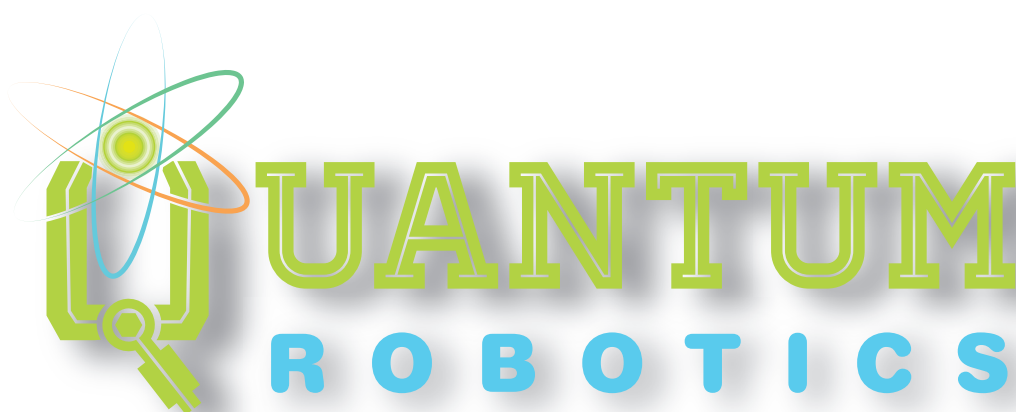


FIRST[®] CHAMPIONSHIP

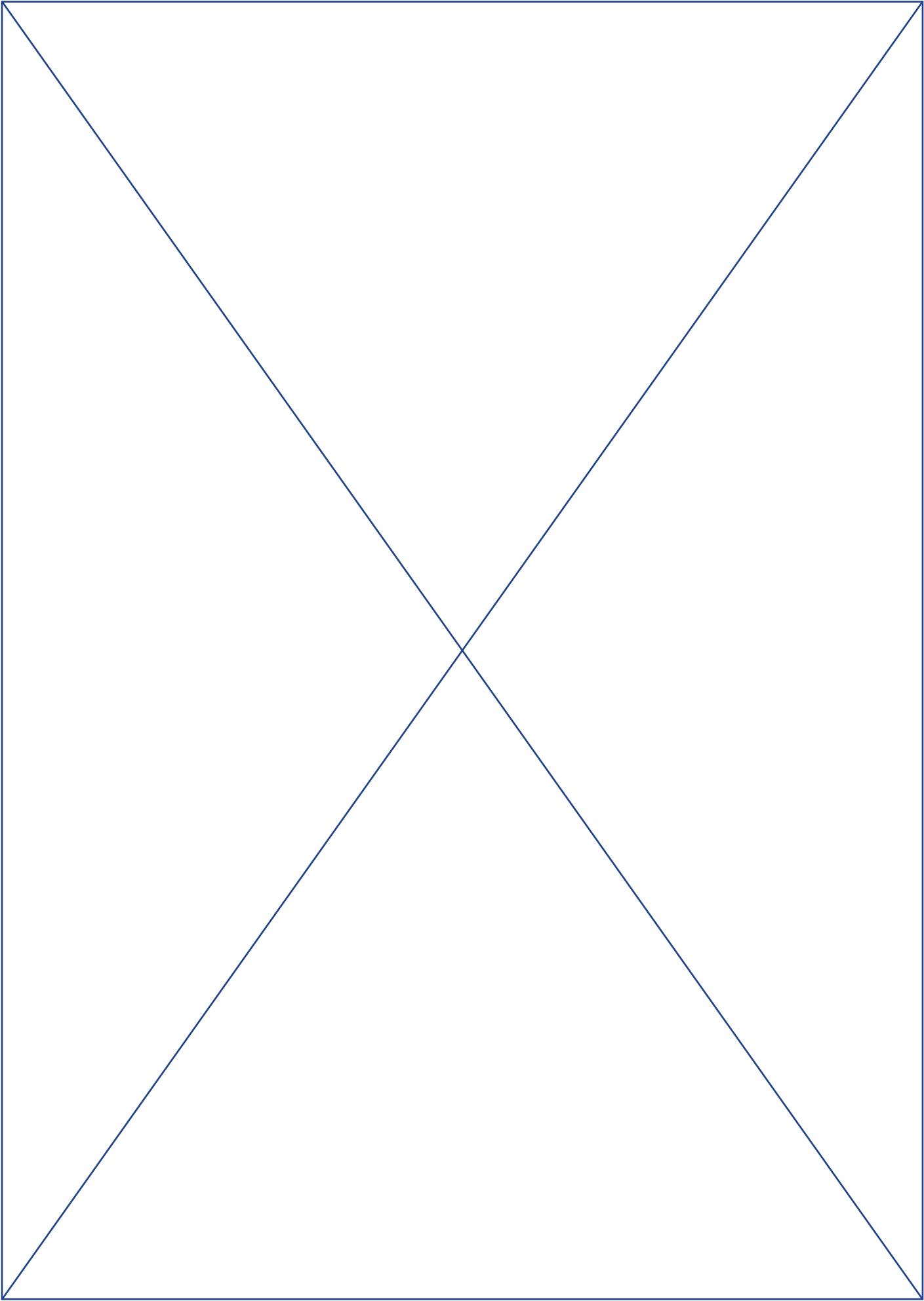
April 24-27, 2019

Detroit, MI



2018-2019







04/24/19
Quantum Robotics

Bucharest
14270

Executive Summary

THE MAIN GOAL OF THE SEASON:

To build a competitive, well organized and team spirit in order to continue perform to the highest FTC level, according our long term view strategy.

WINNING IS TEMPORARY, LEARNING IS FOREVER



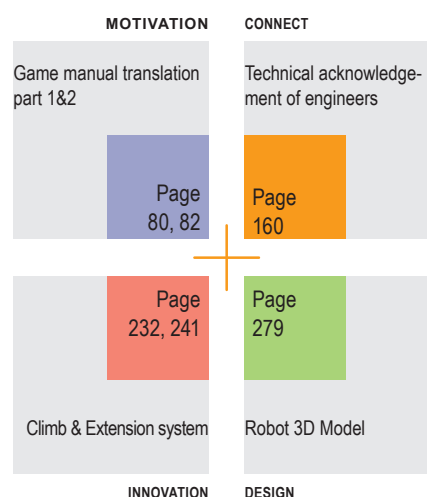
We have developed a business plan for this season to detail our objectives and goals as a team as well as how we are going to best use our resources to promote the growth and sustainability of FIRST.

- Our public activity was focused by promoting FIRST values, FTC robotics competition and awareness of the STEM community, through over 88 events, media presence in Radio, TVs and Journals, achieving indirect over 500,000 persons – page: 57, 97, 160
- We convinced more sponsors from engineering sector to support our team, collecting 66,393.08 USD – page: 196
- We mentored 5 FTC new teams and sustained over 22, keeping in mind our season motto: "Winning is temporary, Learning is forever" – page: 131, 152



This year we've used 2180 pieces for the most ambitious robot yet, totally designed in CAD. Notable pages of the engineering section:

Project management and team organization	Page 47,180
Strategic reasoning and robot's system	Page 213, 217
Complete CAD of the robot using Solidworks	Page 276
Innovative solutions: Climb, Intake Pivoting Axle	Page 241, 230
Key algorithms	Page 263
Autonomous strategy	Page 265
Game strategy in the driving period	Page 271



The Quantum Robotics team has a long-term strategic plan 2017-2022, that is used to enhance team sustainability. See the status this year: Page 195

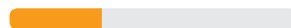
1. Developing strong team by selecting new members/mentors
2. Project management –organizing the team members by roles, tasks, duties
3. Learn by building a successful robot
4. Gain knowledge by research and experimentation and mistakes
5. Develop an excellent team financing plan and sponsor relationship
6. Spread the message of FIRST and STEM

CORPORATE MEETINGS



65% additional contacts and meetings with STEM community

NEW MEMBERS OF THE YEAR



45% We selected 7 new team members, 9th grade for continue long term strategy

SPONSORS CONTRIBUTIONS



78% Increase in sponsorships from private engineering companies

OUTREACH ACTIVITY



92% More outreach activities to expand students' appreciation for science

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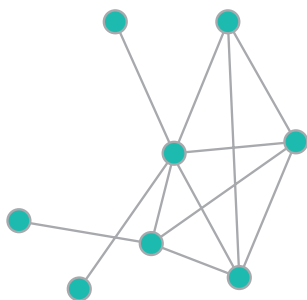
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3. Thanks to our sponsors





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25 YEARS
IN ROMANIA



BRD



FIRST
TECH
CHALLENGE
ROMANIA

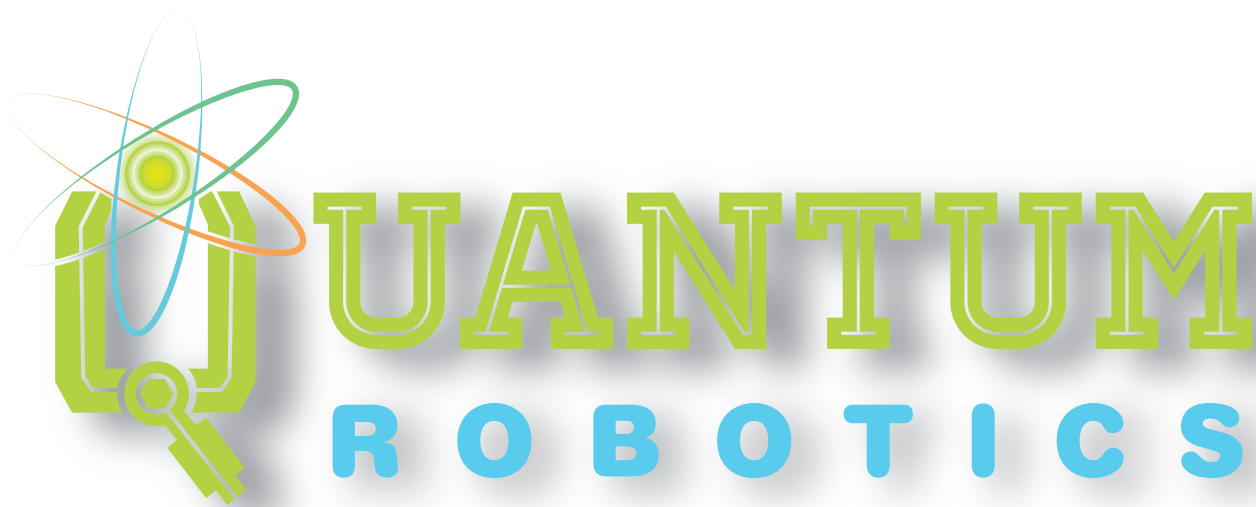
NAȚIE
PRIN EDUCAȚIE

FIRST **CHAMPIONSHIP**



April 24-27, 2019

Detroit, MI

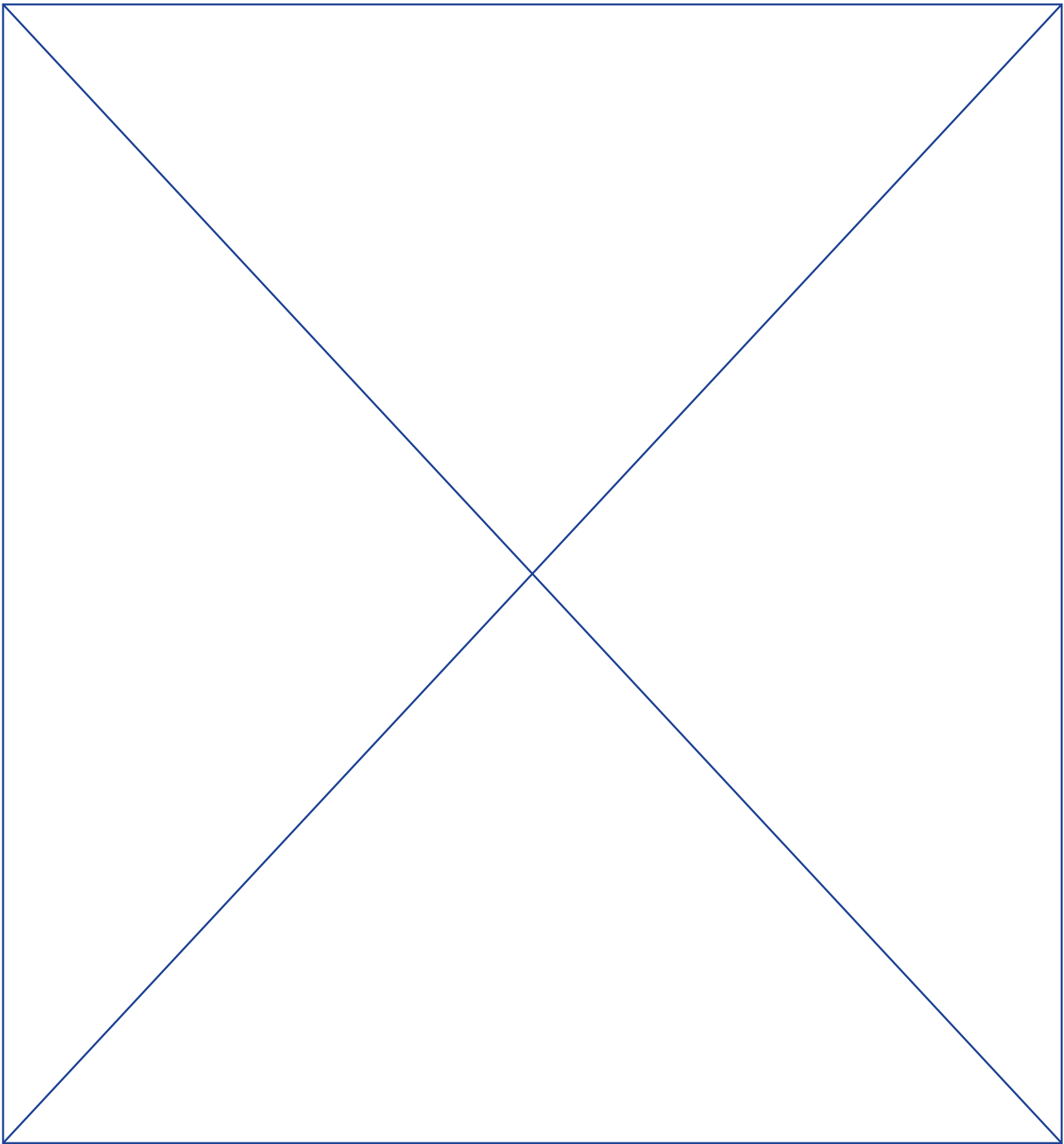


Team

2018-2019

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1. Our FIRST journey continues

Quantum Robotics was established in September 2017 as a channel for International Computer High School of Bucharest (ICHB) students to learn and express their interests in engineering and robotics.

This is the second season of FIRST Tech Challenge for Quantum Robotics but not for all the members. With 15 students, volunteers and three mentors, this team competes as team RO077 the “Quantum Robotics” to the BRD First Tech Challenge Championship 2019.

The team won a lot of experience during last year’s season, which was also their first season. At the National Phase from Romania BRD FIRST Tech Challenge Romania 2018 they won 2nd pick Winning Alliance and 2nd Inspire and qualified for the World Championship from Detroit, April 2018. They also participated and won at FIRST Global (1 member) and Genius Olympiad (3 members). All this contests inspired them to evolve as they also participated at smaller contests related to robotics and informatics but also gave back to their community through events and volunteering.

During this season the team organised a demo and participated at another. In January, we won the Winning Alliance 1st pick Award at the Korean Robotics Competition Seoul.

The team also benefits by his team leader experience, Andrei Preda, in the FIRST Tech Challenge competitions during the last 4 years. He was involved as an active member in AutoVortex Romania #5843 and participated to several FTC competitions across Europe and World Championships, USA. Our team leader was member of the Romanian Robotics Olympic Team Romania for the First Global Challenge Olympiad, Washington, USA, 2017 & First Global Challenge Olympiad, Mexico City, Mexico, 2018.

The department heads responsible for hardware, programming, design and PR are winners to the national and international Olympiads: Physics, Informatics, Biology and Debate.

The Quantum Robotics team has the main goal to promote the STEM and FIRST core of values, to attract more young students passionate for learning, fun and success during robotics program. The goal for this season is to build a competitive team in the spirit of FIRST and to expand our knowledge of robotics design and technical engineering.

The Quantum Robotics team overcame many barriers and applied innovative solutions for its first robot design. This out of the box thinking enabled us to win the Inspire Award and Winning Alliance Award to the FTC Romania tournament, Bucharest, March 2018.

Without the commitment of the students, dedications of teachers, strong involvement from parents, support of sponsors and “Natie prin Educatie” foundation, Quantum Robotics would not have grown to the level it is today. As this growth continues, the team continues to take on new challenges in promoting STEM.

Andrei Preda

Team Leader

11th Grade

Hi, my name is Andrei, I am 17 years old and this is my fourth year in FIRST Tech Challenge competition.

Some of my passions are computers, air soft and especially robotics. When I formed this team I had the goal of building a durable FIRST Tech Challenge team in the high school I study, spreading the FIRST values and pushing the limits of robotics in Romania.

During the last two years I was part of the National team that participated in FIRST Global where last year I've won the first place. These competitions really changed me into a more confident person.

This year I want to be better and share the two extra years of experience with my colleagues. I hope we will have a huge impact on fellow high school kids all throughout Romania and the hole world.



- Team Leader
- Driver
- Group manager
- Event organizer
- Hardware
- 3D Design
- Marketing & PR
- Spokesperson
- Graphic designer
- Dean's List nominee



- **Head of PR & Marketing**
- **Notebook editor**
- **Event organizer**
- **Social-media**
- **Spokesperson**
- **Outreach**
- **Graphic designer**
- **Hardware**
- **Dean's List nominee**

Ema Dumitru

Head of Marketing & PR

11th Grade

Hi, my name is Ema, I am 18 years old and this is my second year in FIRST Tech Challenge Competitions.

Some of my passions are biology, mathematics, debate and I love getting involved in projects of all kinds. I also enjoy doing sports and I've been an artistic skater for 4 years.

Since I found robotics and I joined Quantum Robotics my life changed. I never thought robotics would be an option for me but since I started doing this my future plans really changed a lot and now I am thinking of pursuing a career as a biomedical engineering.

My input in this team is mostly in the PR and Marketing department but I also sometimes help in the Hardware department.

Last year I got the chance to participate in the World Championship with the team and it was one of the most incredible experience I've had in my life.

Last year, in Detroit, I was awarded with the FIRST Inspire pin from one of the judges.

This year I want to develop my passion for robotics and spread it to everyone around me.

Victor Suciu

Head of Hardware

11th Grade

Hi! I'm Victor Suciu, I'm 17 and I am the lead robot designer and engineer here at Quantum Robotics in my secon year of FTC.

My knowledge in STEM, robotics and DIY is vast and I have intrests in mechanical engineering, electronics and machining. Things I enjoy include ham radio, hiking, airsoft and StarCraft 2.

From LEGO, to informatics and Physics olymiads I have always felt a calling to engineering and robotics was the answer.

My involvement in FTC helps satisfie my need for building and tinkering, while helping me develop new skills in my field and also in others, such as CAD, programming and public speaking.

This year I intend to pass on my experience to the younger members of our team's hardware department, so that they can create competent, elegant machines, compete while showing Gratious Professionalism and become members of this rapidly growing community.



- Head of Hardware
- Head of robot design
- Robot admin
- Strategy
- Electronics



Alexandru Turcanu

Head of Hardware

11th Grade

Hey, my name is Alex, I am 17 years old and being part of the core team I have to go through the ideation process, making sketches and cardboard prototypes, all the way to 3D Modeling and building the robot, while striving for perfection and paying close attention to the details.

My craving for computer science started out a few years ago, when tinkering with little snippets of code written in c++, since then I became part of this FTC team, that enabled me to enhance my connection between mechanical and software engineering.

This year I aim to share my passion and knowledge of robotics with the new members along with other FIRST Tech Challenge teams.

- Head of Hardware
- Driver
- Programmer
- Robot design
- Strategy

Alexandru Voinea

Head of 3D Design

10th Grade

Yes hello. My nickname is Boinea, I am 15 and I am the 3D designer of the team and this is my second year in the FIRST Tech Challenge Competition.

I create 3D models for the robot and print them. I am also interested in electronics and amateur radio. In my free time I also play tennis.

Last season I started learning CAD and this year I will work to further develop my skills regarding 3D design. Last year's experience in the USA really motivates me to keep on improving myself.

This year my goals are to learn even more in the robotics field. I hope this year I can spread my love for robotics to even more people around me.



- Head of 3D Design
- 3D Printer admin
- Hardware advisor
- 3D Robot design
- Electronics



Radu Pogonariu

Head of Programming

11th Grade

Hi, my name is Radu Pogonariu, I am 17 years old and I am a student at the International Computer High School of Bucharest and this is my second year in FIRST Tech Challenge.

I really like Informatics and I've been studying it for 7 seven years now. I've also got a couple of achievements at the Informatics Olympiad at the National and International competitions.

I chose to become a part of Quantum Robotics due to the future opportunities. I believe robotics and coding are careers of the future and I feel really privileged to be able to practice them both at such a level this early in life.

Unfortunately, I am the kind of kid that doesn't really get to see the sunlight too much. I am really trying to change this situation but it's really hard to find time to go out considering both of my main hobbies involve mostly staying.

- **Head of Software**
- **Coach**
- **Strategy**
- **Hardware advisor**
- **Orders manager**

Denisa Checiu

Marketing & PR

11th Grade

Hello, I am Denisa, a seventeen year old 11th grader. This is my first year as part of the Quantum Robotics team, and so far it has been a truly enriching experience.

Robotics in the context of the FIRST Competitions is the perfect way to achieve my goal of expanding my area of knowledge by gaining hands-on experience, creating connections with all types of people and helping the community through the outreach events.

Although my favourite subject is mathematics, I am also passionate about psychology, being fascinated with the way the human mind works. I enjoy reading and watching movies that offer me a new perspective regarding life.

I am really excited to see how this season will play out and how much I will learn along this exciting journey!



- Marketing & PR
- Social Media
- Event planner
- Outreach
- Notebook editor
- Graphic designer



Sanziana Tudose

Programming

11th Grade

Hello! My name is Sanziana and I am 18 years old.

This is my first year participating in an FIRST Tech Challenge competition.

I am passionate about computer science and programming especially. I previously participated in the Informatics Olympiad, so in the past I mostly focused on algorithmics and problem solving.

At first, I didn't know anything hardware-related, but since I joined the team, I got the chance to gather experience all-around and learn more about the basic parts that a robot is made of.

This is the first time I built a robot from scratch and even though it was challenging, my teammates guided me through the whole process. With their support I know I will be able to improve even more in the future!

- **Programmer**
- **Hardware**
- **Outreach**

Tudor Popescu

Hardware

10th Grade

Hello! My name is Andrei Tudor Popescu, but you can call me Popica. I am a 16 years old and this is my second year in FIRST Tech Challenge competition.

My hobby in programming and robotics started, about 5 years ago, when I registered to a robotics lecture.

In spend my free time developing apps or indie games or playing them.

I really enjoy working with my teammates and my goals this year include quaffing again for the World's but also getting the chance to reach out to as many kids both form within and from outside of the robotics community.



- Hardware
- Young group member
- Volunteer manager
- Event manager
- Graphic designer



Mihnea Visoiu

Hardware

9th Grade

I am 15 years old and this is my first year in the FIRST Tech Challenge competition.

I am passionate about robotics, engineering, computers, drones and anything in between.

For me, robotics is something I have been interested in since I was seven. After looking online for how to make robots, I learnt about the Arduino.

I had experience with programming before and I was good at computer science, so once I understood how I could make robots with the Arduino, I began to make them smarter and more complicated, going from Christmas lights to train control systems and home automation.

I hope that participating in FTC will teach me how to design even better robots and control them, among with teamwork skills, being in a team with people who have the same passions as me, working together for the same goal.

- **Hardware**
- **Programming**
- **Web design**
- **Young group member**

Eliza Constantinescu

Hardware

9th Grade

I am Eliza Constantinescu, a teenager of 15. This is my first year as member of Quantum Robotics Team and first year of competing in FIRST Tech Challenge.

Since a while, my hobbies are photography and tennis. Two years ago, I discovered my passion for robotics and I had some individual experiences in robotics competitions.

Being a part of a team and participating in FIRST Tech Challenge competition is an exciting and challenging activity.

The team spirit, the interaction and cooperation with other participating teams, along with the hard work on our robot, is fascinating.

Being part of a team for FTC competition is not only robotics, it is much more! We are challenged to get involved in several activities which develop our skills in multiple areas.

At the end of the day, it makes us better students and better people! Robotics is not only robots, it is also human interaction!

I am happy to be part of this and I look forward to the next challenge of our team on the road of FTC competition this year!



- Hardware
- Young team leader
- Spokesperson
- Robot design
- Outreach



Tudor Constantinescu

Hardware

9th Grade

Hello! I'm a 15 years old highschooler in 9th grade, who just loves designing and creating stuff using own imagination and knowledge.

I always wanted to be able to create all the robots I could think of, so I have been going to a robotics club since 5th grade. Now, being a highschooler, I've become more familiar with FIRST, and most specifically FTC.

I am part of the Quantum Robotics team, one of the best in the country! I'm so proud of it! Since the first time I came to the meetings, I have made a lot of friends, one of the things that helped me to successfully integrate.

I didn't expect to have so much fun either, but everyone is amazingly open and inclusive!

#dreamteam

- Hardware
- Robot design
- Young group member

Cezar Mitrea

Hardware

9th Grade

Hi! I'm Cezar, a member of Quantum Robotics. Currently, I'm in the ninth grade, I am 15 and I work in the hardware and software department.

Since it's my first year on the team and also on the first year of FTC, I have a lot to learn.

I'm looking forward to continue in the cybernetics domain in the future, so this is a big opportunity for me to understand better what it takes to create or code robots and cooperate with my colleagues.

What got me into robotics was my passion for engines and electronics, discovered from a cousin when I was nine.

Then, I found out you could program them to do what you wanted and that idea intrigued me ever since, so I'd go to whatever presentation I could find and read any article related to robotics.



- Hardware
- Programming
- Robot design
- Young group member



Calin Teodor

Hardware

9th Grade

I'm Teo and I am in the 9th grade and I am 16 years old. Even though this is my first year in FIRST competitions, this is my second team since during the first semester I've been part of "Qube".

When I moved back to the International Computer High School of Bucharest I wanted to join Quantum Robotics because I knew of their results and I knew from classmates how amazing nice it is to be part of this team.

Being part of this team is a unique opportunity for me. Since I've been a child I was interested in robotics and informatics. I have also participated at Robotex, Robot challenge and other competitions in the robotics field with some of the members from Quantum Robotics.

In my free time I enjoy photography and playing hockey. My love for photography is also a plus for the team since now I can help with the graphic preparations.

- Hardware
- Robot design
- Young group member

Luca Holt

Hardware

9th Grade

Hi!! I'm Luca, I'm 15 years old and I'm a member of Quantum Robotics team. This is my first year in First tech Challenge.

I am in the hardware and software department. This year I hope that I will get better at programing and help the team on software more.

In the future I hope that I will continue on this path, since this is the technology of future we are working with.

The first time I heard about robotics was when I was 10, and i was marveled since then. The thing that I like the most about robotics is that imagination is a key factor, and everything you can do sums up to your own imagination.



- Hardware
- Programming
- Video making
- Robot design
- Young group member



Emre Sertel

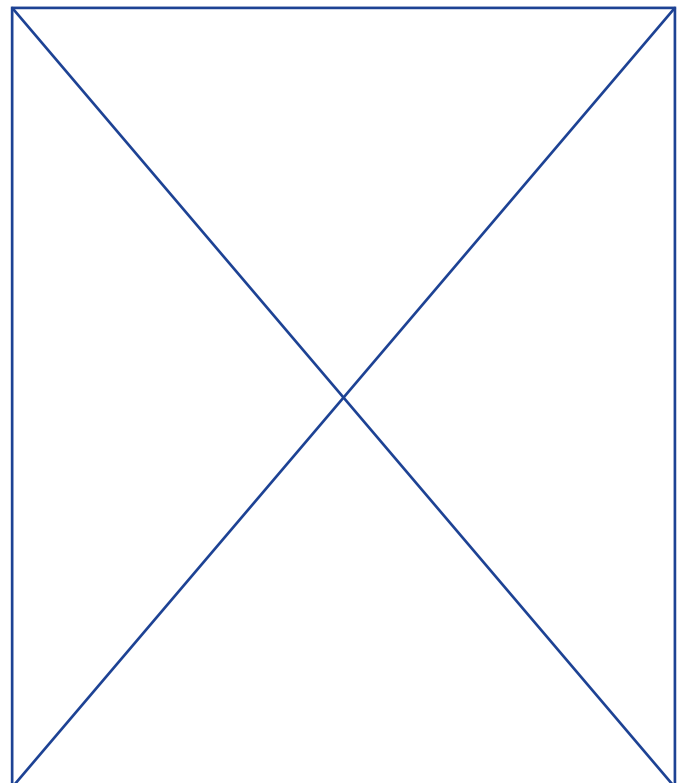
Main Mentor

Informatics Teacher

I am a teacher of informatics and I have been teaching for 13 years in different countries. I have been living in Romania for 4 years. I have a master's degree in computer engineering.

I have studied on optimization algorithms. I am interested in Android programming and metaheuristics. I have supervised students in different competitions as robotics and programming.

This is the second year for me and the team in FTC. I enjoy guiding and supporting my students in Quantum Robotics team. It is wonderful watching how students work as a team, improve their skills and prepare for the future. I am very pleased to be part of this amazing FIRST program.



- **Main Mentor**
- **Organizer**
- **Outreach**
- **Trip planner**
- **Adult representative**

Alin Preda

Nontechnical Mentor

Parent

I'm a non-technical team mentor and team parent. I have been involved in FIRST competitions for more than three and this is my first year working with Quantum Robotics team.

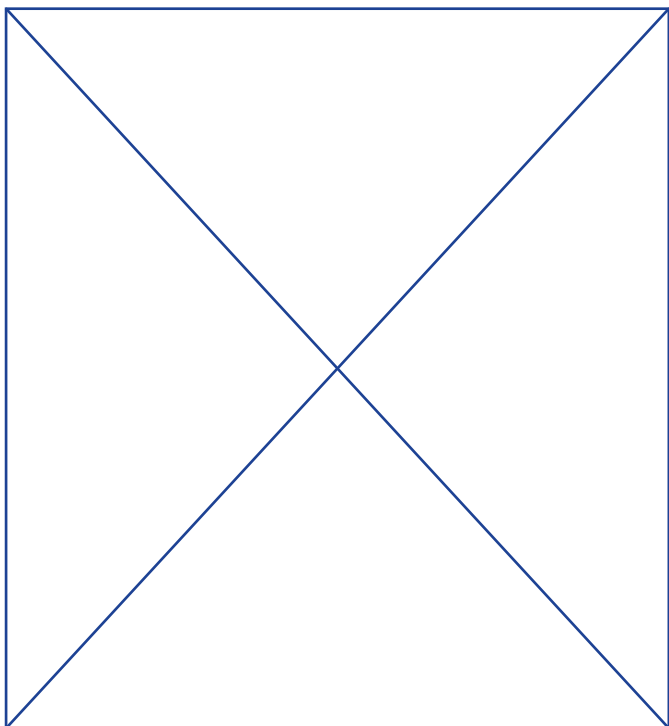
I enjoy working with and teaching students and being part of a team working together to achieve a common goal.

My responsibilities for Quantum Robotics are to work with the students on the engineering notebook and business plan and serve as a marketing & PR and administrative adviser.

One of my jobs at competitions is to take care of over all activities at the pit. I enjoy doing my part giving the team members the tools they need to succeed.



- Co-mentor
- Nontechnical mentor
- Notebook advisor
- Outreach
- Marketing advisor
- Trip attendant





Elena Sacontala

Technical Mentor

Physics Teacher

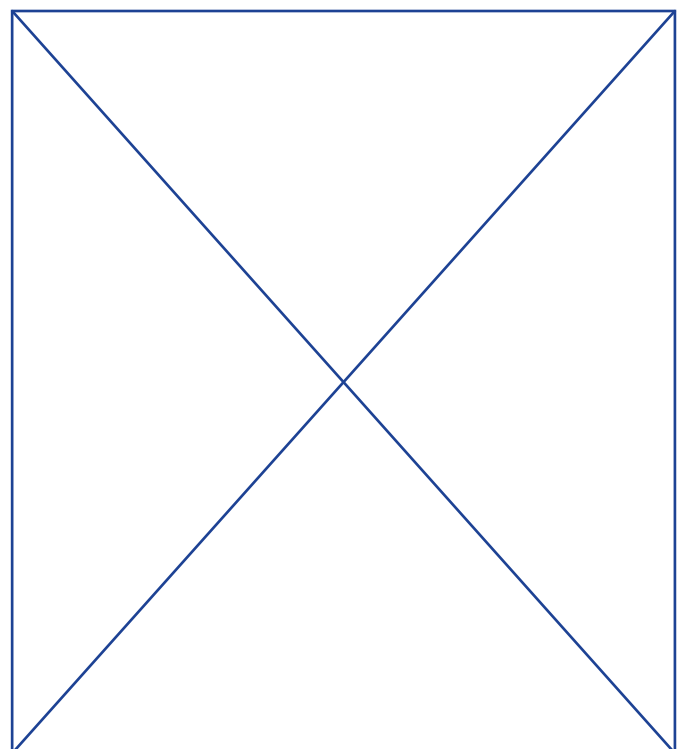
I am 25 years old, a physics teacher, graduate of Bucharest University.

I always considered physics the basis of life as we know it at any given time and engineering the hard working sister of physics who molds theory into reality and puts it to good use.

What I find amazing is how there is always something new to be discovered and more often that I would have thought children shake the very foundation of what we call ordinary and do extraordinary things.

My life motto is to live with an open heart and mind, learn from your own mistakes and regret when you repeat them not when you make them.

- Co-mentor
- Technical mentor
- Hardware advisor
- Outreach advisor
- Trip attendant



4. Awards

Winning Alliance 2nd Pick
BRD First Tech Challenge Romania
Bucharest March 2018



Inspire 2nd Place
BRD First Tech Challenge Romania
Bucharest, March 2018

Grand Gold Award
International Olympiad for robotics “Genius Olympiad”
State University, Oswego, New York, USA.



Gold medals
First Global Olympiad
Mexico, August 2018

Gained by Romanian team where Andrei -our team leader - was selected 2 times in row.



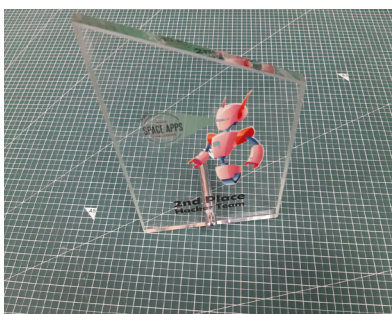
2nd place**Vodafone Hackathon -TechFest 2018**

awarded with 3000 Euro for a software solution to sign the contract to the distance.

Quantum Robotics members design the soft in 24h.

**2nd place****NASA Space Apps Challenge Romania**

awarded with 1000 euro, for an application that is a global rocket launch aggregator, together with the information needed to promote exploration of space by all fans of Cosmos

**“Best Team Effort” Award and “Youngest Team” Award****Hacking Health 2018**

organized by USA embassy and Johnson&Johnson. Designed in 24h, the application is totally revolutionary and helps people with food intolerances at various allergens to detect allergens on food labels, create recipes and buy online products from the nearest store.

For this application the Quantum Robotics team has received an intention letter from an investor to buy the developed and integrated solution for the value of 6000 euro. **Annex 5**



Winning Alliance 2nd Pick
Korean Robot Championship
 First Tech Challenge Korea Open
 January 2019, Seoul



Finalist Alliance Captain
BRD First Tech Challenge Romania
 Bucharest Regionals, March 2019



Inspire Winner
BRD First Tech Challenge Romania
 Bucharest Regionals, March 2019



5. Selection of members and mentors

According 1st team strategy: “Developing a strong team by selecting new members/mentors” (see Strategic plan, chapter 8) proposed for the next 5 years - 2017-2022 – our team started to implement a plan for recruiting new members and mentors.

Team members

We started recruiting one month after our return from America and we had our first set of interviews set for students in the 9th, 10th and 11th grade since during the following season they were still going to be in high school. What we planned was to have two interviews scheduled, one before the summer break and one right after it, when the new freshmen would arrive at our high school.

We sent the recruitment message through an email both times. All students and parents received an email advertising our team and also with the information about the interview.

All interested students could fill out an online form with their personal information and the departments they wanted to apply for.

No matter the departments, we wanted to know what made them apply for a member position in our team, what previous experience they had and how much time they could dedicate to robotics.

For the PR & Marketing department, we looked for several passions and talents. We were looking for a person poisoned by writing or talking (for the notebook and as a spokesperson) on the Public Relations side. For Marketing we were looking for a person with graphic talents or who had previously pursued sponsors.

On the programming part we looked for students with basic knowledge in programming and willing to apply it in a different domain.

For 3D design we were looking for students who had previously worked in specific programs or who had previous experience with a 3D printer.

For Hardware, we looked for kids either with previous experience in the robotics domain or with a high drive and talent. In this department we also offered the students a small test. We asked them how they would assemble 4 Tetrix parts in order to form a square imagining that they would have to screw them together.

All students had the sliders test. We decided that since sliders are commonly used in our designs and we wanted to make sure that all members had an engineer’s intuition, opening a slider is the perfect task for the interview.

Our successful advertising campaign has attracted many talented students and we decided to split the team in permanent members and volunteers. So, we created a motivation system for volunteers, and they have the chance during the season to prove their abilities and passions and become permanent members.

Team Mentors

Since last year it was clear to us that our team will keep on being administrated more by the members than mentors. Even though we are a very independent team, we still had the support of two mentors.

We try to go to our mentors only with the problems we can't solve on our own, when a second opinion is really necessary or when we have legal issues.

Our first mentor is Mr. Emre Sertel. He is an informatics teacher at our school and he helps us with all the organisational problems and documentations we have with our high school.

Our second mentor is Mr. Alin Preda. He is the father of our team leader, Andrei. He's been by our side since the day we started and he helps us on the non-technical part, especially with fundraising and sponsors.

This year we decided that we needed some more advice on the theoretical part of robotics and one of the things that we couldn't quite figure out on our own was the physical part behind our systems. We were not looking for a mechanic since we wanted the robot to be our work so we were able to find Ms. Sacontala Elena. She is a physics teacher in our high school and due to her experience in applied physics she was our the perfect choice for us.

This way, our team has been able to create a full team of mentors that all have their own impact on our work while we also maintain our autonomy and individuality.

For next season we have reached out to Daniel Rosner with a PHD in engineering and we asked him to become a tehcnical mentor for Quantum Robotics.

6. Volunteers and members

Due to the fact that this year's selection was an open one at both interviews we had 70 students who attended the interview.

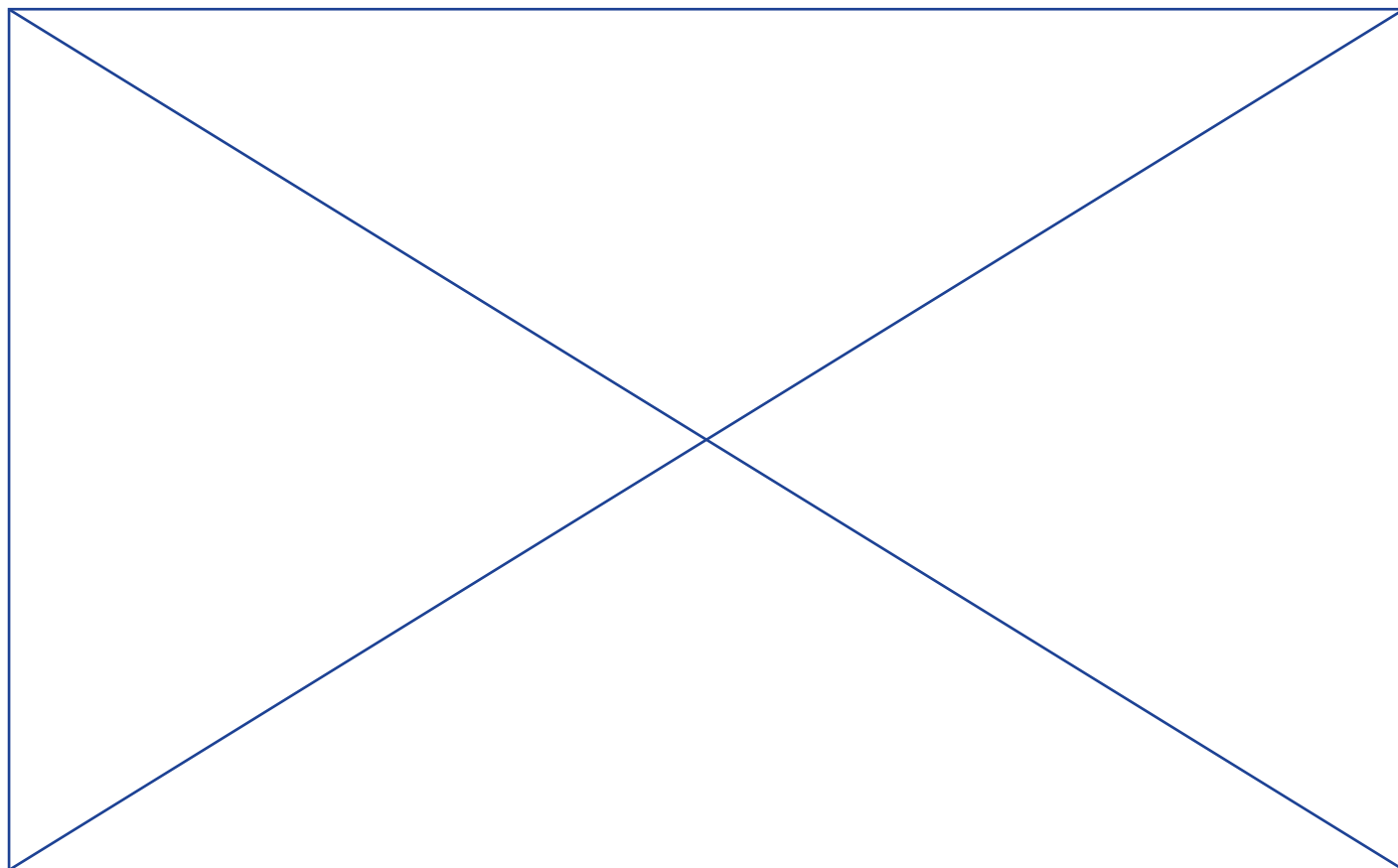
Since we had so many students who wanted to join our team and it was really hard for us to only choose 10 students, we decided to pick up to 35 students.

Our program of recruitment included a 1 month test period during which all students were observed and the most dedicated and present 10 students were chosen as members while the other 25 were volunteers.

Even after the 1 month trial ended, we kept on observing the volunteers and in cases of lack of interest or unjustified absences they were sometimes switched with more present volunteers.

In the end, after 5 months of several switches and changes, after some of our members left or simply lost interest, we were able to come up with a final configuration for a 15 members team for the rest of the season.

With a full team consisting of 4 girls and 11 boys, we have a consistent team with fully dedicated team members.



7. Contact & Social Media



@QuantumRoboticsFTC



@quantum_robotics



quantum.robotics@ichb.ro



www.qrobotics.eu



Quantum Robotics FTC



Quantum Robotics

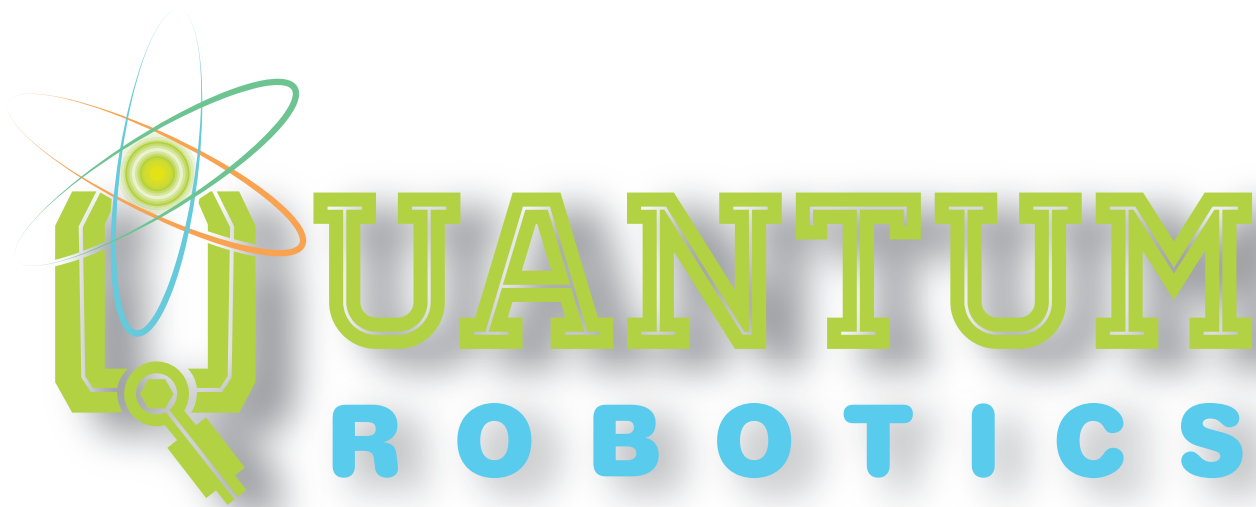
Thank you for your time and consideration!
Quantum Robotics Team

FIRST **CHAMPIONSHIP**



April 24-27, 2019

Detroit, MI



Bussines Plan

2018-2019

1. Executive Summary

Sustaining our education institution core of values, team's vision, mission and goals are focus on collaborating to inspire interest, knowledge and application of STEM, according FIRST values such as Gracious Professionalism and Coopertition.

Our main goal this season is to consolidate a competitive, organized and team spirit team in order to continue develop the passion for robotics in our school and to recruit students and mentors for continuing the long-term view strategy. We have developed a business plan for this season to detail our objectives and goals as a team as well as how we are going to best use our resources to promote the growth and sustainability of FIRST.

This year, the team is always looking for ways to be more financially stable and sustainable. We continue to keep a strong relationship with our main sponsors, offer thanking diploma for each of our sponsors and interested parents to maintain steady support. We continually focus to search for more sponsors interested in helping support our team around our community and within our school.

Our public activity was focused by promoting FIRST values, FTC robotics competition and awareness of the STEM community. In the future, we hope to do more public outreach and expand and encourage students' appreciation for science.

Our motto: "Winning is temporary, Learning is forever" was well appreciated by younger members and rookie teams we mentored. We try to teach they about the techniques used in the designing, building, and programming processes in order to continue the strength of the team as older members move on.

We also look at newer technology and techniques and continue to experiment with these during the off-season in order to refine the techniques in a way that will best suit our needs. Because of Quantum Robotics's firm foundations in relations, innovations, and dedication, we are prepared for long-term sustainability, continuity and impact.

Quantum Robotics RO077
FTC Team

Business Plan Summary 2018-2019

1. Executive Summary

- Mission, Vision, Values and Goals
- Team Summary

2. Team Information

- Basic information about our team and mentor
- Benefits to the students, mentors, sponsors

3. Organizational structure

- Team structure
- Training of team members and mentors
- Training attendance, expectations, safety
- Work location to Lab

4. Outreach and mentoring plan

- Spread FIRST values
- Inspiring and mentoring other teams
- Actively support in order to give back to the community

5. Operational plan

- Details major FIRST season tasks
- Action plan
- Project Management

6. Marketing plan

- Explains how we use our brand to enhance partnerships
- Actively support in order to give back to the community
- Branding, Slogan, Motto

7. Sustainability plan

- Financial statements
- Present the sponsors and all sources of funding
- Details of management of team finances for sustainability

8. Strategic plan

- A 5-year plan which defines our goals and actions we'll take to get there
- SWOT analysis

1.1 Mission, vision, values, goals

Mission

To operate with Gracious Professionalism and respect, inspiring our young colleagues to incorporate the core values of FIRST into their lives, and develop vital skills to success in the real world through a strong relationship between team members, mentors, institutions, sponsors and media.

Vision

To create leaders by giving students real world problems to solve which gives them experience in more than just science and technology.

Core Values

In everything we do we display Gracious Professionalism, act with integrity, have fun, learn is more important than what we win, respect each other, work together to find solutions to challenge, honour the spirit of the competition and inspire others to adopt these values.



Mission picture



Vission picture



Core values basics

Our SMART Goals

- The main goal for this season is to build a competitive team in the spirit of FIRST and to expand our knowledge of robotics design and technical engineering.
- To design and build the robust robot and find new and innovative ways of thinking to solve the field's challenges
- To have a detailed documentation of our robot-building process throughout the season in an engineering notebook
- Learn to be strong competitors, but also treat one another with respect and kindness in the process
- Communicate more effectively our core values in order to attract new students, mentors and sponsors

For achieving our goals, the team members and mentor focus on collaborating to inspire interest, knowledge and application of STEM, business and leadership skills.

Our Business Plan has been created to document the team's approach to achieving our mission and goals in a sustainable manner and it will also attract, enthuse, and empower future team members as well as other FIRST teams both in our community and around the world.





Photo from Korea



One of our older sponsors



Our school

1.2. Team Summary

Based at International Computer High School in Bucharest, Romania the Quantum Robotics began its journey last year in September with a group of fifteen Olympic students.

We have a stable team for the moment, but our target is to grow steadily and to have more students and mentors in order to grow and support our strategy development.

Our team members experience helps the team to create a branding image and trust in front of our sponsors. Even we have a short history we succeeded to convince our audience and support our ideas.

We have eleven major sponsors, including corporate, educational foundation, high school and friends and family that fund almost all our team expenses, for starting the season and participate to the competition. We succeeded to collect **66,393.08 USD** through our successful presentations.

We have developed a business plan for this season to detail our objectives and goals as a team as well as how we are going to best use our resources to promote the growth and sustainability of FIRST.

2. Team Information

Year Founded	2017
Location	Bucharest, Romania
School Affiliation	International Computer High School of Bucharest
Key Figures	3 girls 12 boys
Mentors	2 teachers 1 parent
Sponsors	TCMTunning, International Computer High School of Bucharest, Lumina Education, Natie Prin Educatie, Parents, Kruk, Roel, SolidWorks, Celesta Conexim, MarcTel, Reloc
Website	www.qrobotics.eu
Mail	quantum.robotics@ichb.ro
Facebook	Quantum Robotics #14270
Instagram	quantum_robotics
LinkedIn	Quantum Robotics FTC
YouTube	Quantum Robotics

2.1. Benefits for Students, Mentors, School and Sponsors

Students	<ul style="list-style-type: none"> • Learn how to design and build a robust robot • Develop self-confidence, communication and leadership • Have fun • Be part of a community and work as a team • Help others through community outreach • Gain opportunities to meet managers • Start to practice STEM related field such as engineering • Develop multi-tasking and time-management skills • Work with and learn from adult mentors who have professional experience in the areas of science, technology, engineering, math, and business
Mentors	<ul style="list-style-type: none"> • Share knowledge and experience with students to help them accomplish their tasks, in both engineering and business areas • Have fun • Be part of a community and work as a team • Help others through community outreach • Offer students a “real life” learning experience they cannot get in the regular classroom
School	<ul style="list-style-type: none"> • Support an outstanding student development program • Support STEM and business interests in students • Increase name recognition as a school that helps develop outstanding students • Gain insight of professionals outside of academia to help set curriculum • Support students for scholarship opportunities
Sponsors	<ul style="list-style-type: none"> • Real occasion to market their company • Reach out to the community in a positive way • Identify and develop future employees • Inspire students to enter STEM and business fields • Provides opportunity to be good corporate citizens

3. Organizational Structure

For the first year our organizational structure was simple in order to be more effective and to achieve our main goal. This was the chance to involve all the members in the process of designing, project management, construction and business, developing self-confidence, communication and leadership skills. With this experience we think that each member can learn and understand what he enjoys do and for the future projects to develop its own subdivision.

For this year we consider that it was necessary to work with subdivisions, because our main leaders have the experience to work with new members for each department. We split the organizational structure in 4 sections: PR&Marketing, 3D Design, Engineering and Software and to be more efficient we create sub-teams in order to handle specific tasks. Each experienced student will manage and train new members.

Also, we create new positions for volunteers to all sections from the organizational structure for training and selecting new members.

Roles

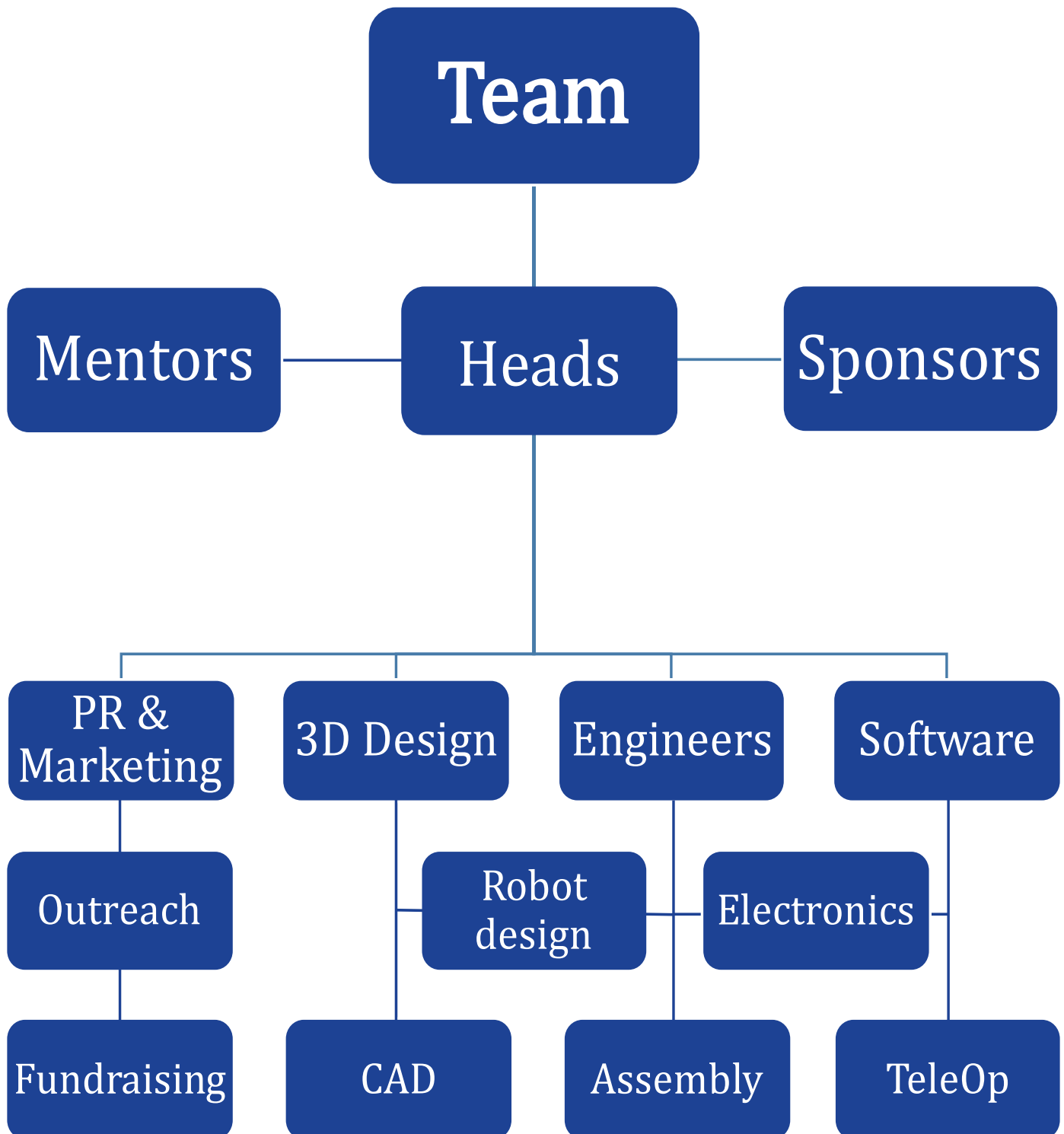
PR&Marketing team - Functions as communications channel between the team, sponsoring businesses, and they are responsible for team documentation and building relationships with sponsors.

3D Design - Works with the CAD team to determine the necessary parts and modifications to build the final iteration of the robot. Machines parts and builds gearboxes to be used on the robot. Drive team - Responsible for the execution of team determined strategy/gameplay and controls the robot during competitive game.

Hardware - Designs the robot based upon the desired aspects from the team. Lays out the parts and plans prior to final build.

Software/Programming team - Writes code to be used on the competition robot. Works with the drive team to determine the best system of controls to be used during the competition. Solely responsible for autonomous performance of the robot.

Team managment scheme





Organizer in Romania



Robotics Camp



Rover Ruckus FTC Poster



Webinar

3.1 Team members training

All the team members and mentors benefit by the periodically training organized by the organizer of the Romanian competition.

Usually online interactive training sessions on Facebook and YouTube for mentors and students are organized by “Natie prin Educatie”, and our team members always participate.

The trainings offered contained subjects from all aspects of FTC game and our team learned a lot of tricks and tips from construction of the robot to the programming and working to the engineering notebook.

Also, starting with this season we implemented a training/testing strategy, creating a team with new members for building in the same time a robot only for testing and training (See RobotY chapter).

During the off-season, our team members participate in new student workshops in which mentors and veteran students teach them about engineering, robotics and the business aspects of the team.

Through this, our team members enter the FIRST season with a greater knowledge base.

3.2. Training attendance, expectations, safety

Our main goal set by team mentor leader is to have presence and students on time to all webinars to all major meetings. If a student is unable to attend, a mentor or colleague should be aware of his or her absence in advance.

It is beneficial to the team that all students attend their own sub-team's meeting on a weekly or daily basis, depending on the demands of the group.

Our target is to attract passionate for learning students and our mentor keeps in touch with the teachers and support students to have good standing to the school's classes.

Thus, grades are of upmost importance on our team. For a student to remain on the team, he or she must have at least 7 in all his or her classes.

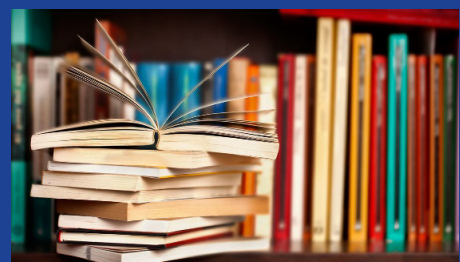
Safety of team members is of upmost importance. Students and mentors working with the robot at school or in the pit must wear safety glasses. The use of power tools is supervised by experienced mentors. In addition, our team adheres to a rigorous, award-winning safety plan.

	A	B	C	D	E	F	G	H
1	Attendance							
2	Names	Total	Wed 2/1/17	Thu 2/2/17	Fri 2/3/17	Mon 2/6/17	Tue 2/7/17	Wed 2/8/17
3	Student1	3	1	1	1			
4	Student2	3	1	1	1			
5	Student3	3	1	1	1			
6	Student4	3	1	1	1			
7	Student5	2	1	1				
8	Student6	2	1	1				
9	Student7	3	1	1	1			
10	Student8	2		1	1			
11	Student9	2		1	1			
12	Student10	3	1	1	1			
13	Student11	2	1	1				
14	Student12	2	1	1				

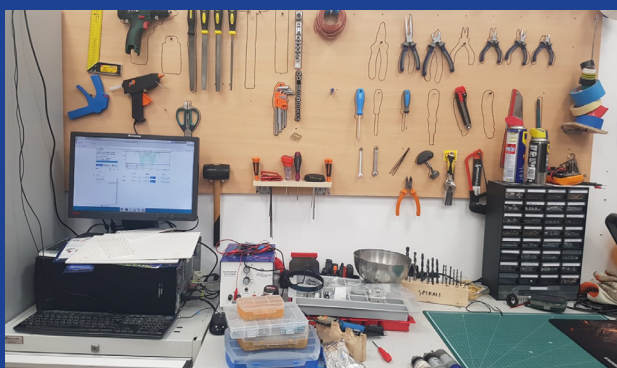
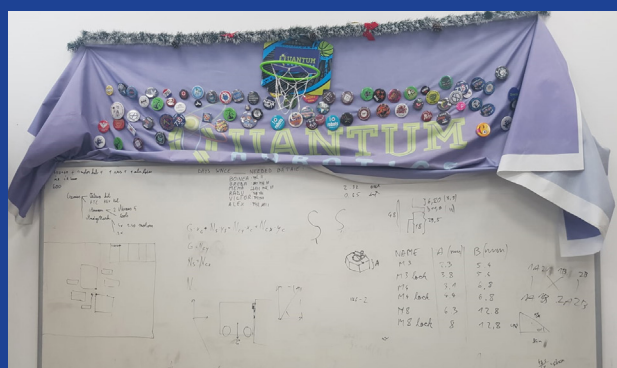
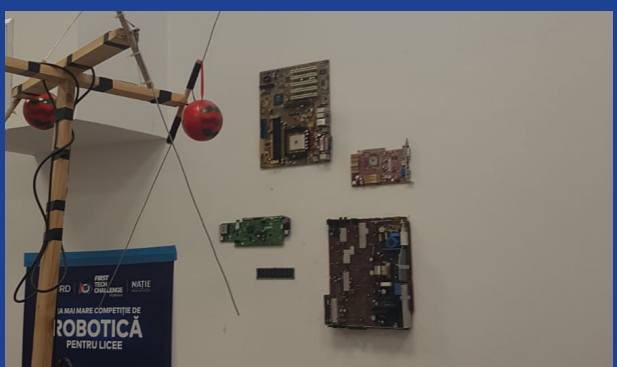
Attendance example



What defines members



Good grades are important

*Tools**Last year's poster and pins from World**Computer parts on the wall*

3.3 Work location to Lab

International Computer High School of Bucharest (ICHB) provides educational opportunities in a safe, supportive environment which fosters pride, inspires excellence, promotes respect and builds strong relationships and to prepare an adaptable international student body for lifelong learning by emphasizing higher level thinking skills, successful communication techniques, and global responsibilities within a nurturing and stimulating environment.

International Computer High School of Bucharest (ICHB) makes available to our team a dedicated room for Olympic Preparations and allows us to meet and work to the robots.

Our Lab is located to the basement and we enjoy working in a peaceful, safe and clean environment in the school.

We have tooled the workroom with the necessary machinery our team needs, 3D printer, CAD computers, tables and enough space for work.

With the support of our sponsors for the season 2018-2019 our team invested in new and useful tools and machines as follow:

For the next year, with the support of our school administration and a big sponsor we plan to open a large robotic laboratory, fully equipped with high tech technology, having the main goal to attract more students for STEM activities.

4. Outreach and mentoring

Table of contents

- 4.1. Spreading team values to other competitions
- 4.2. Promote First Tech Challenge values in Romanian schools
- 4.3. Spreading FIRST values to the public
- 4.4. Community outreach & services
- 4.5. Mentoring and Assisting Other Teams
- 4.6. Connecting and collaborate with Other Teams
- 4.7. Connecting with the STEM professionals

Summary

The Quantum Robotics choose to participate to many community outreach events to further impact our community, spread awareness of FIRST, and to emphasize the importance of social responsibility to team members. Our team members inspires other people to be involved in the community science, accommodate with robots and understand the evolution their life.

Our activity in numbers:



4.1. Spreading team values to other competitions

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11. Titan's Demo	71
12. Bucharest Regional Competition	72
13. Romanian National Competition	75

Summary

Since April 2018, members of the team Quantum Robotics participated in 12 contests. Some were associated with robotics and even FIRST Tech Challenge events while others were programming and invention contests.

We had amazing results at all of these contests and each of the events was an opportunity for us to find out new information and test our abilities and team bond.

In the official robotics contest our results were:

Genius — 1st place

FIRST Global — 1st place

Korean Robotics Competition — 1st place with the alliance

Bucahrest Regional Competition - Inspire Winner

Bucahrest Regional Competition - Finalist alliance captain

We also took part in 3 scrimmages this season (one organized by us) and we had amazing results in all of them.

We took part in 4 programming contests, and we qualified as world semi-finalist for NASA Space Apps Challenge.

Genius

11 - 15 June 2018

USA-NY

Summary

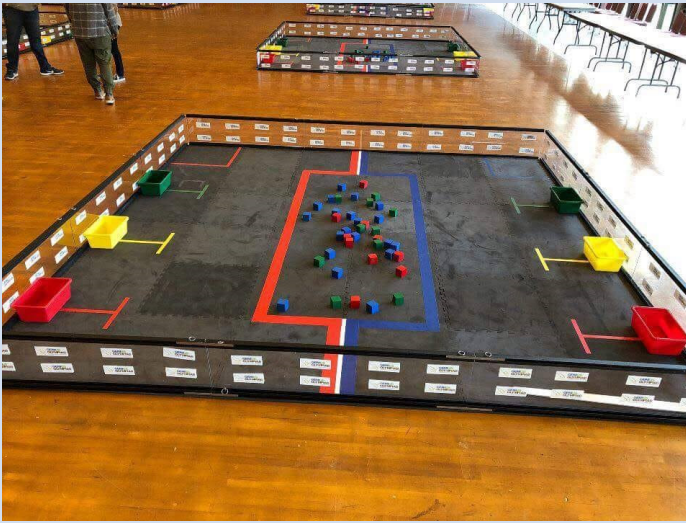
Today we are leaving for Genius Olympiad! It is an international competition that takes place in Oswego, NY, United States of America. We have been working for the last month to finish the robot. Because we will participate at the robotics category, we need to collect 2 inch cubes and deposit them in boxes depending on their color. We also worked at a engineering notebook for this competition. After a 1 hour delay, we departed for London, our first connection. Unfortunately, the delay meant we missed our flight so we were given tickets in the next one. After a 7 hour flight we arrived in New York. Here we found out that because of our different flight from London to NY the airport lost our Genius robot! But we didn't give up and hoped the robot would make it to the competition in time. After another 1:30 hour flight, we made it to our final destination, Sunny Oswego University Campus. The next day we had a break day between our arrival and the competition. Unfortunately, we still didn't find our robot but at least we got an address for its destination. We spent the rest of the day relaxing and visiting the Sunny Oswego Campus.

Today is the big day! The competition starts at 11 AM and we still don't have our robot! We started the morning at 8 AM by calling FedEx and they told us the package was already delivered, but we could not find it. The Sunny Oswego campus was really big and it was very hard for us to find the package. We managed to convince the judges to delay our matches for a few hours, but to make matters even worse, it started to rain. When it we were almost ready to give up, we got a call from the campus director. He told us to search in a nearby building that was across the campus. And there it was! We were so happy to finally have our robot we worked so hard for. We went straight to the competition hall and played all of our matches back to back. We won all of them! We were really happy but it wasn't all over because judges had a big saying in the final scoring.

The next day is our free day off! The organizers are taking us on a field trip to the Niagara Falls. We started the day at 8AM and all the participants got in the buses. After a 2 hour trip, we got dropped of at the entrance of the Niagara Park. The organizers already gave us tickets so we quickly got in line. Unfortunately, it was extremely crowded and we had to wait for 1:30 h in line! But it was all worth the wait. The falls were amazing and we had a lot of fun. After that, the buses took us to a huge mall where we spent the rest of our day.

Today was the award ceremony. We were also looking for the parts we ordered for our FTC preparation. Unfortunately, this package got lost in the huge campus as well! We had to look for it in a lot different offices and mail rooms. In the end, we found out the organizers set up a table for all the orders from the competitors and we just didn't know about it. We picked up our items and sat down at the award ceremony. After some tense bronze, silver and gold awards, we were called on stage for the Grand Gold Award, the highest distinction of the competition! We were thrilled that our hard work payed off! The following day we were leaving for a 3 day vacation in New York City.

Photos



The field for this competition: we had to collect cubes from the center of the field and then sort them between the three boxes.

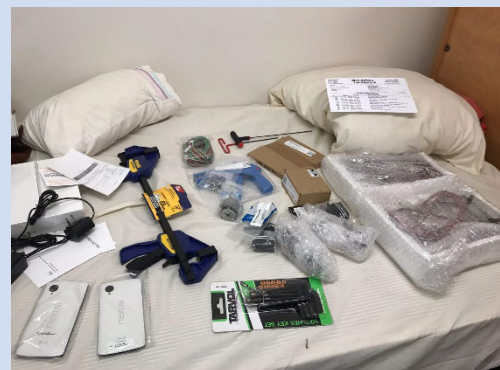
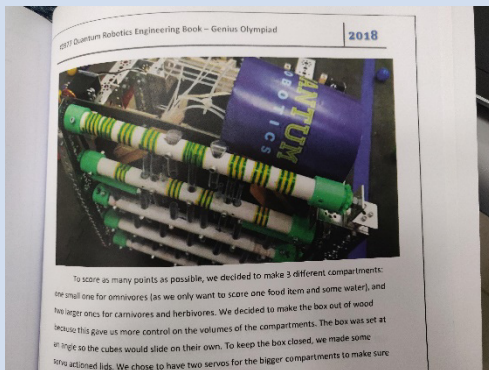
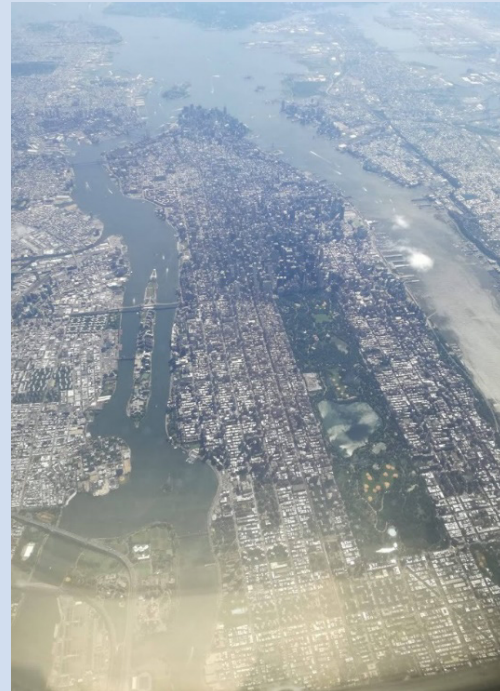
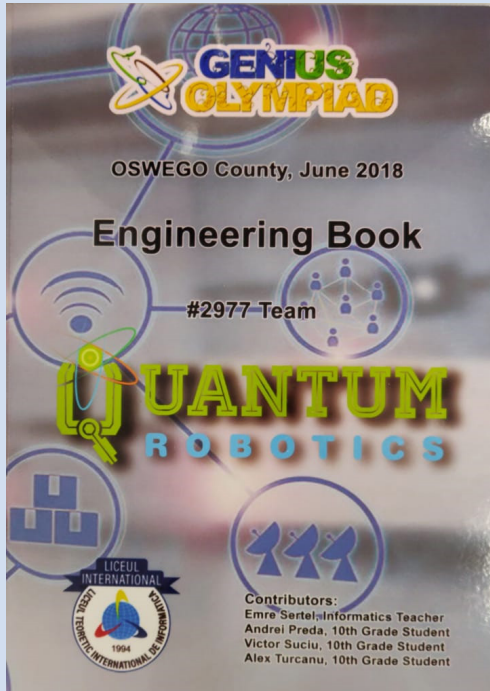


These are Victor and Andrei happy that they finally rescued their robot from the airport.



Victor, Andrei and Alex on the podium after they won first place and gold medals.

Photos



The engineering notebook's cover and the intake system.

The view from the airplane (top right).
The parts we just received for the next robot. (below)



The Niagara Falls from our short visit.

FIRST Global

20 - 25 August 2018

Mexico

Summary

We were extremely proud and honored to hear that Andrei, our team leader, has been chosen to be a part of the FIRST Global team that represented Romania to this year's championship! We are truly inspired to have him as one of us, a part of the Quantum family, a family that, in the end, he created when he came to our highschool and asked the principal to create this robotics club, last year.

He participated at the FIRST Global championship of 2018 with six other members coming from Hundedoara, another city from our country. They all worked a lot to get where they are, and proudly represented our country through it all.

The competition took place in Mexico City, it was very exciting for everybody seeing as none of them had been there before. Although they were a bit intimidated, realising against whom they were competing against, it was a very inspiring and humbling experience, especially being able to participate along the best robotics members from around the globe!

They came to understand the importance of just being there, near the minds of the future, alongside people with the same passion for robotics as they do. After this, they enjoyed every moment of the championship! Their team came back with four Gold Medals: Best score in qualifications, Most wins in qualifications, Winning team of finals, Albert Einstein Award, and one distinction Safety award!

They, not only made us proud, but also our country! It was truly inspiring to realise what our team member is capable of. He came back with refreshed knowledge, new ideas and an unstoppable desire to help our team achieve its goals! It was a memorable experience that he will never forget!

Photos



The Romanian team on the podium and then when they arrived back at the airport.



The Romanian team on the podium and then when they arrived back at the airport.

LIVE 97 RESULTS MATCH FINALS FIELD 2

Team	Score
Team Romania #7	1129
Team Singapore	
Team Germany	
Team Madras	992
Team Ireland	
Team Colombia	

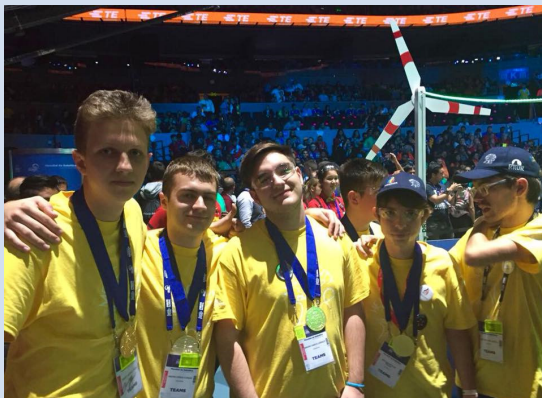
WIN

Category	Team Romania	Team Madras
SOLAR FACTORY	100	100
WIND TURBINE	100	100
REACTION PLANT	0	0
COMBUSTION PLANT	100	100
COOPERATION BONUS	0	0
PARKING BONUS	0	0
PENALTY	0	0
TOTAL	1129	992

The scores from the finals which Romania won.



The gold medals brought home by our Romanian team, including Einstein Award and Best score in Competition.



A selfie with the team after the competition.

Hackathon Bucharest

23 September 2018

Bucharest

Summary

We decided to participate to this Hackathon right after we volunteered to help 1st and 2nd graders write their first code. The challenges were given by Vodafone and were as follows:

1. Make an application that allows clients to visualize phones in augmented reality and compare key features.
2. Make an application that allows clients to securely sign contracts from long range.
3. Make an application that informs clients of the closest shop that has a phone they are looking for.
4. Make an application that returns a link to the Vodafone store from a picture of a phone.

At first we started working on challenge 1 because we thought we had enough experience working in 3D design. But we quickly realized that it took more than 3D design to project an object into Augmented Reality. So we quickly reprofiled to challenge 2.

Our plan was to use image recognition to identify an ID card and read the personal data and picture off of it. Then compare the data from the card to the one in our database and a selfie of the user. The idea that made us stand out was taking a one-time reference picture in a certified store. This would assure you couldn't steal somebody's identity.

Another idea we had but didn't have time to implement was using a 3D mapping software to make sure that the face in front the camera is actually a person (not a 2D picture). You would be asked to make a face expression (like smiling) and rotate your head.

After 24 hours of hard work, we stopped coding and had a small break. The project pitch went really smoothly! At the end, one of the judges asked us if we learnt all of this in university. We simply replied by saying "We are in high school".

After judging we were awarded 2nd prize and a 3000 euro check. We later reinvested this money back in robotics. We were really thrilled to win such an award in a competition filled with university students and IT employees.

Photos



The team having an interview with for an online channel



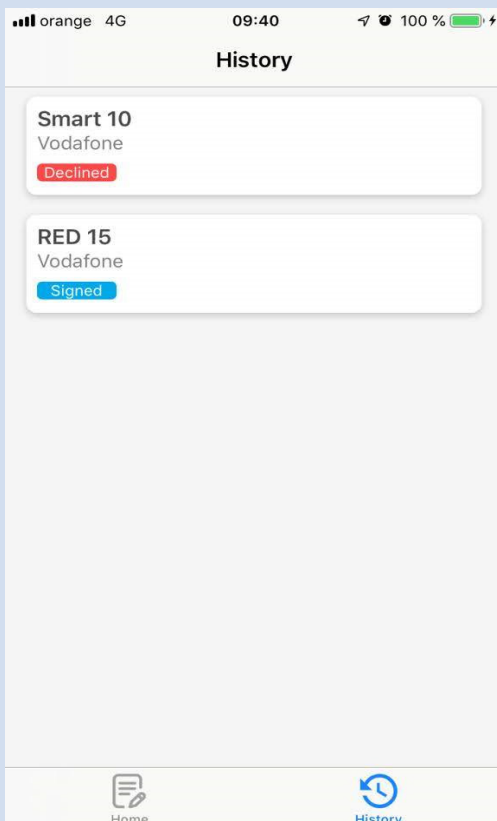
TechFest Bucharest MegaHack 2018 trophy



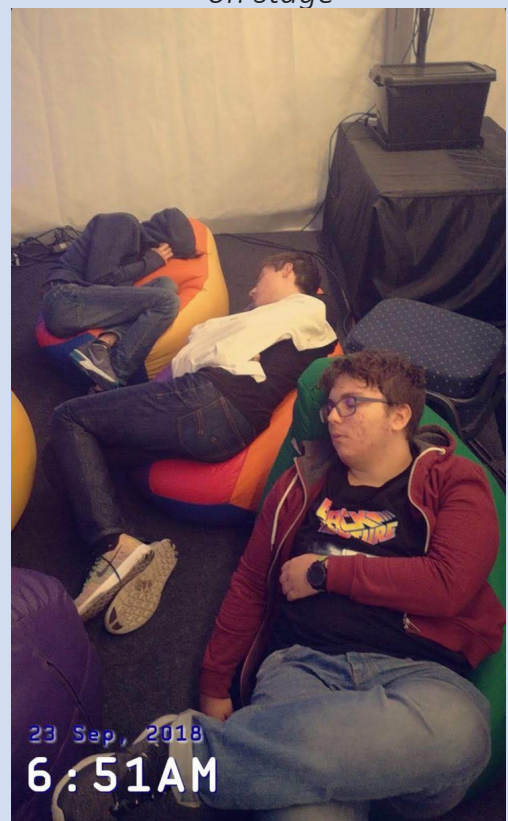
The team being happy to receive their prize



The team taking pictures with the organizer on stage



A prototype design of the user interface



The tired team taking a quick nap

Da Vinci

20 October 2018

Bucharest

Summary

Da Vinci Contest was a competition for inventors organized by Gheorghe Lazar National College in cooperation with Rotary Club Bucharest

We got involved in this competition when Ema heard about it from a school council meeting. We quickly signed up and made a sketch for the idea. We wanted to make a secure system for storing patient information and to allow the disabled to get prescription medicine without having to physically go to the doctor.

We also hung some posters around the school to try and convince as many kids to join this competition.

When we got to the competition, we saw a lot of interesting inventions such as an algorithm that identified the type of melanoma from a picture of the tissue or a 3D printer that automatically removed printed parts from its bed.

After presenting the project, the jury gave us some feedback. They said it was a good idea but it needed a lot more work on the backend. Another problem would be the Romanian system itself. They said it would take a lot of work to make such a drastic change in both the public and private system at the same time.

We took notes and promised to return with a more finalized project as soon as it was ready.

Photos



Photo of the team at the final's presentation.



The poster for the contest.

NASA Space Apps

22 October 2018

Bucharest

Summary

Because we kept in touch with the organizers of TechFest MegaHack Bucharest, we were informed about a hackathon related to NASA – Space Apps. Space Apps is a huge international hackathon in which you choose one of 25 challenges from 5 different categories.

The hackathon started with some icebreakers and then we quickly got to work. Unfortunately for us, the challenges were not really focused on coding or were too complex for us. After some brainstorming we narrowed it down to 3 choices:

1. Create a tool to track international rocket launch information.
2. Build a crowdsourcing tool for citizens to contribute to early detection, verification, tracking, visualization, and notification of wildfires.
3. Create an easy-to-use way for people to develop their own, custom checklists – both items and plans – for specific kinds of disasters. Use NASA images, videos, or data visualizations to illustrate each disaster type, to help people understand how to prepare.

We started research on all of these subjects and we got to the conclusion that challenge 1 was the best one for us. Our app stood out because it also included a scoreboard that encouraged people to engage with rocket launches and had integrations with Google Home and Google Assistant.

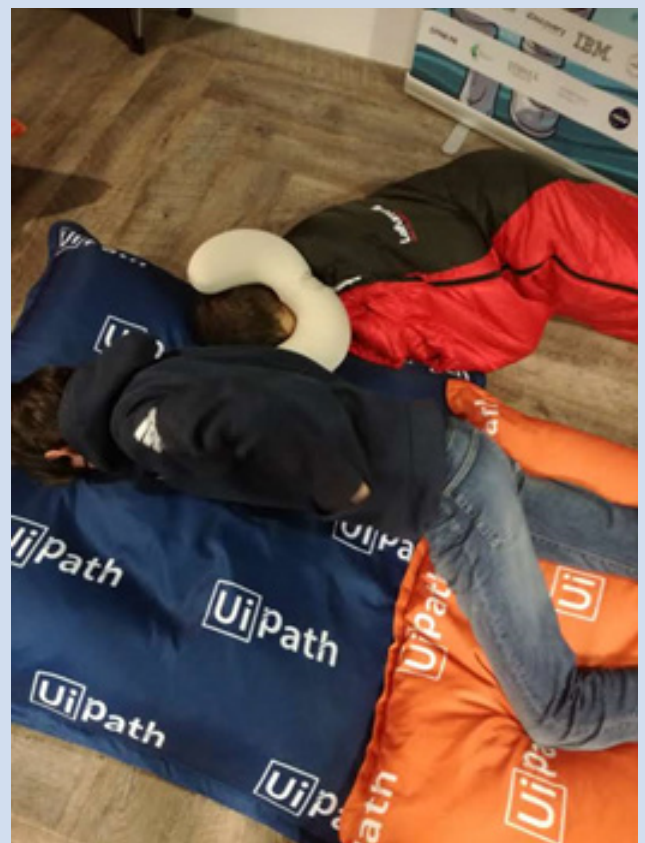
After a full night of work (and a very small amount of sleep) we were done coding. When our turn came to present the project, everything went very smoothly. We had a Google Home Pod that we taught to say hi and goodbye to the jury before and after the presentation.

We were really happy when we heard we were the winners of 2nd place! We were awarded with a 1000 euro voucher to EMAG that we later managed to sell for cash that was later invested back into

Photos



Victor shutting down for a few minutes



Alex and Victor resting for a bit



Dumitru Prunariu – The only Romanian that has been to space – holding a speech for the contestants



The team getting ready to start coding

Hacking Health

2 - 3 November 2018

Bucharest

Summary

This weekend six of our members took part in a 24 hours coding contest called “Hacking Health” along with programming lovers and some FTC members.

The purpose of this contest was to identify a problem in our health system or health issues that can be improved and then find a solution based on an app, a program or anything related to technology that we could make up in 24 hours.

Our app was targeting people with allergies and food intolerances and it was making ingredients without allergens more accessible as a matter of information from where you can buy it and what you can cook.

Participating in this contest gave us the chance to think about real life problems.

Photos



Photo with the awards won by our team and by Gabriela Ivan.



Photo from our team's table, from the initial brainstorming.



Photo from the opening ceremony for the programming event.

MegaHack Cluj

9 - 10 November 2018

Cluj

Summary

This weekend three of our members left for Cluj to participate at another hackathon (24 hours coding contest).

This contest gave the participants the liberty of choosing between three categories of challenge.

After thinking of building a chat-bot for this competition, our guys ended up deciding on doing an app for Cluj City Hall.

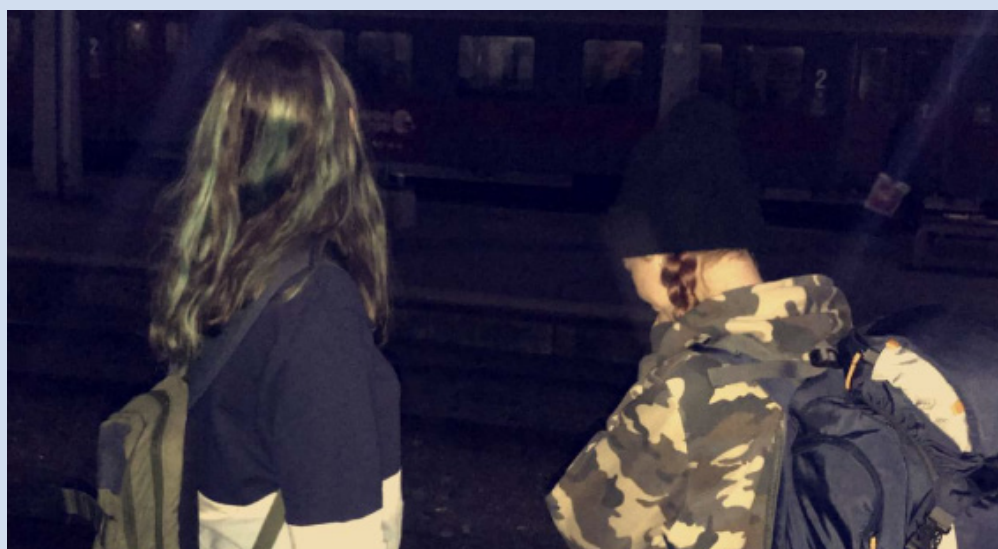
Our app, called “Bloodify” had the main purpose of calling all users with a certain type of blood type when in need.

Even though we didn’t win the grand prize it was amazing to try our skills for something like this.

Photos



Photo with the team at a midnight break.



Ema and Sanzi waiting for the train to Cluj.

Demo Rm. Valcea

24 November 2018

Rm. Valcea

Summary

Today 6 members from our team were in Rm. Valcea for a Demo and managed to win Winning Alliance Captain.

In the morning our 6th member also arrived in Rm. Valcea so we went at the sports hall a little earlier since we still had to finish the autonomies for the demo for both red and blue alliances. We thought it would take a while to finish them but we were way faster than predicted so we also had time to train a little on driving.

We also had the chance to talk with a few of the spectators that came to see the matches and we explained a little about FIRST and about our robot. When the matches started we were extremely hyped to play. After all qualification games we were able to finish in the first place so we got the chance to pick another team to be part of our alliance and we chose team 42 Bionic Royals.

In the semi-finals we lost the first game and during the second one there was a small misunderstanding and due to a robot malfunction in the other alliance we were not able to score two game elements in the lander so we were barely able to win the second game. During the last semi-final even though we had a pretty hard time since the other robot disconnected we managed to win and qualify for the finals.

Between the semi-finals and finals we worked with our alliance partners because the hook they used to deploy broke just 7 minutes before the finals. Everything was happening on fast-forward and somehow we managed to be ready. We took a look at their code hoping to find a solution for their problem with disconnection when staying for too long in Init.

In the finals we only played 2 games and we were able to win. We were extremely blessed with also winning the second game since our robot did have a small malfunction during the ending of the second game. Also, during the last final our alliance was almost able to put both team markers and move both cubes during the autonomy but unfortunately we had a problem and our robots collided.

This demo was a really good chance for us to find out what we need to improve on our robot and what we need to change. We realized that we need to be way more efficient and also we need to make sure our robot is durable so we wouldn't have problems during the games. During this demo we also had the chance to remember some game rules and regulations since during the other semifinals there was a little misunderstanding and we were able to help with advice about scoring with the help of the game manuals.

After the demo we also got a chance to interact more with the other teams at the after party organized by Bionic Royals.

Photos

FIRST Pit Display

Rank	Team #	RP	TBP	Plays
11	47	4	345	5
12	122	4	313	6
13	5	4	289	6
14	63	4	264	5
15	83	4	250	5
16	45	2	498	6
17	23	0	353	6
1	87	10	437	6
2	142	10	389	6
3	42	8	546	6
4	77	8	463	5
5	82	8	361	5
6	57	8	270	5
7	6	6	435	6

Match
Q-11
Q-12
Q-13
Q-14
Q-15
Q-16
Q-17
Q-18
Q-19
Q-20
Q-21
Q-22
Q-23
Q-24
Q-25

The scores after some of the qualification games when we were on the 4th place. In the end we were on the first place.



Photo with the diploma and throphee won.



Group photo with Bionic Royals after winning the Demo finals.



At the beginning of the demo we helped with the fields since there were some problems.

Korean Robotics Competition

27 January 2019

Korea

Summary

Because we knew we had a lot to do until Romanian regional phase, we knew we wanted to set another checkpoint for the robot and the notebook. So we decided to attend an international competition. At first we wanted to go to FTC Russia Open but we were later informed that the Russian competition was only open to the local teams for this year as they had a problem with FIRST.

Then we started looking for other options and soon we found out about KRC. We were really excited to go as most of the team members hadn't ever seen an Asian FTC team. This competition would allow us to experience the Asian culture and their way of building robots.

We bought the plane tickets and reserved the hotel as soon as possible. The work schedule became totally full as we had a lot of ideas we wanted to implement.

We made new T-shirts, Soft shell jackets and hoodies for the team members and mentors. We also prepared promotional materials such as pins and stickers. We were really impressed by the questions the Korean spectators asked us. For example, somebody asked us how much we were selling the pins for! When we told him that they were for free and he could take as many as he wanted, he was really shook.

We only had 3 qualification matches and we won 2 of them. In the elimination matches we were selected as first pick by team Autovortex and went on to win the championship with them.

Going to Korea was a really eye opening experience as we had the chance to embrace a different approach on the FIRST ideology.

Photos



The excited team heading for boarding in Bucharest Airport



The tired team on an 8 hour layover in Doha Airport



The team doing some maintenance on the robot on the training day after the flight



A picture with a Korean team and their robot



The winning alliance – made out of 1 Korean and 2 Romanian teams – celebrating the victory



Quantum Robotics and Autovortex picking up their prizes on the stage



The team taking a picture in front of a traditional Korean palace



The team enjoying a traditional meal at a Korean BBQ

Official Demo

3 February 2019

Bucharest

Summary

This weekend we had the thrilling opportunity of participating at the official demo, organized by 'Natie prin Educatie', that took place at the American School in Bucharest. The matches took place in two days, each team participating in just one of the days.

We were very excited to see the other teams and to compete with our robot!

It was an enriching experience, which really helped us solve any existing problems with our current version of the robot. At the same time, we realised the importance of interacting with the other team from the alliance we are in, communicating our individual strengths and weaknesses can help us perform better together.

It was the perfect opportunity to talk with the other teams, exchange advices and stories. We also loved the fact that we could see the teams that we mentor, we were very proud of the progress they made!

It was a very interesting day, and it made us even more excited for the upcoming FTC regional phase, and even more determined to perform better!

Photos

Rank	Team #	RP	TBP	Plays	Rank	Team #	RP	TBP	Plays
1	141	10	558	5	16	81	4	390	5
2	20	10	328	5	17	37	4	369	5
3	67	10	254	5	18	17	4	366	5
4	106	8	361	5	19	15	4	311	5
5	58	8	325	5	20	117	4	273	5
6	19	8	259	5	21	95	4	251	5
7	77	7	554	5	22	54	4	210	5
8	109	6	528	5	23	51	3	490	5
9	80	6	403	5	24	90	3	367	5
10	13	6	320	5	25	48	2	300	5
11	79	6	299	5	26	42	2	279	5
12	142	6	294	5	27	111	1	219	5
13	116	6	255	5	28	30	0	394	5
13	116	6	255	5	29	39	0	313	5
14	145	4	467	5					

The results from the demo.

Titan's Demo

2 March 2019

Korea

Summary

One day we got an email from a mentor from team Titans. It was an invitation to their friendly competition, aimed at preparing the teams for the Bucharest Regional Qualifier.

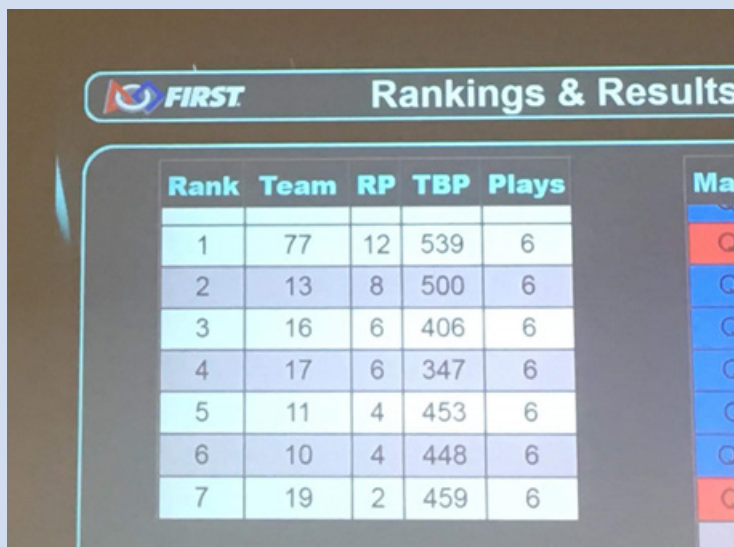
We joined the competition too because we wanted to test new robot improvements under the pressure of a competition.

We also had the chance to test the freshly finished autonomous program. It worked really well but we identified some problems that we would fix during the following week.

We were really happy to be able to interact with other Romanian teams when there was so little time left until the competition. It gave us the chance to help a lot of the teams in need and we really enjoyed it.

After 6 won qualification matches, we ranked 1st.

Photos



Rank	Team	RP	TBP	Plays
1	77	12	539	6
2	13	8	500	6
3	16	6	406	6
4	17	6	347	6
5	11	4	453	6
6	10	4	448	6
7	19	2	459	6

The team's ranking during at the end of the matches



The team receiving the participation diploma

Regional Competition

8 - 10 March 2019

Bucharest

Summary

This weekend we had the much awaited Bucharest Regional Competition! We had been preparing for it for such a long time, that when the time came everything felt a bit surreal.

As the competition has been approaching, for the past two weeks we spent a lot of late nights in our lab, trying to perfect everything, trying to finish all we had in mind for the Regional Phase, trying to reach the best version of our robot.

We had a lot of work, especially since most of our members had to prepare for different olympiads they participate at, but we love doing what we do so no amount of time spent in the lab was too much!

As the first day of the competition began, you could see the buzzing energy circulating between our members, the contained excitement and nervousness. We loved seeing how our new members for this season were so eager to absorb every detail around them.

As the days progressed we put all our energy into performing the best we could during the qualifying matches, and got the 1st place!

We reached the finals, and even though we weren't the winning alliance by 5 points, we weren't dissappointed by it, we were proud and happy that we reached this far! For us it was still a win!

We gathered a lot of knowledged, we analysed our weak spots and made plans for future improvements. It was a competition full of learning possibilities!

One of the things we loved most, was the opportunity of connecting with all the other teams, sharing ideas and advice. We felt truly humbled by the support we received from all the other teams, especially the ones we mentor, and we tried to give back to our robotics community just as much!

We won the 1st Inspire Award, and this deeply motivated us to push ourselves further and improve all the aspects we could.

It was a successful completion from which we learned so much, and which motivated us for the following weeks to truly prepare for the nationals! We are so excited for all the upcoming challenges!

Photos



Photos from the stage with the awards.





Preparing for a match.



The team waiting for the finals.

National Championship

21 - 24 March 2019

Bucharest

Summary

The national phase of the First Tech Challenge competition has been very much awaited by our team! We have been preparing thoroughly, trying to put together the last possible details and perfect everything we did wrong before. The days started with much excitement for us, but we also got a bit nervous seeing the level of the competition. Each team prepared such interesting promotional materials and each pit area was more unique and fun than the next. The place was buzzing with contained excitement. As the days passed we got close as a team and enjoyed communicating with all the other teams and mentors. We loved answering whatever questions the judges had, and even more we loved helping the people from our robotics community when something was going wrong. Our excitement reached its peak when we found out we were the Winning Alliance! We were so nervous and the last matches left us hanging for each point our alliance could score. Finding out we also won the Inspire Award and the Think Award made us feel so incredibly proud! It was a truly exciting experience from which we learned so much and we can't wait to get to Detroit to apply all that we learned! We are ready for the next challenge!

Photos



The team on the stage

4.2. Promote First Tech Challenge values in Romania

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Summary

Through this season and also during the preseason we really tried to reach out to as many people outside the FIRST community as possible.

We shared FIRST, it’s values and it’s goals to thousands of school kids, and we were also able to reach out to parents and teachers.

This season we translated both manuals in Romanian and one of our team members was part of the robotics caravan that reached out to more than 500 students from 55 FTC rookie teams.

Our contact with primary and secondary school kids was made through presentations held at different high-schools, volunteering programs some of the members had been part of for more than 6 months and 3 public events held during Bucharest Science Week.

Colentina Talk

23 May 2018

Bucharest

Summary

Today we visited our sister high-school from Colentina and we had three meetings to present FIRST, FTC and robotics.

First we met with the mentor from a small group of passionate 7th and 8th graders that love robotics. They usually participate in robotics contests such as Info-Matrix and FirStep so we first presented to the mentor FIRST.

After talking with him for a bit we realized that the kids would be somewhere in between FIRST Lego League and FIRST Tech Challenge so we presented both programs. Since the kids were already accustomed to robots that were similar to the FTC ones, the mentor decided he would think about it.

Our second meeting was with the head master and with the mentor from our previous meeting.

The meeting took longer than anticipated due to language problems because all of us spoke 3 languages but at different levels and one of the mentors couldn't really understand English or Turkish while the other had problems with Romanian. Our main topic was opening an FTC team in ICHB Colentina.

After presenting the idea for a while to the head master we started talking about what this would imply.

We talked about founding and about students. We offered to mentor the team and we helped with the prices for materials and field.

Our third meeting was actually a presentation. Since opening a team cannot be done without having interested students we presented FIRST and robotics to 9th and 10th graders from Colentina.

We met in the schools auditorium and we talked a little about our experience during our one season of FTC but also about how being part of an FTC team is also about being gracious and about belonging to a huge community of amazing teenagers.

We talked a little about the departments in a team and in the end we answered to some questions.

After deciding for themselves who wants to join we will help them as much as possible.

Photos



Ema and Andrei speaking to the mentor from our sister highschool.



Andrei and Ema talking to the director from the same highschool.



Andrei and Ema presenting robotics in an Amphitheater from the highschool for the ninth graders.

Balkan teachers

5 August 2018

Bucharest

Summary

This week, 15 informatics teachers from Balkan countries were in our school for “robotics as extracurricular activity” seminar. They are from Albania, Macedonia, Serbia, Bulgaria and Bosna Herzegovina. We also had the chance to make a presentation. We introduced FIRST programs and told them how FIRST is a STEM program, outcome of FTC and how they can apply them as extracurricular in their schools. We have demonstrated how our robot works and introduced the kits we use. Finally, we talked about our team and every members’ duties.

Outline of our Presentation:

- FIRST Programs and values
- Introducing FTC Games
- FTC Team Duties
- Outcomes of FTC
- Robot sets
- Building robot
- Our team - Quantum Robotics

Photos



Photo from the event with the teachers.

Game manual 1 translation

12 - 15 July 2018

Bucharest

Summary

Today we started working on the translation of the official FTC book. We realised the importance of being able to read each page and of understanding each rule and value FTC showcases. We thought that by making this translation possible we may help our romanian community. We talked and decided to meet in our lab as soon as we saw the book released online! Let the work begin!

It was our second day working on the translation of the first part of the official FTC book. Even though it was the summer holiday, and most of our friends were having fun going out, we didn't mind spending time together in our lab. We knew deep down that by doing this, we may help our community and even encourage other romanian teams to sign up! The whole day we enjoyed each other's company, we laughed about our misspells and bonded over the fun moments! In the end it didn't even feel like working!

Today was the final day of translating the first part of the official FTC book. We were ready to translate the final chapters and do the final check-ups! It was a relaxing day. Each team member took care of its part, translated it as accordingly as she or he could, and asked for help when he had questions. We talked about our holiday plans and realised with joy that we will meet again soon to translate the second part of the book too. To celebrate a work well done we ordered some pizza and had some fun moments together!

Photos



On the left we have our post from when we finished translating the first manual.

On the right we have the cover of the translated with the language given by the flag on the top right side of the page.



School kids

21 July 2018

Bucharest

Summary

Today we had the amazing opportunity of talking about robotics to a young group of kids from our school! After this event we began working on starting 2 FLL teams that will enroll next season.

When our informatics teacher asked us if we wanted to talk a bit about what we were doing, to the group he teaches to, every weekend, we just couldn't say no.

We love sharing our story and inspiring others with what we do, especially when it comes to youngsters from our community! We had a little session in which we showed them video from the First Tech Challenge competitions, which they found really interesting.

We told them about this year's theme, and showed them our little robot. They were pretty amazed by it, they asked all types of interesting questions, and we tried to make them understand as much as we could.

At the end, we watched videos of different robots used in the industry, and what each kid dreamed to have as a robot. It was a truly inspiring session in which we were amazed by the way the kids brain work! We loved to share our knowledge with the little ones!

Photos



Photo with the little kids watching our demonstration. Andrei and Alex were driving the robot and trying to give the kids interesting facts for their age.

Game manual 2 translation

8 - 9 September 2018

Bucharest

Summary

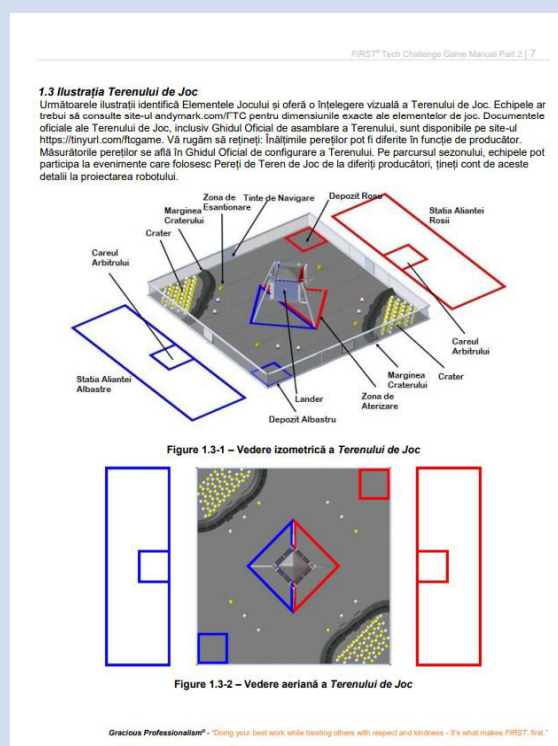
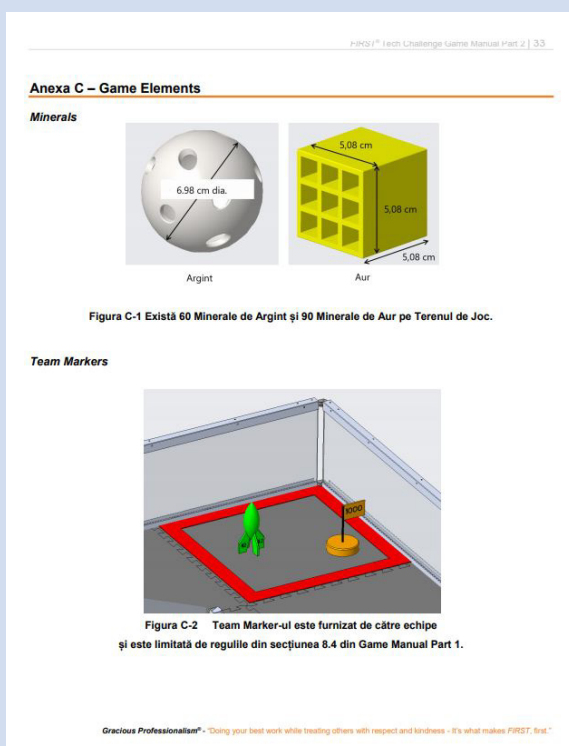
Today we found out that the second part of the official FTC book was published! It was time to meet again and start translating. Unfortunately, the different schedules we had stopped us from being able to meet in person, but each member that could, chose a part and translated it at home, or in the hotel he or she was staying during the holiday they were having.

We communicated on What's App and asked each other where we had questions about the most appropriate translation we could make. It was a productive day even though we couldn't meet in person! Today we found out that the second part of the official FTC book was published! It was time to meet again and start translating. After finishing the both game manuals we went on to speaking with organizers from Natie Prin Educatie and they added the translated game manuals on their official site.

<https://natieprineducatie.ro/challenge-materials/>



Photos



In both photos we have pages from the translated second game manual.

Geology Museum

26 September 2018

Bucharest

Summary

Today we attended one Bucharest Science Festival's event.

We were at The National Geology Museum for an outreach event with small kids ranging from kindergarten to Secondary School.

We had an amazing time at this event and we were so happy to share robotics with so many kids, there were over 1000 kids who came by, looked at our robot, listened to our story and even drove the robot themselves a little.

Repeating the same answers very 5 minutes might be a bit tiring but seeing the young kid's smiles and the happiness in their eyes gave us such joy that it made us wish it to never end.

Photos



The interested kids wanting to give a try to driving the little robot.



The kids are interested by the little robot that just approached them.

Robotics HUB

27 September 2018

Bucharest

Summary

Today we attended another one of the Bucharest Science Festival's events. We were at the Robotics HUB from BRD FIRST Tech Challenge for an outreach event. We spent the day presenting and demonstrating FIRST Tech Challenge.

Today was a little different from yesterday since today everyone knew why they came there, today it wasn't an exposition but a demonstration and this changed the rules a little bit. Today's questions were actually more complex but even so spending time with the kids was amazing and some of them really gave us hope for the future generations of FTC.

Today was also a bonding opportunity between teams and the organizers. Since we arrived a little earlier today, we had the chance to spend more time with the organizers of BRD FIRST Tech Challenge and help them arrange the HUB for the event.

As other teams arrived, we started talking to them and asking about their summers since we haven't seen most of them in a while. It was amazing to meet with our fellow friends from FTC and it was also an opportunity to talk a little about plans and strategies for this year's theme.

During the day, in a break between two groups of kids, we had the chance to see the size of a field element since one of the teams tried to print one ball as an example.

Photos



In the first photo we have Voinea helping set things up by taping posters of the Romanian competition on a white board.



On the second photo we have one of the series of kids interested in robotics watching the robots play in last season's field.

Promenada

28 September 2018

Bucharest

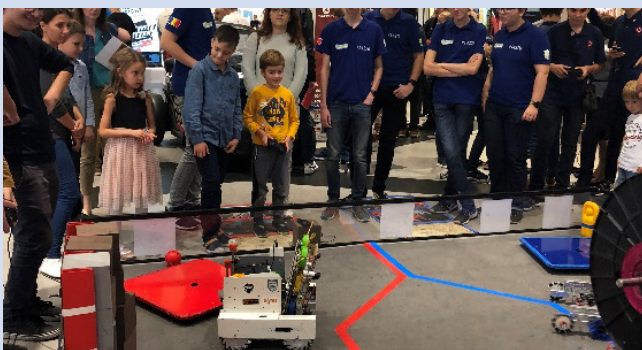
Summary

Today we attended our third Bucharest Science Festival's event. We took part in a public event with people of all ages this time. We were in Mall Promenada and presented robotics today. This was our time of giving back to our community. We felt like this event, even though it didn't have the same impact on kids because they were very distracted by all the noise and movement and couldn't really focus on the tasks, on the robots or on our stories. Today's impact target moved from the future generations to some a little bit older generations, to parents, to adults to however had a secret passion for robots.

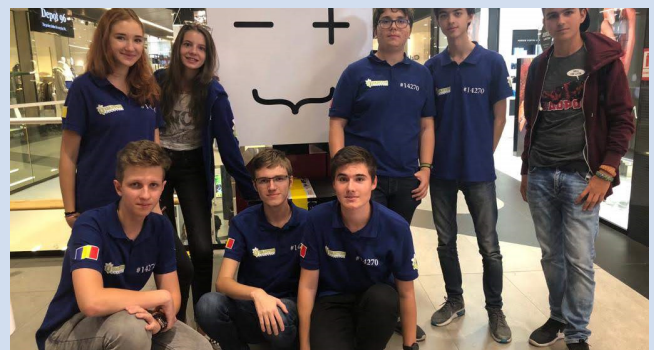
If the other two events were meant to bring kids closer to robotics and maybe even open a new door for some of them, today's events was more for the generations that have already passed through high school and university.

We gave hope to our community today. From time to time, the adult sin pour society need to reminded that we can do it, we can invent smart things and we can make a change. They usually loose hope in time and that is why seeing ordinary high scholars speak with so much passion about this not so loved department, robotics and building something that they believe in, building a robot from scratch, gives them hope for a future. Today was fascinating and coming to the realization that outreaching isn't based only on kids was an important part of our growth as a team.

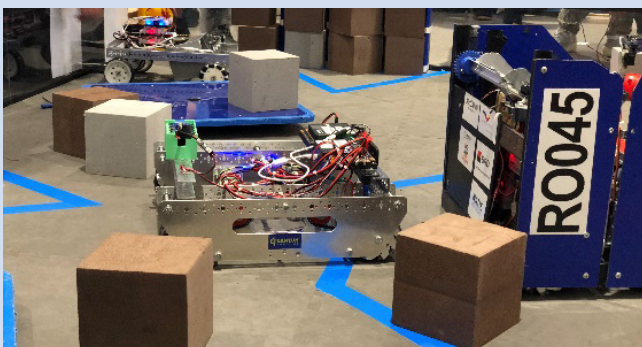
Photos



Here we have some little kids controlling the robot on the field.



This is a group photo with the members from this event.



This is our robot, an early stage towards the official one for the competition.



At the end of the event, our team stayed behind to help pack-up.

Country robotics caravan

22 - 28 October 2018

Romania

Summary

Today is a big day! Andrei is leaving with the organizers of the Romanian FTC competition, “Natie Prin Educatie”, to share the STEAM with the new 55 rookie teams. Andrei’s journey took 6 days of exhausting but rewarding work. He traveled for more than 2350 km by car, got to 20 cities and impacted more than 500 students and pushed them towards STEAM, only in this trip.

Every city he visited had at least 1 team, with some of them having 2. Every team that got to meet Andrei also got his personal phone number. Teams have flooded him with messages since the end of the caravan. He has answered all of the messages so far and his effort was appreciated by the students. The trip started from Bucharest and it went as follows:

Bucharest - Pitesti - Mioveni - Ramnicu Valcea - Sibiu - Blaj - Medias - Targu Mures - Nasaud - Beclean - Baia Mare - Ineu - Timisoara - Moldova Noua - Drobeta Turnu Severin - Hunedoara - Petrosani - Craiova - Calafat - Slatina - Turnu Magurele - and finally back to Bucharest.

Here is the list of the teams Andrei visited:

Pitesti: RO138 - “Robodac Pitesti” and RO139 - “TEHNOZ”

Mioveni: RO131 - “TECHNO MAISTER”

Ramnicu Valcea: RO142 - “BroBots”

Blaj: RO104 - “RUBIX”

Medias: RO118 - “Code Warriors” and RO130 “SNGine”

Targu Mures: RO094 - “RobotiX”

Nasaud: RO134 - “Cyber Souls”

Beclean: RO100 - “Esentza Revolution”

Baia Mare: RO103 - “Clever Core”

Ineu: RO129 - “PEAKY Robotics”

Timisoara: RO093 - “BLISS”

Moldova Noua: RO132 - “LTCDMN Robotics”

Drobeta-Turnu Severin: RO124 - “The Emeror”

Hunedoara: RO121 - “RobotY HD” and RO126 “LYNX”

Petrosani: RO137 - “Aplha Bit”

Craiova: RO122 - “RaSky”

Calafat: RO110 - “Bots Brain”

Slatina: RO144 - “TITU ROBO”

Turnu Magurele: RO095 - “ROBOTEII CNU”

Photos



Here we have a new team excited to start the season.



This is a team meeting that Andrei attended while giving the kit.



An excited team member when the kit arrived.



A team after receiving the kit and the posters.

Halloween “Ajungem Mari”

28 October 2018

Bucharest

Summary

Sanziana, Denisa and Ema had the special opportunity of hosting a robotics workshop for the boys from the social settlement they volunteered at. The girls were incredibly excited to be able to share their passion with the kids, an excitement which only grew when they saw how much the boys liked the idea!

Considering Halloween was a few days away, they designed a special themed meeting. The day started with a few fun games, so everybody could relax and have a bit of fun. Afterwards we had a discussion with them about robots in general, how we encounter them in our daily lives and the dream robot they wish they could build. We let the kids talk more, and juggled with the knowledge they already had. Then we used the little plastic pumpkins Denisa prepared, seeing as each contained a paper with a robot part written on it, folded in the shape of an origami bat. Each kid read his word and, looking at the little robot we prepared, tried to guess what it was. It was a fun and interactive way in which they learned the basic parts of a robot.

Afterwards Sanziana showed them the code behind the robot, and a few robot related videos. They were really curious about each information we provided, and so the whole meeting ran smoothly. We finished the day by letting each kid control the robot for a few minutes. They loved this part! Everybody was so excited to be able to do this!

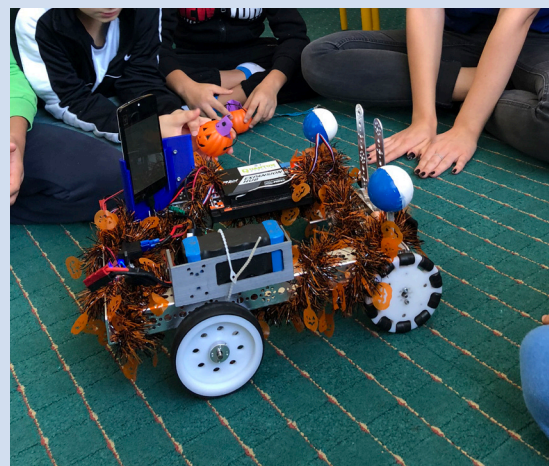
We encouraged the kids to follow their dreams, and never back them from the challenges they will encounter. We told them how empowering education is, and how we believe they can succeed at anything they set their mind to if they work for it!

It was one of our favourite outreach events, it felt incredible to be able to inspire the generation behind us.

Photos



One of the kids is driving the robot around.



Explaining parts of the robot in a fun way.

Scouting app

25 January 2019

Bucharest

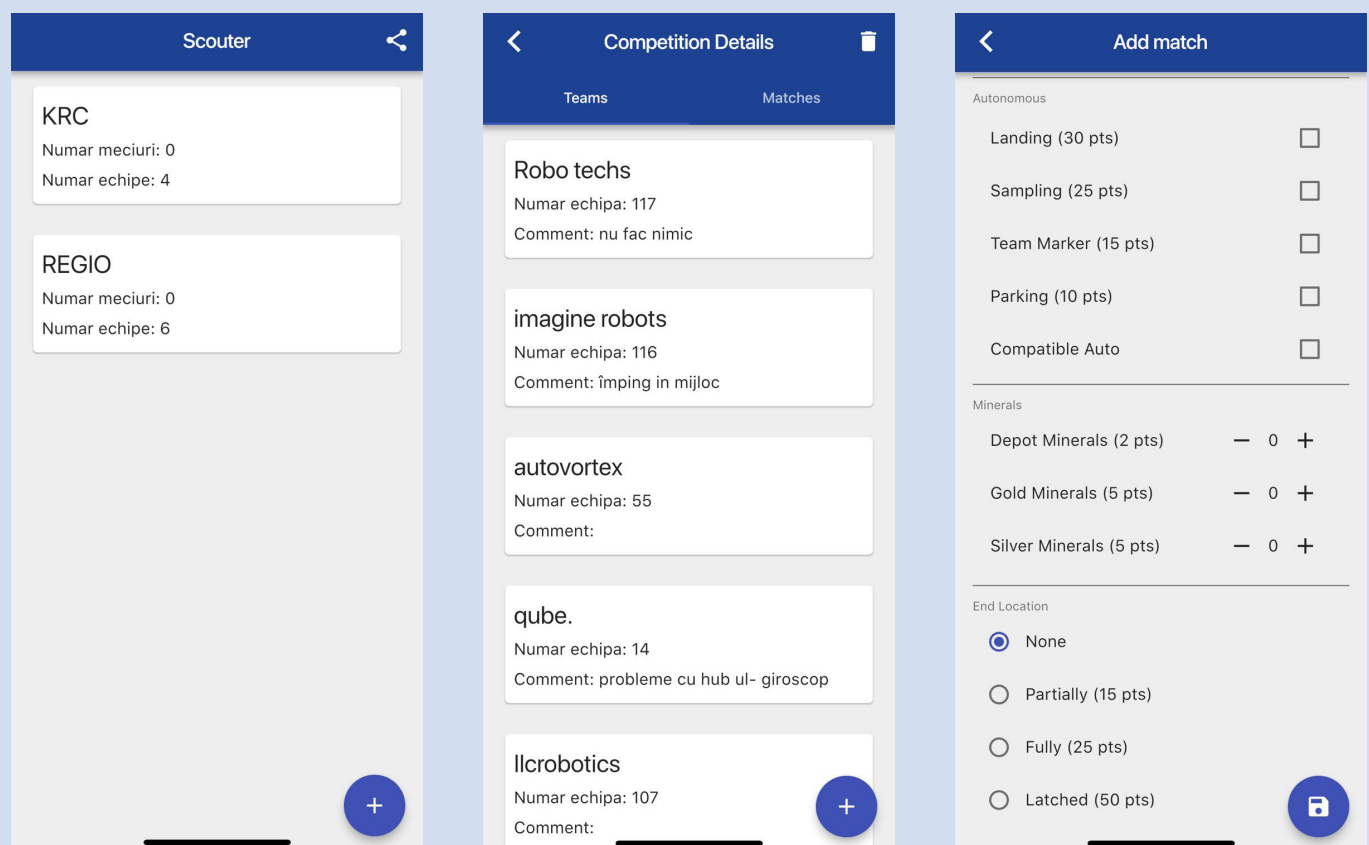
Summary

We wanted to help other teams to scout easily, knowing how hard it is and seeing the rough conditions teams are put when scouting. So we started working an app just for that. To have a better device coverage and help as many people as possible, we made the app in Flutter. Flutter in comparison with Android Studio lets us develop the app for Android and IOS at the same time since the programming language is darts and not Java. Besides, the user interface is cleaner.

The main problem when scouting is searching for the lost pages and grouping the information. To simplify it we made a virtual form and to centralize the information we thought of using a database. The form it has all the ways of scoring points written down and all you have to do is write a number or check a box. Unfortunately, the code that centralizes the data will not be ready until the national phase. However, when the app exists the BETA phase we will release it on Google Play and App store. Next season, when the new theme will be announced, the forms will be changed to match the new ruleset. Changing it will not be hard so the app will be ready before the regional phase.

We started this project before our contest in Korea but we diidn't yet get a chance to perfectionate it and we will post it as soon as the final version is ready.

Photos



Screenshots from app

Open field day 1

15 March 2019

Bucharest

Summary

On the 15th of March 2019 we organized a “open field” day. We wanted to help other teams that don’t have a full field where they can test their robots. We made a post on the Romanian facebook FTC teams group announcing the event.

Two of the teams, respectively Boogey Bots and Bionic Royals, answered our call and accepted our invitation. We were very happy to help them and give them advice regarding their software/hardware problems.

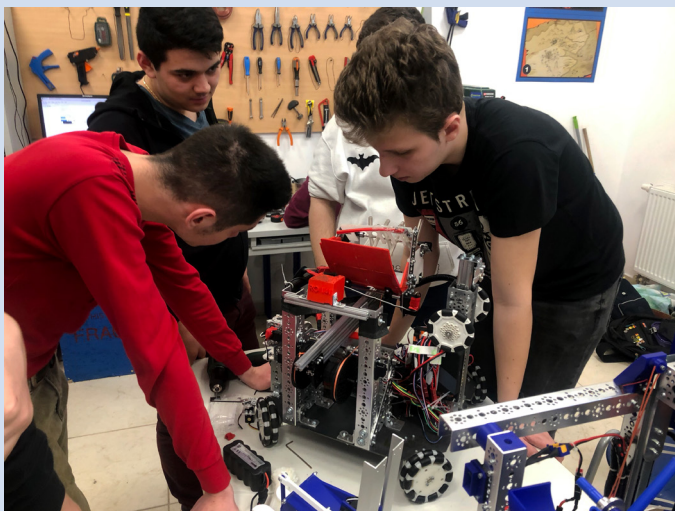
We even got the chance to play some timed matches with them in order to check if all the systems are working properly(autonomus wise and controlled-stage wise). Before going on the field we presented them our robotics lab and showed them around.

They seemed to be happy to get our help and advice and socialize with other teams. Afterwards, they presented us their robots and their working principle. By analysing together we conceived some optimizations that we can make, in order to improve their systems and subsystems.

After making the aforementioned improvements we tested the robots one more time on the playing field and we noticed some slight score differences: Boogey bots scored on average 30-40 more points while Bionic Royals scored 20-30 more points. We worked til’ dusk in the hopes that we could improve more systems .

Unfortunately the scores pretty much stayed the same. In the end we were all exhausted but happy to know that we could help 2 teams achive better results.

Photos



Photos from the lab with the teams working.

Open field day 2

20 - 21 March 2019

Bucharest

Summary

Because we knew how stressful it was for the teams that didn't have a field, we decided we would share our full field with all the national phase participants.

We thought this was especially important for the teams that come from outside of Bucharest and will need a field to recalibrate their robots after the rough trip.

To share our idea, we made a post on the Facebook "FTC Romania Teams" group. On Wednesday we will open the doors at 14:00 and end at 21:00, and on Thursday we open at 10:00 and end at 21:00.

We are really excited and we hope to create a memorable event for the participants

Photos



The post for the event.

Pocket schedule

12 March 2019

Bucharest

Summary

We started this project after the regional and we were able to finish it before nationals.

We wanted to make life easier for other teams in knowing which teams they have in their alliance and when they are playing. So we created an app that gets the information of the matches during the competition and makes a timetable for each individual team. The main difference between the main schedule and our time table is that only the most important information is written. So as nobody will spend time searching for the next game they are going to be playing in.

The pages contain a table with the upcoming matches. The table is easy to understand. It contains the number of every match, the color of the alliance you are going to be in, the number and the name of the teams that participate in that specific game. After the code finishes the generation the papers are going to be printed on our printer, brought from home. During the competition, the sheets will be given to every team as fast as the pages are done.

Photos

Test Team #13 GAMMA			
Match	Partner	Opponent 1	Opponent 2
Q10 Red	106 H-Tech	18 VORTEX BREAKERS	102 Ercast
Q15 Red	14 QUBE.	150 PML30 White Nigh	20 VAMPIRES
Q24 Blue	96 Cyber Lions	108 Clockworks	21 VIANU LEGENDS
Q40 Red	114 QUBE.JR	120 Ro2D2	149 Quartech
Q46 Blue	54 Dark Angels	11 Masterminds	139 TECHNOZ
Q52 Blue	138 Robodac Pitesti	11 Masterminds	15 Robo Titans

A test with games from regionals.

Supporting Fast Forward Future Team at Nationals

22 - 24 March 2019

Bucharest

Summary

During the Bucharest Regional competition, one of our mentor learned about the difficulties going through the team Fast Forward Future, from STEI, Bihor county. Even the team was qualified due to its position: The Highest Ranked Team not previously advanced and 3rd place to Motivate award, the team members declared that they can not afford to participate to the Nationals in Bucharest.

Andrei told our team members that he knows very well the team and the mentor, because he met, they during the “Robotics Caravan”. He asked all the team to make a small effort and to support the Stei team. All the team members were very happy to help when they heard the tough moments the Stei team going through. Andrei let a message on their Facebook page, and they were very happy to accept our support.

Together with team members and parents we start working and in a very short time we succeeded to collect 1000lei from a sponsor, covering a part from travelling costs of the team. But they needed money for accommodation because school solved the cost of transport.

Using all friends, connections, parents, our colleague Tudor Constantinescu, set up a meeting with the Mayor’s Councilor of Bucharest 4th District. Due to the FTC National competition takes place to Polyvalent hall in 4th District, he was very happy to find a solution for accommodation of the team during the robotic competition.

In this moment they have reservations to Corvaris Hotel***, 10 minute away by car to the competition location.

Estimated budget for Stei accomodation to Nationals was: **2500 RON**

Photos



The hotel we reached out to.



The team we are helping.

7th graders “Scoala altfel”

10 April 2019

Bucharest

Summary

We had the amazing opportunity of visiting “School 97” during their “Different School” week, in which they are supposed to have diverse educational and interactive activities. They gave us a really warm welcome. We presented our team, what we do and First Tech Challenge. We enjoyed interacting with them as they were really interested in what we were presenting and seemed excited about robotics in general! We were thrilled to answer their curiosities. It was a great opportunity for us to interact with the generation that will come after us and we truly hope we inspired them to participate at FTC too!

Photos



A photo from the event

7th graders “Scoala altfel”

11 April 2019

Bucharest

Summary

When we heard that a group of 8th graders were going to visit our school, in order to decide if they want to apply for High School here, we were really excited to present them our robotics team too! After the faculty of our school gave them a tour of our campus, they stopped in our lab. The kids seemed amazed with everything that was happening around them. We loved the fact that we maybe contributed to them deciding to apply for high school at our school. The children were really receptive and asked all kinds of questions about the robot building process. We hope that they decide to study here, and if so they will also try to become a part of the Quantum Robotics team!

Photos



The team on the stage

7th graders “Scoala altfel”

18 April 2019

Bucharest

Summary

This Thursday we had a fun meeting with the children of a 4th grade class! This week they have the “Different School” week in which they have diverse interactive activities. We invited them to our lab with their class teacher. Although a bit shy at first, after we presented ourselves and showed them our robot in action, they became more excited. After we answered all their curiosities, they wished us good luck and left. We love interacting with little kids and promoting robotics to young people!

Photos



Photo with the kids

4.3. Spreading FIRST values to the public

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“Ziarul Financiar”

29 March 2018

Summary

Our first presence in media, was the “Ziarul Financiar” Journal, one of the most business-oriented journal from Romania. The article was written after the Winning of the BRD First Tech Challenge, 2nd edition and presented our team before FTC World Championship.

Photos

Cei patru câștigători ai celui mai mare concurs de robotică între licee din România

Like place Distribute Tweet Share Print Mail



Screenshot from the article



QR for the website

Investing Romania

19 June 2018

Summary

A team of three Romanian students won the top award in the robotics category of the Genius Olympiad held June 12 - 15 in Oswego, U.S., that saw the participation of 1,200 students from 73 countries.

Photos

Team Romania win Genius Olympiad Grand Gold Award in robotics category

BRD BRD - GROUPE SOCIETE GENERALE S.A.



Bucharest, June 19 /Agerpres/ - A team of three Romanian students won the top award in the robotics category of the Genius Olympiad held June 12 - 15 in Oswego, U.S., that saw the participation of 1,200 students from 73 countries.

The Romanians won the Grand Gold Award for their robot's performance in the play field - where it scored highest, and for its technical presentation, a release informs.

The winning trio are Andrei Preda, Victor Suciuc and Alex Turcanu, all 10th graders at the Bucharest International High School of Informatics, who worked under the coordination of professor Emre Sertel.

The three are also members of the Quantum Robotics team that clinched the Winning Alliance Award and Inspire Award at the BRD First Tech Challenge Romania robotics contest this March

Screenshot from the article



QR for the website

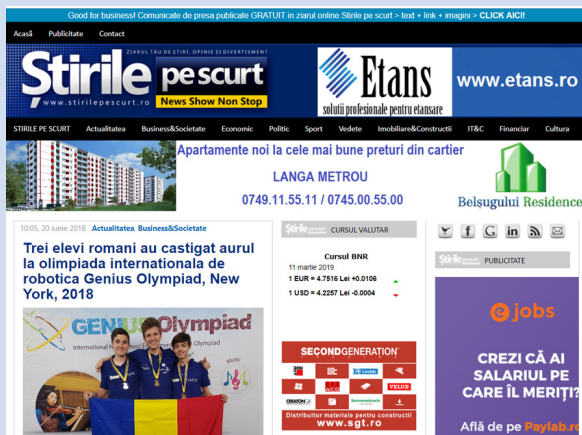
“Stirilepescurt.ro”

20 June 2018

Summary

The online journal was the first article appeared after the winning Grand Gold Award to the robotic competition from Genius Olympiad. We participated under the name of Quantum Robotics FTC team. After this article appeared, many other on-line journals have taken over and distributed the message, counting a huge impact on the on-line channel. This article become very popular on the Internet and even Dana Razboiu, the president of “Natie prin Educatie” mentioned us and the topic in an article. The topic became viral on the social media, as well.

Photos



Screenshot from the article



QR for the website

Kid Magia

20 June 2018

Summary

Andrei Preda, Victor Suciu and Alex Turcanu, members of the Quantum Robotics robotics team, are very proud of the results of the Genius-International High School Environmental Olympiad competition in Oswego, New York, the US gold medal!

Photos

3 liceeni din echipa Quantum Robotics au câștigat medalia de aur la competiția Genius International High School din Oswego



Screenshot from the article



QR for the website

PRwave

25 June 2018

Summary

Another post about the 3 FTC members that won at GENius Olympiad.

Photos

Participanți la BRD First Tech Challenge România, 3 liceeni din echipa Quantum Robotics au câștigat medalia de aur la competiția Genius International High School din Oswego, New York

© 25 June, 2018 by Liliana Kipper

Andrei Preda, Victor Suciu și Alex Turcanu, membri ai echipei de robotică Quantum Robotics, sunt foarte mândri de rezultatele obținute la competiția Genius International High School Environmental Project Olympiad, din Oswego, New York, SUA: medalia de aur!

Cei trei liceeni a căror experiență în domeniul roboticii a crescut prin participarea la BRD First Tech Challenge, competiție implementată în România de Asociația Nație prin Educație, fondată de Dana Războiu, se pot lauda cu „Grand Gold medal”, distincție obținută la categoria „Robotics” a olimpiadei pe teme de mediu din Statele Unite.



Screenshot from the article

QR for the website

7life

25 June 2018

Summary

Another post about the 3 FTC members that won at GENius Olympiad.

Photos



Screenshot from the article



QR for the website

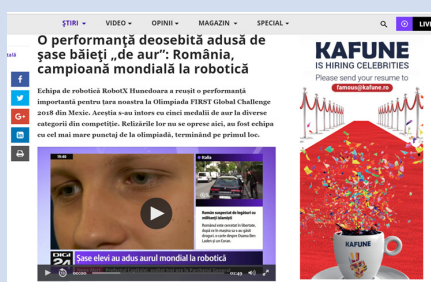
DIGI-24 interview

23 August 2018

Summary

In august 2018, Andrei participated with the Romanian Olympic Team to the First Global Olympiad, 2nd ed, in Mexico. Romania won first place with 5 medals and Andrei gave some interviews to all important TV stations and National journals from Romania, achieving a huge audience.

Photos



Screenshot from the article



QR for the website

Antena 1 TV

24 September 2018

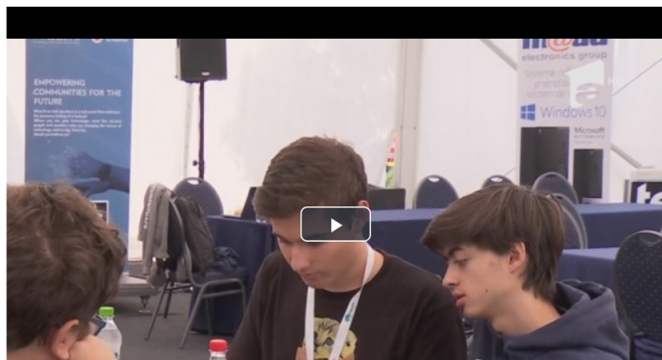
Summary

Interview to the Antena 1 for Observator news release was given by some Quantum robotics members during the Vodafone Hackathon, in Bucharest, where the team won the second place. All organizers and participants were impressed by our team organization, team management, skills and ambition to provide a reliable and secured solutions.

Photos

Adolescenții români care fac o aplicație în doar 24 de ore

Publicat pe 23.09.2018 la 22:52



Screenshot from the article



QR for the website

TVR interview

21 October 2018

Summary

Interview to the TVR news, presented to the highest rated audience, given by Andrei after Quantum Robotics won the second place to the NASA contest. Andrei presented our awarded solution which it qualified us to the World final from 25.000 participants around the world.

Photos

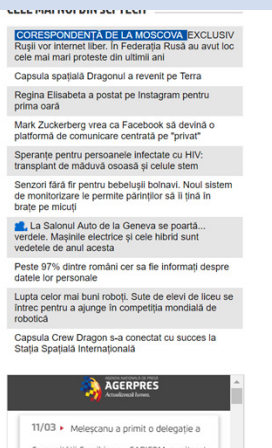
Ambiția de a reuși merge până în Cosmos. Două echipe din București au câștigat prima etapă a unui concurs NASA

Nouă tineri din București ar putea să schimbe istoria sau să salveze Pământul! Au câștigat prima etapă a celui mai important concurs organizat de NASA, care le-a lansat provocarea de a dezvolta aplicații spațiale în doar 24 de ore. Simultan, în 200 de ore din lume, s-a muncit fără oprire. Una dintre echipele premiate a creat un dispozitiv care, de exemplu, ar ajuta mașina familiei să se repare singură.

21 Octombrie 2018, 18:57 (actualizat 21 Octombrie 2018, 19:23) |



Screenshot from the article



QR for the website

Radio Guerilla - NASA

21 October 2018

Summary

After the winning of the second prize to Vodafone hackathon with the our soft for signing contracts to the distance, a lot of media channels invited us to interview. We were very exciting to meet the persons behind the voices and to inform the public about STEM an FIRST values. Andrei is in the backstage arranging his microphone. :)

Photos



BRD FIRST Tech Challenge Romania post about the event.

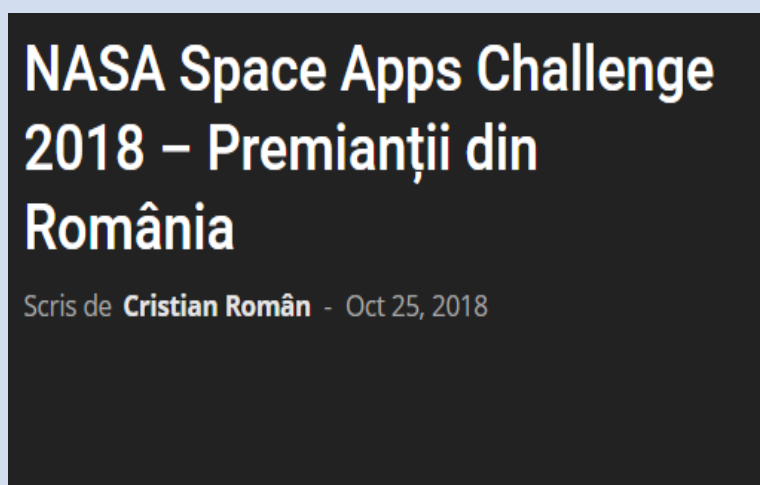
Stiinta & Tehnica

25 October 2018

Summary

This composition lists all of the winners of NASA Space Apps.

Photos



Screenshot from the article



QR for the website

TVR International

6 November 2018

Bucharest

Summary

We were truly honored to be invited to talk about our passion for robotics at TV!

Even more, seeing as TVR, is one of the most famous channels in our country. Ema, Andrei, Radu and Alex represented our team.

They talked about the First Tech Challenge competition and how much it had helped us evolve, not only as individuals, but also a team, due to the core values that it stands for, as not being only a build a robot contest, but so much more.

They also talked about how much work this means, how many late nights we spend in our lab working on our current tasks, and how much planning goes into the events we organize, seeing as we want to offer our community as much as we can.

Photos



Photo from before filming.



Talking about future plans.

Radio Guerilla - Demo

16 November 2018

Bucharest

Summary

Today we started the morning by visiting Sorin Badea at Radio Guerilla. We talked about the incoming demo we were organizing the next day, on Saturday. For us it was an amazing opportunity to promote our team and FIRST Tech Challenge. We were able to make a lot of publicity for our website and for our Facebook page. Sorin Badea the moderator was really impressed by us and offered to have us again, maybe after some more competitions. We can't wait to go back live on radio since it was an amazing experience.

Photos



The logo in their building.

“Romania te iubesc”

19 November 2018

Summary

Cristian Leonte invited Andrei to Live Studio interviews. The three technology creators from BRD FIRST Tech Challenge Romania, the largest robotics program for high school students in Romania: Adelina Dinescu (Bravebots team), Andrei Preda (Quantum Robotics team) and Bogdan Chiriță (Qube team). We spoke about robots in our life, how we spend the free time learning better and inspiring people around us and what plans we have for space exploration.

Photos



The online poster for the live event

Facebook frames

28 November 2018

Bucharest

Summary

Today, as we were planning our trip to Korea we came up with the idea of making personalized Quantum Facebook frames.

We realized that it might actually be a good idea and that we need to make our voices heard in order to inspire our community to do the same. To share our passions and encourage others to find theirs too.

We made the personalized Quantum member frames, in order to be seen by all the people around us as proud members of this team. In order to invest ourselves a little more into telling the world about us and robotics.

Now we all have attached to the profile pictures the Quantum frame, and we couldn't be more proud of it! We realized that even the little steps, can matter.

Photos



One of the frames that we released.

our Quantum Robotics Facebook frames.
tate to add it to your profile picture. 😊❤️

or the frames using key words like: "Quant
enge", "FIRST" and "FTC".

FirstTechChallenge #gameon Natie Prin Ed

The post we made on facebook after we released the frames.

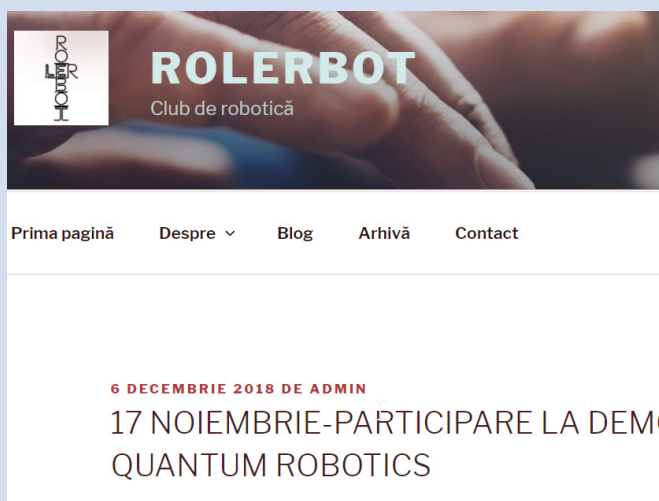
Rolerbot Review

6 December 2018

Summary

In this article one of the romanian teams, RoLERbot is accepting our invitation for the November demo. They wrote a review for our event and went on with telling small stories from the demo and their impressions. We were extremely happy to see that teams really enjoyed our event and they had fun.

Photos



Screenshot from the article



QR for the website

ComputerBlog.ro

22 January 2019

Summary

This year started really well for our team. Our first article for this year was about our accomplishments not only in FIRST but also in other contests. The article was also a way of finding sponsors. It was amazing to see people supporting our journey and eager to help young inventors.

Photos



Screenshot from the article



QR for the website

Stirilepescurt.ro - Korea

28 January 2019

Summary

The year continued very well for our team, when we won the Winning Alliance Award to the First Tech Challenge Korea competition. The contest happened on 26th January 2019, in Seoul where participated teams from Korea, Japan and Romania.

Photos



Screenshot from the article



QR for the website

Razvan & Dani

6 February 2018

Bucharest

Summary

After our Korean FTC win, we were offered the amazing opportunity of being invited to one of the most famous morning talk shows of our country, "Razvan si Dani", to talk about our passion for robotics and how the competition was. Some of the members present were a bit nervous at first, but we encouraged each other and soon realised that the important part was sharing our story, and so maybe inspiring others to invest into robotics too. The presentors were extremely and appreciative with us. They were curious, and asked each of us a question, being especially impressed with our girl team members. Although the interview wasn't very long, we had fun and we got to be really proud of our achievement! We always feel honoured when we have opportunities like this!

Photos



The team after the interview

School article

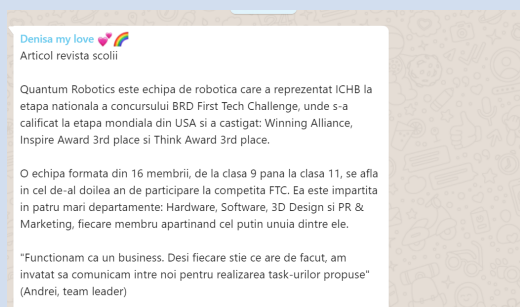
25 March 2018

Bucharest

Summary

After our participation to the national championship we were invited to write an article for the school magazine. We were really happy to have this opportunity and we were proud to present and write about our team.

Photos



The article on our PR group

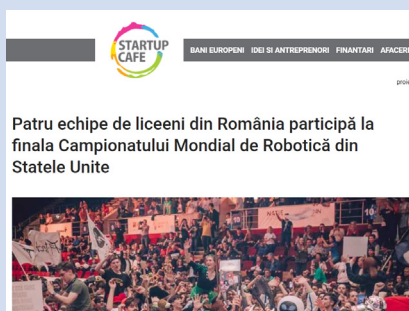
Startup Cafe

25 March 2019

Summary

In this news article the teams that won BRD First Tech Challenge Romania are presented.

Photos



Screenshot from the article



QR for the website

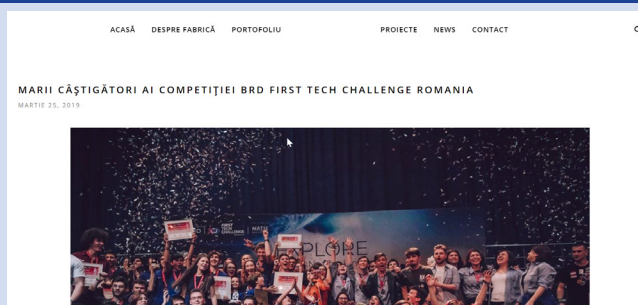
Fabrica de PR

25 March 2019

Summary

This story details the events that happened at the national championship.

Photos



Screenshot from the article



QR for the website

World news live 4 you

25 March 2019

Summary

A story about the 4 teams that qualified and might be noticed by big companies in Detroit.

Photos



Screenshot from the article



QR for the website

SparkNews.ro

26 March 2019

Summary

Another story about the 4 winning teams and stories told by students that qualified.

Photos



Screenshot from the article



QR for the website

Avantul Liber.ro

26 March 2019

Summary

This post is about the journey that the 4 qualified teams had along the season.

Photos



Screenshot from the article



QR for the website

Republica.ro

27 March 2019

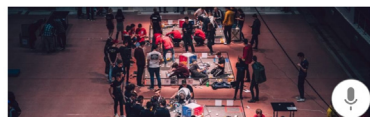
Summary

This is another post about the national but it is focusing more on the competition.

Photos

4 echipe românești,
calificate la Campionatul
Mondial de Robotică FIRST
Tech Challenge din SUA

2019-03-27 07:03:00



Screenshot from the article



QR for the website

National TV News

27 March 2019

Summary

Today we shot some frames and a small interview for the news for this evenin on one of our national TV channels.

Photos

Stirile National TV

Căștigătorii Concursului Național de Robotică pe licee

27.03.2019



*Screenshot from online post
of the news*

Market Watch

1 April 2019

Summary

This article talks about our presence at the 5G and IOT Telecommunications day/

Photos

Industry Watch >> IT&C >> Stiri si comunicate

5G, IoT si AI la Ziua Comunicatiilor

01 Aprilie 2019



Screenshot from the article



QR for the website

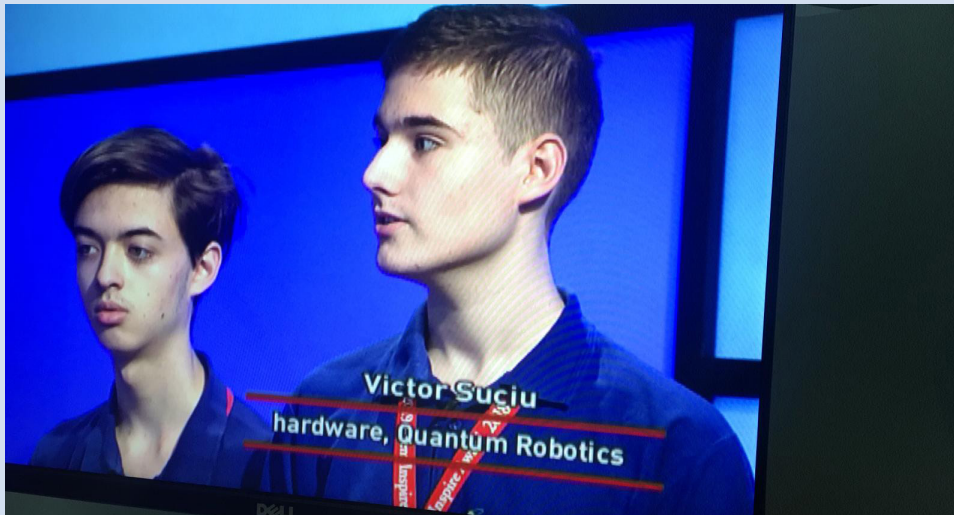
TVR International show

9 April 2019

Summary

Today we had a visit on one of the shows we are veterans on. We went on a National TV channel name TVR International that also had coverage outside of our country. We presented our results from the National phase and also from our Regional phase and talked a little bit about our qualification. It was also an amazing opportunity for us to reach out to benevolent people who could sponsor and support us.

Photos



Victor our team member

National TV show

10 April 2018

Summary

This Wednesday we went on a show that will air on 25 of April. We had a 1 hour show and we talked a lot about Nationals about our incoming trip to Detroit and about how interesting FTC is and our journey as a team from 0 to qualification to worlds. We also talked about the integration of FTC in our schools.

Photos



NationalTV

The channel we went to

4.4. Comunity outreach & services

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Summary

Starting from our return from Worlds in April 2018, all of our members took part in several community events.

We took advantage of the experience gained throughout our previous season and our high school years, and we tried to share as much of it as possible. 3 of our members took part in a 7 months volunteering event and taught primary school kids. During one of the biggest events of such kind, at Tech Fest Bucharest, our members taught little kids the foundation for programming and worked some harder problems with the more advanced students. More than 10 of our members volunteered as jury assistants for InfoMatrix and Firststep due to their experience in robotics from FTC.

Our quest of giving back to our community didn’t end with our experiences as teachers and judges, we also tried to give a hand to our school’s community. The whole team took part in a Christmas event that lasted for more than 16 hours and prepared gifts for more than 2000 people in need.

“Ajungem Mari”

1 May - 1 November 2018

Bucharest

Summary

Three of our members, Denisa, Ema and Sanziana, did volunteering work each Sunday for 6 months, at the organisation “Ajungem Mari” (Becoming Big), which helps the kids from social settlements.

They were assigned to a settlement of little boys, with whom, along the course of their journey, learned and had fun together, getting to regard the kids as friends. They helped them with their school work, sometimes even doing some extra exercises in order to help them really understand the subjects studied, but they organized different activities for the boys. Each week Denisa taught them a new origami piece, Sanziana brought them a new dynamic game and Ema found interesting educational videos to show them. What really intrigued the kids was our passion for robotics, a curiosity which we fueled with our stories of what we do, and how robots can bring so much help into this world, and encouraging them to keep learning and working in order to do this too one day, if this is what they wish.

The session were always full of joy, each of them ending with a karaoke part, when each kid chose a song for all of us to sing and dance along to.

We loved giving back to our community by helping the privileged kids, who don't have the opportunities that we do. We are thrilled just with the thought of bringing a little joy to those amazing little boys!

Photos



Denisa with the kids in the park

Info Matrix

10 - 12 May 2018

Bucharest

Summary

Our team was part of the 3 days educational event the International Informatics Project Competition Info-Matrix 2018. Some of us participated as volunteers while others were contestants. This was an opportunity for all of us not only to learn new information but also talk about robotics with other interested kids. Most importantly we shared our knowledge and advice with the smaller lovers of robotics and computer science.

Contestants

The contestants representing Quantum Robotics had to present their individual projects to the judges and then prepare their pit where other contestants and judges would then visit them. The contestants could also go around and look at the other inventions and projects presented.

Volunteers

During the first day we got the chance to talk a little bit with many of the contestants since we took care of signing them in and also checking their projects were all set and verifying the measurements of the robots.

During the first part of the second day we were jury assistants and we helped with judging the projects that also had pits and theoretical parts.

It was amazing to see how an adult interprets the inventions and how they manage the situations and how they try to help the kids differently based on their ages and how they try not to give the solution immediately but instead guide the students in order for them to figure it out. Helping the judges was a really good experience since it opened our eyes to the way someone from outside a project may try to understand and appreciate the effort put in it but also the way certain understanding is expected based on the competences you show.

During the rest of the event we had the chance to be judges ourselves. We helped with arranging and organizing the practical robot contests like the summo and mini summo battles, the maze contest, the line follower and drone contests.

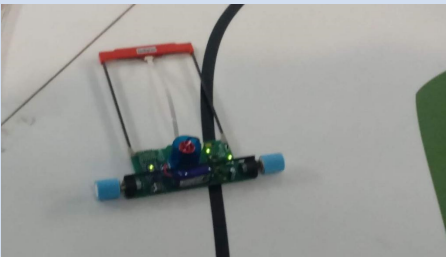
Since we had experience with robotics the drone competition was the only one where we needed supervision since it was a new experience even for us. For all the other competitions we only had help with the software at the beginning since I was the first time we were interacting with it.

Interacting with smaller kids and having them looking up at us for advice was interesting since it was pretty hard for us to put ourselves in their position and find the best suitable answer.

Photos



On the left there is a selfie with the team and international students and on the right a photo on the podium.



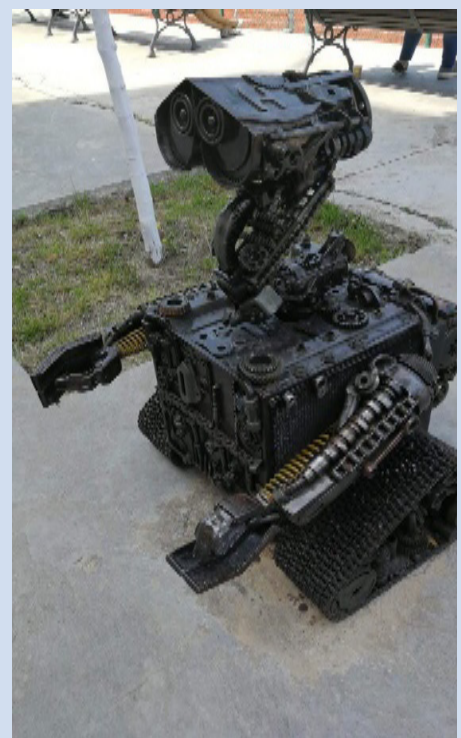
On the left there is a line-follower robot and on the right a selfie with Ema, Radu and Andrei.



On the left we have Ema and Andrei talking to one of the mentors about FTC and on the right the track for line-follower contest.



On the left we have Andrei, Voinea and Radu watching a robot and talking about the opportunity they missed of participating in a contest. On the right we have a WALL-E robot.



International Day

18 May 2018

Bucharest

Summary

Today we participated at International Day, an event that took place in our high school. Each class got the chance to pick a country and bring traditional food.

Since our team is like our family, we asked permission and we participated at this event as Quantum Robotics.

All the funds raised from this project by our team were brought to our funds.

This event gave us the opportunity to tell as many kids as possible about our team and about our passion.

Participating as a team was an amazing idea since lots of our colleagues found out about us and we proved ourselves we aren't good only at robotics.

Photos



Photo of our team selling shaorma to some of our classmates and schoolmates.



This is a photo from the cooking of french fries for the shaorma. All the french fries not sold were eaten by the team.



A photo of Victor wearing a traditional hat.

Museum Night

19 May 2018

Bucharest

Summary

This evening is the Long Night of Museums and two of our members were volunteers at The National Museum of Art of Romania.

During the night they helped the staff from the museum to keep the order at the museum but also they helped at the workshops specially created for this night.

Helping at this public event of immense proportions gave us the opportunity to learn new things and but also prove ourselves and change the impression that other people have upon teenagers and lovers of robotics.

Volunteering is a great way for us to share robotics with as many people.

Photos



Ema and Andrei at the volunteering event during the Museum Night.



Andrei and an interactive painting that gives you the opportunity to see the butterfly moving and look up every flower.

TechFest Volunteering

22 September 2018

Bucharest

Summary

Today we a few of our members volunteered to help young kids learn about the basics of code. The event took place in TechFest Bucharest 2018, in the parking area of the Promenada Mall.

The kids were given laptops and were thought how to think like a programmer through a mini game from the Hour of Code website. We chose to use the Minecraft mini game as we thought it would be the best suited for the kids.

After everyone went through the Hour of Code course, we instructed them to make a basic game in Sketch. We gave the kids some ideas but we allowed them to be creative. We suggested making a pong or football game, but some of them worked on a narrative game.

At one point, even the media got involved. A reporter from PROTV came and filmed us and used the footage to promote TechFest further.

Photos



Andrei helping a 9 year old write his first code



Andrei teaching the kids the basics of Sketch

IAA Global Conference

2 - 3 October 2018

Bucharest

Summary

On 2nd and 3rd of October we had the amazing opportunity to participate at the Creativity for Better Conference! Entrepreneurs, people of success of all ages from all around the world, came there to tell their story and give their advice through interactive and special workshops. We came there to spread the word about robotics, FIRST Tech Challenge and to show the participants and speakers what a match at this competition looks like.

The reactions were all positive, as we met many interested and curious people. The day started early for us, seeing as we had to make a trip to our lab to get the robot and then go through the packed traffic at the early hour. As soon as we got to the designed location, we were welcomed by the staff members, and showed to our place.

You could see the professionalism showed by all the participants and speakers present. After we set up our robot, we had the opportunity to talk with the other three robotics team present. It was wonderful to be able to reconnect with old friends and colleagues, and to share what we were up to since we have last seen each other. During the official event breaks, the participants of the conference came by and saw our match on the field we had set up.

While the drivers controlled the robots, we talked with the people who gathered and told them more about who we are and what we do. Some of them were more interested in the technical part, whereas the others were more curious about the competition itself or what is our motivation to take part in this. No matter their wonders, we think we answered their questions accordingly, even succeeding in encouraging parents to send their children to robotics clubs.

During a workshop, the organizer of the event came by to offer her congratulations for what we do and to make sure we are feeling okay and well-integrated. At the end of our stay there, Sebastian Dobrincu came by to talk to us and tell us his story. He is a young entrepreneur, who developed a successful business ever since he was only 17, now owning millions of dollars. He told us about his story and what inspired him to get where he is now. He encouraged us to never give up, to persevere until we succeed and then some more. He also told us that, in his opinion, routine is essential to a healthy, balanced life style.

The second day we also got the chance to listen to his speech and it was a very inspiring and amazing one just like the other speakers. But the thing that impressed us the most, was him seeing our potential and telling us that each one of us could be where he is right now. Talking to someone so young, yet so successful, really broadened our horizons, it made us see more in perspective and it made us more motivated to work toward our goals.

All in all, our participation at the IAA Global Conference Creativity for Better, was an amazing experience, which helped us spread the word about what we do and who we are.

One of the things we left with from this amazing event are different perspectives towards life, and made us feel more motivated to become the best version of ourselves!

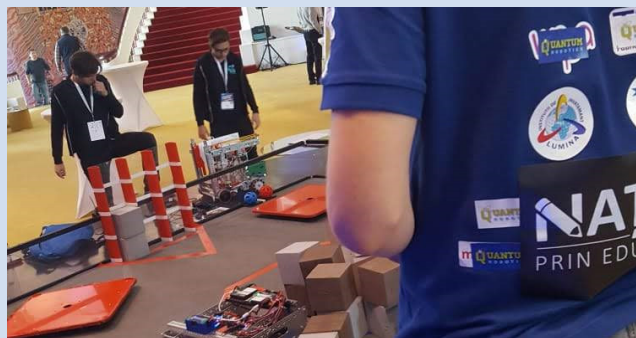
Photos



Ema helping cover up the field with "Natie" stickers since sponsors were not allowed.



Ema, Andrei and Luca



Andrei driving the robot on the field.



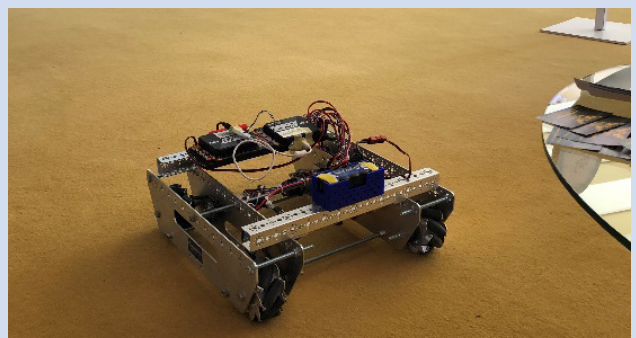
A group photo with all teams.



Andrei presenting the robot in detail.



A photo from the meeting with Sebastian



Our robot for this event.



Sebastian's talk about the box concept.

“Tara lui Andrei”

9 October 2018

Bucharest

Summary

Today we had an interesting opportunity to help our community. A person from “Tara lui Andrei” organisation contacted us and asked for our help in spreading the word about what they do.

Meant to help young people start their own projects and offering them financial aid in order to succeed, we realised how great this opportunity was for a lot of people our age. So we happily promoted them on our social media and spread the word in our school and encouraged as many people as we could to apply and work on their ideas in developing a project.

We enjoyed informing our young community about this incredible opportunity!

Sometimes you just need a person to believe you can, in order to take a leap of faith and get involved. We hoped we inspired at least some people to apply!

Photos



Poster of the organisation “Tara lui Andrei”

Halloween posters & activity

15 October 2018

Bucharest

Summary

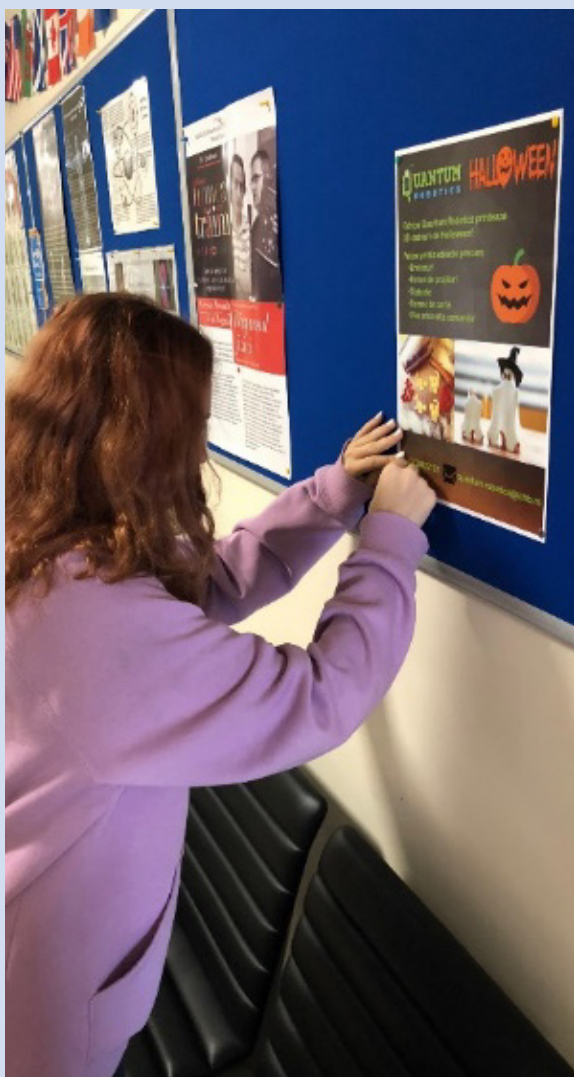
Besides thinking a little about intake system and brainstorming for a contest, the PR team also worked on starting our Halloween project.

We printed the posters for the school and then we went over to the school management in order to get their approval for the posters.

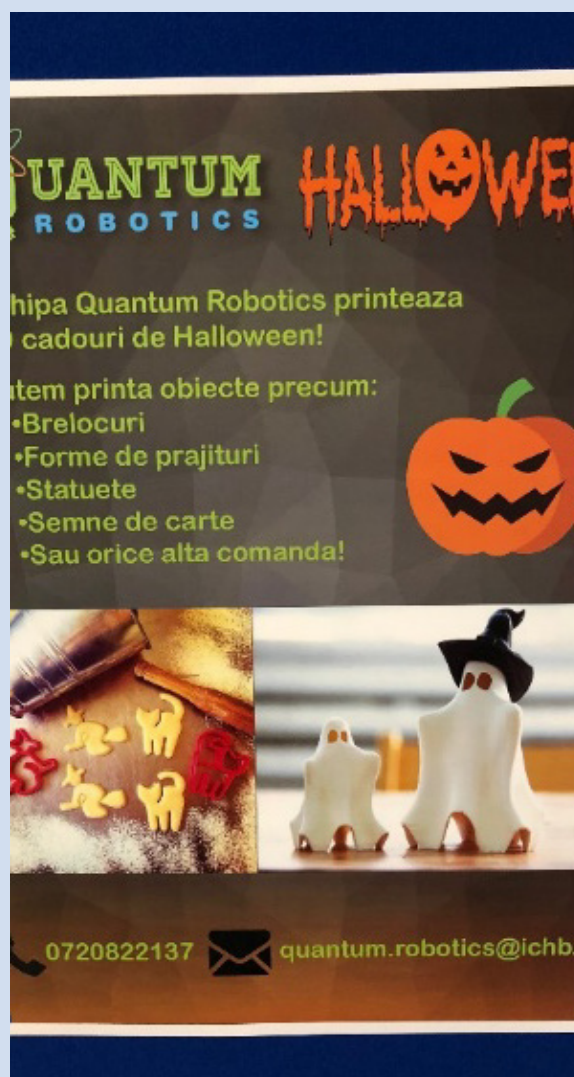
Only after going through several directors and signatures we were able to put up the posters on each floor and officially start our project.

Since the aim of this activity was to have it not only within school but also as an outreach method we also posted it on both Instagram and Facebook.

Photos



Ema putting up a poster after she obtained permission from the school.



The poster for the Halloween initiative.

Fixing the vending machine

24 October 2018

Bucharest

Summary

Today we had a very interesting encounter with our school during the lunch break.

Seeing as the lunch break is the time when the vending machine is the most used in order for students to get food and soft drinks, our staff was a bit panicked when it stopped working. Luckily, a few of our team members were around and they offered our help. We managed to fix the broken part, the vending machine being put back into action.

We loved being able to help our school at such a moment!

Photos



Voinea fixing the broken part.

No uniform day

26 October 2018

Bucharest

Summary

Today we held an exciting No Uniform Friday! We promoted FTC and robotics with our fellow colleagues from our school, our highschool having approximately 600 students. On the top of talking with them about our passion and the competition, we also organized a special No Uniform Day.

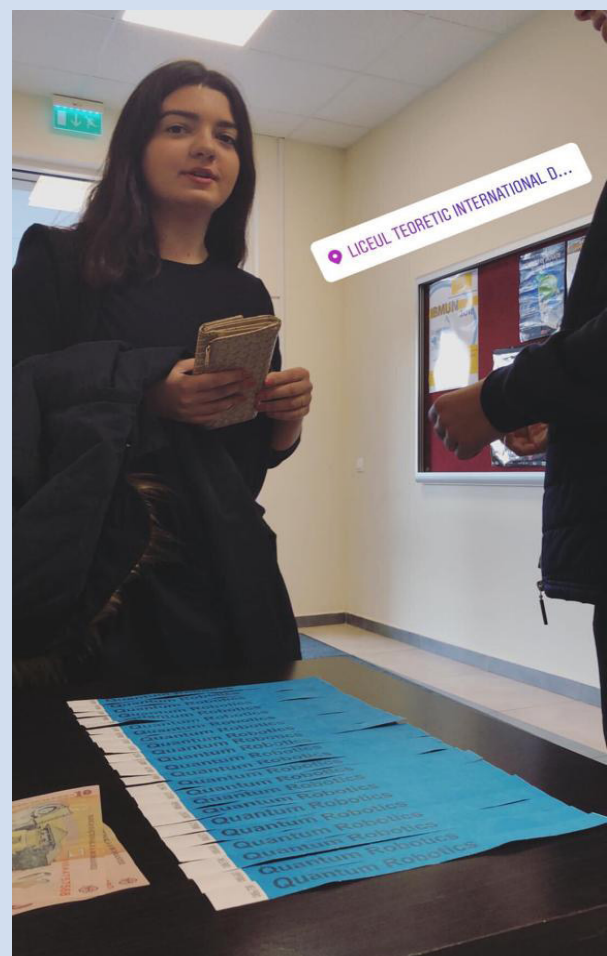
We talked in advance with the headmaster in order to get the approval for our event, we wrote an informing email that was sent too all the parents from our school and we designed and printed special Quantum bracelets that we shared with the participants. We were incredibly excited to be able to talk about what we do and all the FTC values that are so important to us!

The money we raised, around 2000 lei (440 euro), we shared half-half with the other team from our school, which we mentor – Imagine Robots. They are in their first year, and we are happy to help them anyway we can! We know how hard it is to launch yourself individually, we could see they were struggling with the financial situation, so, even though we organized the event, we happily shared the profits!

Photos



The bracelets



One student donating

Sweets fair

31 October 2018

Bucharest

Summary

Today we were able to organise a Halloween themed sweets fair for our school!

We met the day before in order to bake all the cookies, a time in which we had a lot of fun and in which we bonded over our cooking skills (or lack of them in some cases).

We also prepared some Halloween themed cookie cutters, made with our 3D printer. The cookie cutters were also sold along the cookies.

We use dthe first set of 3D printed cutters to make the biscuits for festive.

We held the sweets fair during the lunch break. We had fun socialising with our colleagues and raising funds for our team!

Photos



*One of the shapes made for the biscuits.
A witch's hat.*



*A more complicated shape since it kept
breaking. A ripper.*

Our Big Day Out

15 December 2018

Bucharest

Summary

Today we spent the day at an organization called “Our Big Day Out” who organizes each year a gathering of clothes and food and then giving them away to kinds and families in need.

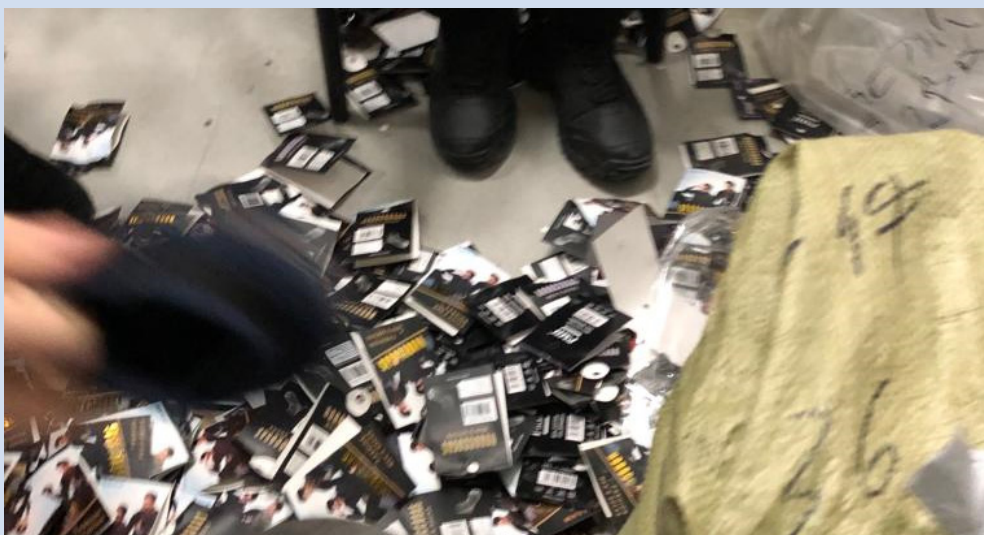
Most of us arrived in the first batch of volunteers in the morning and we helped with counting and placing different objects so we could later on divide them between 2000+ bags that would then go to the people we were helping.

We had a great time and even though sometimes it was getting really tiring and boring to count so many things we used a lot of math and in the end it wasn't so hard. It was an opportunity for us to find a solution for the lack of preplanned tasks. We worked with the organizers and we managed to speed up the process.

Photos



Unpacking new items brought.



Counting sharpeners.

Firststep volunteering

16 February 2019

Bucharest

Summary

Our school offered us the amazing opportunity to be volunteers at the national Firststep Science Fair Competition, held by the Lumina Institutions. The competition has five big categories of projects, at which kids from all around the country come with the most genius projects. It's a very big Science Contest, having up to 500 participants.

We were jury assistants, and so it was a very interesting experience in which we could see the participants present all their amazing science projects! We saw so many good, innovative solutions to the problems that we deal with in the whole world. We were amazed by the way the mind of little kids work, how incredibly creative and smart they are!

We were also happy that we got to talk about FTC and robotics, and encourage as many people as we could to work for their dreams and never give up, no matter how hard it can be.

It is always inspiring to see people who are determined to build a better future little by little. It was an enriching opportunity, which truly helped us expand our horizons!

Photos



The official colors for the firststep project.

Progresam Impreuna

27 February 2019

Bucharest

Summary

We are very proud to know that four of our members are volunteers at the “Progresam Impreuna” (Progressing Together) project. Organized by one of our favourite teachers, they are helping kids with disadvantaged backgrounds gain knowledge in mathematics and informatics, by doing weekly personalized meeting with them.

Mostly, they do preparation with 8th graders in order to get ready for the national exam that takes place in June. To see the low level at which the kids were, was a bit of a wakening shock. We realised the sad truth of our educational system, and we took the challenge to help them the best we can.

We recognize and promote the importance of receiving a good education. It's the vital factor that makes us evolve, improve, it's what gives us the base and the means to be able to create a better world, a better society not only for ourselves, but also for future generations. Unfortunately, in this day and age, education is a privilege not all can have. We believe in a world where we all start on the same basis, where we all have equal rights, where we all get the opportunity to change the world for the better.

We are truly humbled to be a part of this project!

Photos

Test Initial – 15.03.2019

Subiectul I

1. Rezultatul calculului $18 + 18 : 6$ este egal cu
2. Dacă $\frac{x}{4} = \frac{5}{2}$, atunci numărul x este egal cu
3. Cel mai mare număr par din mulțimea $M = \{1, 2, 3, 4, 5, 6, 7\}$ este egal cu
4. Punctele D, E și F sunt mijloacele laturilor triunghiului ABC . Dacă $AB = 6\text{ cm}$, $BC = 8\text{ cm}$ și $AC = 10\text{ cm}$, atunci perimetrul triunghiului DEF este egal cu ... cm.
5. În Figura 1 este reprezentat un cub $ABCD A'B'C'D'$. Măsura unghiului determinat de dreptele AD' și BB' este egală cu ...°.

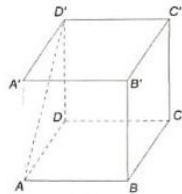


Figura 1

6. În tabelul următor sunt prezentate informații referitoare la țările reprezentate într-un proiect internațional și la numărul de participanți din fiecare țară.

Țară	România	Italia	Fransa	Olanda	Spania	Polonia
Număr de participanți	15	8	10	5	3	9

Conform tabelului, procentul reprezentat de numărul de participanți din Franța, din numărul total de participanți este ...%.

7. Știind că $a - b = 4$ și $a^2 - b^2 = 24$, calculați $a + b$.

The initial test we decided to give to the 8th graders.

“2% For Robotics” Campaign

6 March 2019

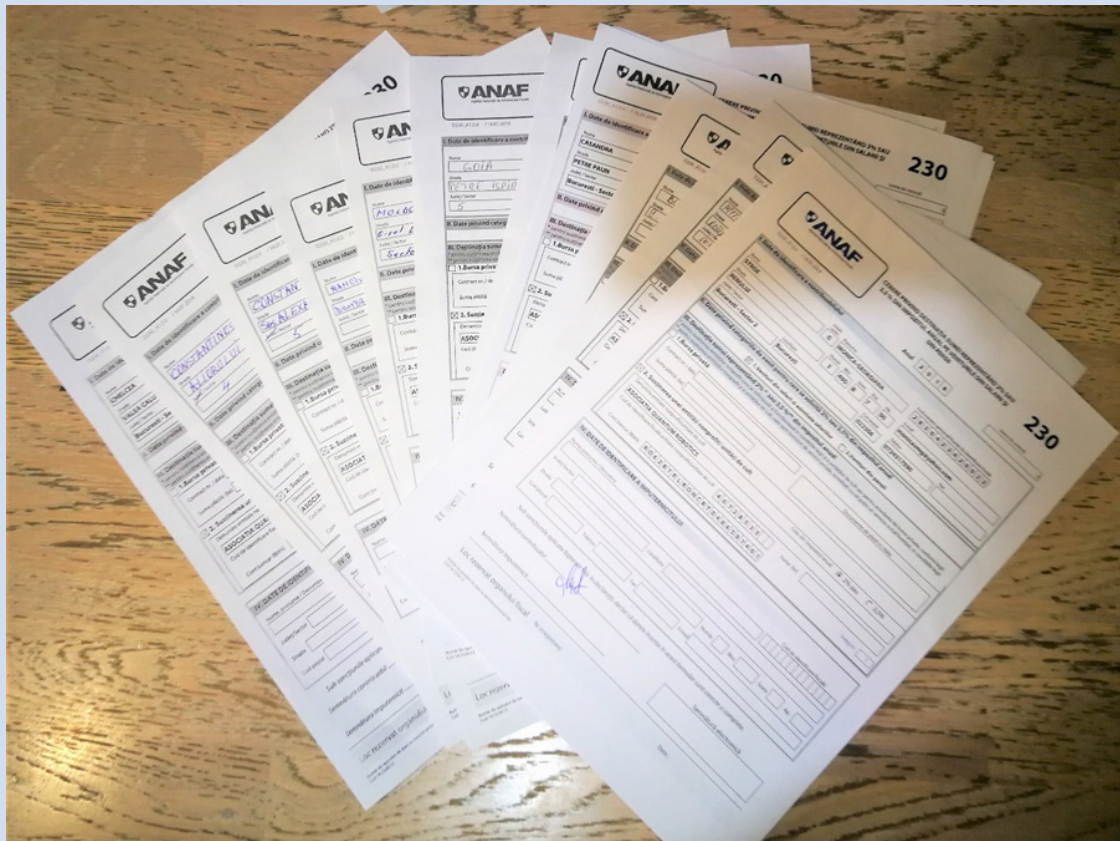
Summary

Our fifth long-term strategy is to “Develop an excellent team financing plan and sponsor relationship”. With huge effort and with the support of parents and school administration we succeeded to launch the “Quantum Robotics” Association, a non-profit organization for supporting the STEM and Robotics for all young fans.

Officially, the association was launched on 6th March 2019 and we decided to start working immediately. Taking benefits by the Romania government rules which asses that all Romania employees can redirect their 2% from the income tax to the non-profit organisation, we start the campaign donation: “2% For Robotics”. Donating 2% from income tax is not a sponsorship or a private donation. This campaign can help you gift away without any cost. If you do not redirect this percentage until March 15th each year, the money remains the property of the Romanian state.

Being a short time to the deadline, we started to speak with all friends, parents, supporters, teachers, sponsors in order to donate the 2% to our association. In 9 days, we succeeded to collect 89, form 230. From our calculation this represents around 3500 Euro, money that can be in our account around June 2019. This is a good start for the next season. :-))and the period for summiting the forms have been extended to July 31st.

Photos



The 2% papers

Woman's day flowers

8 March 2019

Bucharest

Summary

Today was international Woman's Day, so we thought we should spread some kindness and offer flowers to all the girls and women present at the Regional! Everybody was excited and nervous at the same time, because of the competition. Our boys from Quantum thought about this the week before, and so they came prepared! The morning before we arrived where the competition was taking place, they went and bought a big box of flowers, which they later offered to the women present! It was so nice to spread a bit of kindness, even with a small gesture like this!

Photos



Posts from Instagram

Easter program

16 April 2019

Bucharest

Summary

The Lumina organisation has been raising money for a few months now, in order to buy food ingredients and necessary toiletries to make care packages for numerous families who come from disadvantaged parts of our country. On the top of donating approximately 750 lei (=160 euro) from the members of Quantum Robotics, we also took part in the making of the care packages. We spent a whole day counting, separating and arranging the things bought to be put into the packages. We feel extremely humbled to be able to help so many families who don't have access to the same opportunities that we do, who struggle to live day by day. The packages will be delivered the day before Easter (27th of April). This kind of experiences always make us realise how lucky we are to live life the way we do and not worry about when the next meal is going to come. We are thrilled that we were able to take part in such an amazing project and we truly hope that numerous families get to profit from this. Everybody deserves a Happy Easter! The program has the target to reach 10 000 people this Easter.

4.5. Mentoring and Assisting Other Teams

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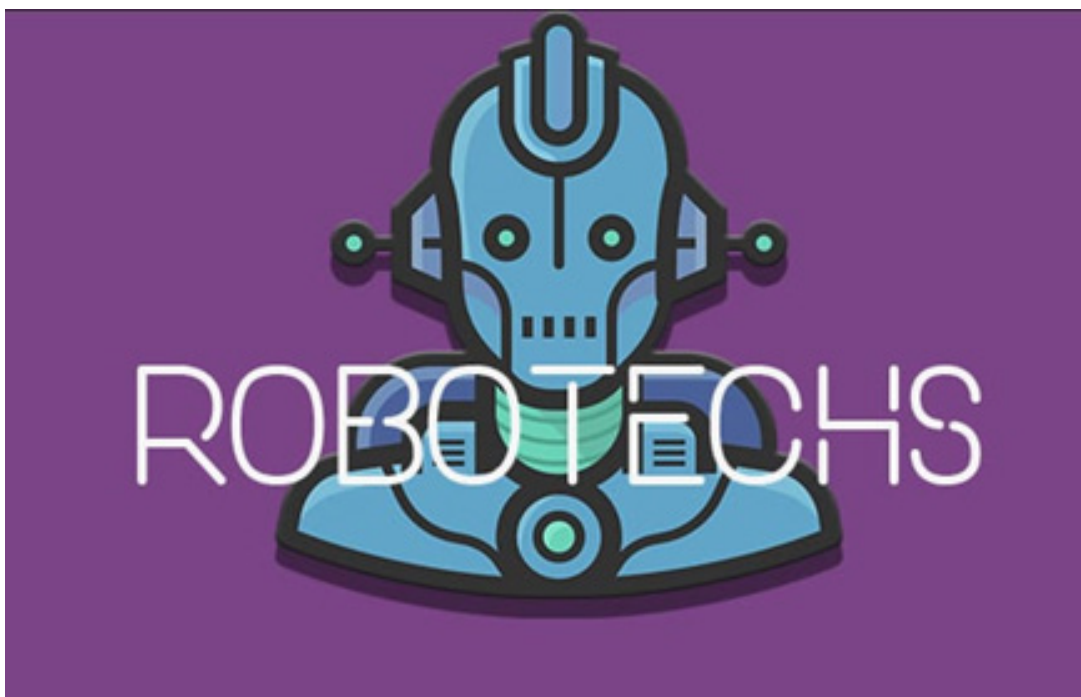
1. RoboTechs – RO117	131
2. Boogey Bots – RO141	133
3. H-Tech – RO106	134
4. Imagine Robots – RO116	135
5. I.L.C.Robotix – RO107	136

Summary

Throughout this year's season, we have had the chance to interact with a lot of teams from around the globe. However, there are a few that stood out to us because we had the chance to actually get to know them.

We believe the following teams have been impacted by our FIRST attitude and we hope we will be able to help them develop further. This season we were able to push 5 teams even closer to STEM. While mentoring a team we always kept in mind our moto – Winning is temporary, learning is forever.

1. RoboTechs – RO117



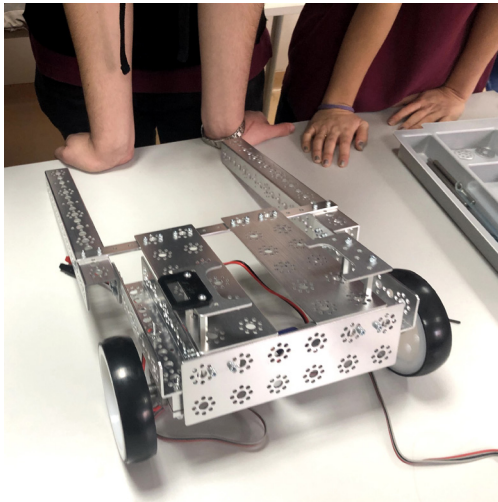
As ICHB Colentina is the sister high school of ICHB, we have a very tight relation with their teachers. That is how we got them to come to our lab for an introduction to FIRST and FTC. We told them about the core values of FIRST and we tried to explain how a robotics team should work. (2 oct 2018)



After this, we had a phone call with them and we discussed about what robotics kit they should purchase. We came to the conclusion that a Tetrix kit would benefit them the most. After a month of waiting for the parts, we went to their lab and helped with reorganizing. They had quite a big room but it was filled with desks that we carried outside so they could fit half of the FTC field.

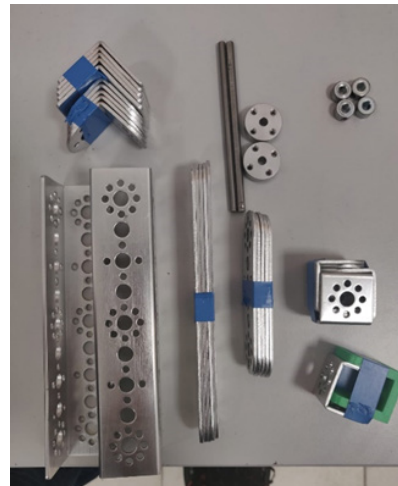


After this, we helped them build and program a tetrix PushBot so they would understand the basics of this system. (18 dec)



The next day we went to Dedeman with them (a hardware shop) and we bought all the tools necessary for building a robot. (19 dec)

We also came to us twice asking for parts. This is what we were able to give them:



2. Boogey Bots – RO141



Boogey Bots is a new team from Ramnicu Sarat. Radu found out their team leader was interested in starting a FTC team in his high school. So after they had their team roster ready, we invited them to come over.

At the meeting we presented the basics of FIRST and what it meant to be a part of a robotics team. They were really excited to talk to us as they wanted to get involved but didn't know how.

After this, we had a hardware workshop where we designed 3 simple pusher bots so they would get accustomed to the Tetrix system.

At the end of the meeting we ate pizza together while theorizing about this year's challenge. After the meeting we remained in contact and periodically exchanged ideas. When we told Boogey Bots that we were placing an order to GoBilda, they went to the site as well and gave us some parts to order for them.

Since then, we have kept in contact and continued to try and help them whenever they were in need.



A goodbye photo with both of the teams, with the simple test bots visible.



Boogey Bots working on the test bots

3. H-Tech – RO106



We first got in contact with H-Tech when a member of Autovortex that knew the team members asked us help kickstart the team. We quickly arranged a meeting in our lab and they brought their REV and Tetrax Pusher bots.

After giving them some advice on lab safety and the importance of having a clean workspace, we decided to meet again as soon as they had a lab set up at their high school. When we visited them, they had already built an interesting drive train. It was a rectangle shaped holonomic drive. Although it looked weird at first, it actually worked very well.

Unfortunately, it was too small to fit any other systems and we had to disassemble it.

Also, they misassembled the Lander, so Alex and Victor had to remake it from scratch so that H-Tech would train on the correct field. After this we made a habit of visiting them every 1 or 2 weeks. We saw them progress from a simple PushBot to a very potent robot. Every time we visited them, we gave them as many tips as we could.

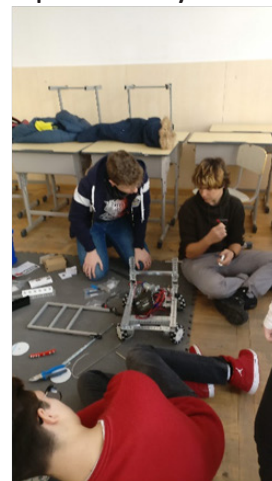
We also kept in contact over WhatsApp whenever we couldn't personally visit them.



Alex and Victor tiding the toolbox



H-Tech building the new chassis they came up with



H-Tech's interesting drive train

Alex and Victor assembling the Lander while Radu is sorting through the parts



H-Tech brainstorming for a new chassis

4. Imagine Robots – RO116



Imagine Robots is the other team from ICHB. They were founded when some members from last year decided they wanted to make their own team. We work very tightly together and share our practice field.

Whenever they are missing any parts or tools, we always lend them whatever they need. Their lab is right next to ours so it is really easy to interact with them.

From time to time, Andrei visits them to see how they are doing. So far he has helped them with the programming and hardware part.

Also, Voinea helps them with advice on the new printer they purchased – A PRUSA MK3 – and 3D design tips.

After helping them program the intake arm, we realized that one of the encoders on a motor was broken. After replacing that motor, everything worked perfectly.

5. I.L.C.Robotix – RO107

We got in contact with I.L.C.Robotix through a friend of Visoiu's. They invited us to their lab to show us what they had done so far and to ask for our input. After the official Natie Prin Educatie DEMO, they completely rethought their robot and wanted to hear what we thought about it. (22 Feb)

The design was well thought out and it had good chances to succeed if they worked hard enough on it. We tried to give them as many general tips as possible so they would be ready for the Regional competition that was in few weeks.



The team giving general feedback on the robot's design



Andrei explaining other good solutions for the climb system



Alex giving tips on programming



4.6. Connecting and collaborate with Other Teams

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Summary

In this year's season we have tried to open up to as many opportunities to connect with others as possible. We believe that a very important part of FIRST is the aspect of team-work and cooperation. As such, we have tried to take part in as many social and teambuilding events. Through such events we have strongly increased the bonds between our team and all the FIRST community as a whole.

Teambuilding PR

9 June 2018

Bucharest

Summary

Seeing as the summer holiday was about to start, the PR department decided to have a teambuilding day.

We agreed on meeting in Parklake, which is the closest mall to our high school. We ate and talked about ourselves and our summer plans.

We also got to talk about what drove us to apply to become a part of this team, it was a really interesting experience to observe how each of us is driven by something else, how each of us finds his or her motivation in things we would never think.

Each of us contributed equally to the conversation, we all heard the other out. It was a fun day in which we the PR department bonded and became even closer!

Photos



During the meeting we also talked about:

- *working on making a manual with team specific colors and guidelines so we would have consistency in our materials*
- *finding a solution for our T-shirts since last time the stickers on them started peeling off*

RoboCamp 1

2 - 8 July 2018

Beclean

Summary

Today Andrei left for the Beclean Robotics Camp. He went there to meet with RobotXHD, a team from Hunedoara that he was participating with at Mexico FIRST GLOBAL 2018.

He made the trip by car with his roommate's father. On the way to Beclean, they stopped at an inactive volcano crater. He took rock samples that he brought back to the robotics lab to study. Today the robotics courses began. The camp had 3 types of courses Hardware, 3D design and motivational.

The hardware classes talked about the basics of Tetrix structure, how to use REV electronics, gears, chains and more 3D design was mostly about CREO 4.0, a CAD software. Unfortunately, we work in SolidWorks so the classes weren't very useful, but we still got some insight in another powerful CAD solution.

The motivational courses were held by 2 psychologists and they really bonded the students from the camp together. Today the teams present in the robotics camp had a friendly skirmish. Because Andrei was our only member present, he did not have our robot with him, but he helped out the teams with technical problems. During these interactions with other teams, he exchanged phone numbers and Facebook pages.

During the friendly matches, Andrei saw a few interesting designs from teams with limited parts. Because they had fewer options than other teams, they were really inventive with the limited resources they had. Today it was our day off. We started the courses as usual in the morning, but after lunch we were told that a surprise was waiting for us. We were taken to some buses and we went on a 30 minute trip.

After that, we arrived at a kind of remote restaurant in a small forest. We started playing card games, listening to music and joking.

After a few hours, the organizers set up some tables and we were served lunch. After lunch, we built a huge camp fire and the winners from a game we played in the previous day got to light the fire! We light it just as it was getting dark, so it was perfect for pictures.

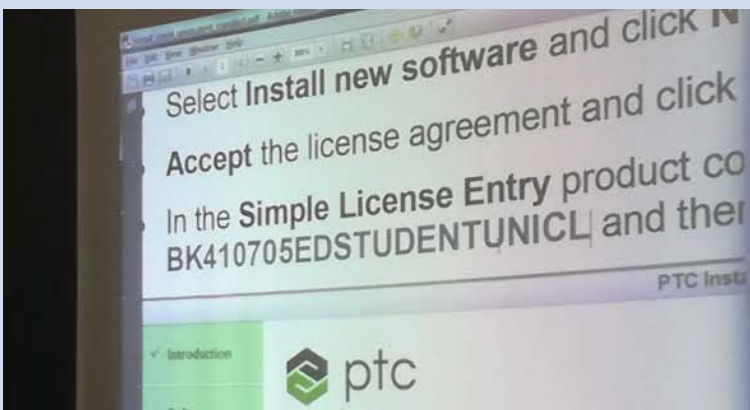
We started the day off as usual, with the robotics courses. After that, we were announced that we would have a CAD competition. Although Andrei did not have a team to participate with, he decided to try to put something together, just for fun.

After a few hours of work, a small metal structure was finished. Unfortunately, Andrei found out all the submissions were supposed to be sent in CREO 4.0, and because he was working in SolidWorks, he decided to go and try to help other teams.

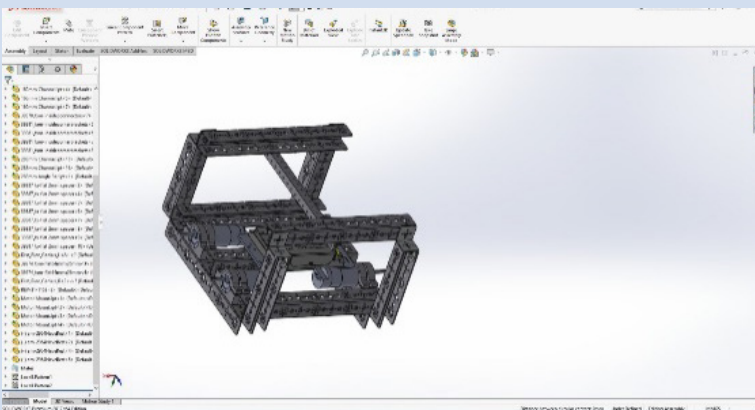
Photos



The winning team from the small scrimmage we had at the RoboCamp in July.



During the first Creo course we all received licenses to work with the program during camp week.



A prototype assembly Andrei made for the design contest. Even though he didn't use Creo, he made a great job in SolidWorks.



During the end of the week they had a recreational camp fire after hard-working day.

RoboCamp 2

2 - 9 August 2018

Beclean

Summary

This week 5 of our members were in the robotics camp from Beclean. They left on 2nd of August before 1AM but since Beclean is near Cluj and it was a huge music festival that was starting the next day, the night cabins from the train were all taken so they bought tickets on chairs for a 9 hours trip by train.

On the way they even met with two other teams and they played some cards and watched a movie before everyone started trying to go to sleep. Upon arriving at the train station one of the volunteers was awaiting them and they went to the boarding school they were staying at along with the other teams. Before going to get some proper sleep after the long night trip to Beclean, they decided on eating breakfast with some of the other teams that had arrived this early at the camp.

After getting some sleep, they took their robot in the sports hall and they started assembling it since the next day there would be a small competition but in lack of a box, our robot was brought in two parts, each in a huge bag so we had to assemble it since it was totally unprepared. After preparing the robot we went to the official opening and received the schedule and a map for the camp. After the opening ceremony we went along with two other teams to eat in the city and we stopped at a pizza place and started making new friends.

On the second day, 3rd of August right after the breakfast there were 2 small events. First there was a talk about BRD FIRST Tech Challenge, about organizing the competition, founding it in Romania and the evolution it had and the expected evolution. Next, there was a video conference "How to demo". An employee from Oracle Romania gave us some tips about presenting ourselves to the judges and about not getting emotional when speaking in public.

What we realized is that even though many people might really want to help you, sometimes you need to look for advice to people who know more about the situation since their responses will be more specific. During the second part of the day there was a small scrimmage, the last matches from the season since everyone would then modify their robots.

In our case, our robot had already been disassembled and we didn't really get the chance to rebuild our robot so we just tried to remake one of the robots from the presentation video since we thought that would be fun and new. Our goal at the scrimmage was not to win but to develop our artistic side in robotics. This way we had way more time to talk with other participants and also help some of them when they had problems. Even though we didn't win the contest it was an amazing day because we made friends.

On the third day we had in the morning two workshops. The first one was about delivering a pitch. The second one was actually more interesting. We were able to choose between two other workshops and we chose the one called “Project management with Agile”.

This workshop was held by employees from Oracle and it was an amazing workshop for our team. Since we do have problems with arranging and setting tasks this workshop was really good for our 5 members. During the afternoon, there was a trip to some known pools nearby and this was the time for bonding with other teams.

This way we spent even more time with some of our new friends and also met new teams. On the fourth day we started some workshops that would take longer than a session. One of the workshops was about a 3D Program and also held a little contest at the end of the course days.

Each team could bring a 3D project of the team's robot and we decided to bring it in the program that our 3D designer used to work on. One of the other programs was about mechanics and it was interesting as a first lesson for all 5 members no matter their usual work. The third workshop was about Motivation and since it was more PR inclined, this is where finding about the other FTC lovers happened. During the afternoon we had another amazing day at the pools and great time with some of the other teams.

The fifth day of camp was another morning with the three courses and if the 3D Design one was abandoned by our team members, the mechanics one was a place for new friendships today. Since our colleagues did translate the game manual, they knew a lot of info and helped many teams. Today was the last day of Motivation workshop but everyone enjoyed it very much. There was even contest of pitching a new made team with members from all teams. The goal was to get a big sponsorship and we were very happy to see our head of Marketing and PR prove her skill. During the workshop, FTC members also got the chance to define their personality a little the end of the workshop was sad.

In the afternoon we had free time and our team members divided upon a group who worked for the new robot, from the challenge from the mechanics course. And two who worked on the 3D Design contest. In the evening everyone got a chance to breathe since everyone left for a bonfire somewhere at 15 minutes from the boarding school.

It kind of rained that afternoon and everyone thought it would be a problem but one group of kids started playing cards and everything was way better. Everyone had a great time and a lot of fun. We spent a lot of time with the new friends we made from 2 teams but we also sang and danced with everyone at the bonfire. On the sixth day, the motivation course was switched with a theater one but since most of the teams were working on improving their robot for the challenge from the afternoon.

We all decided on not going to classes and we instead spent time with the other teams and worked on doing our robot along with 7 other teams.

In the afternoon when there was a robot exposition we were really happy to have our robot in an almost final state, this way we were able to show our idea.

Our poster was really good as an improvisation and even though our robot was being cut 20 minutes before the show-off, in the end it was an almost perfectly functioning prototype. On the seventh day, we had the same three courses as yesterday so we spent the morning with some other teams. We talked a little about our experience in Detroit and then we talked a little about what we think of the next season and what our hopes are.

After lunch the 3D Design contest took part. Our 3D designer was really scared of talking in public since he is not used to doing that because if he has to present his projects on his own it's just for a very small number of people. That's why he was one of the last ones to present since this way he also had time to repeat his tactic with Ema. She tried to ease his nerves and so did some other kids from other teams. He won 2nd place.

During the last day of camp most of the teams left during the morning so it was just us and another team left in the boarding school. That's why we all packed our bags and then both teams left for the pools.

This one day of bonding at the pools was our opportunity to make really good friends. We spent a lot of time with them in the pool complex but unfortunately they had to leave earlier because their mentor wanted to eat in town. Even so we had an amazing time in the camp and we even had a pleasant trip back home since this time we had tickets at the sleeping cabins to Bucharest. Overall it was fun experience and good outreach.

Photos



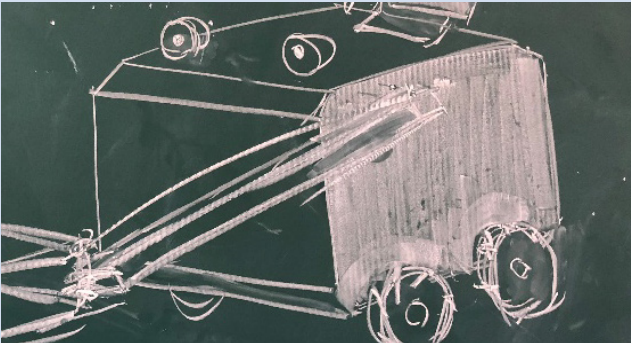
The tired team on the way to Beclean



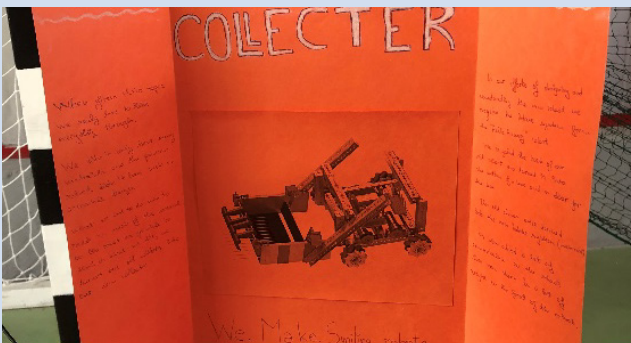
The team ready for the beginning of the friendly matches



The excited team at the campfire after a long day of hard work



First robot design for the brainstorming competition



Our poster submission for the poster competition done in only 2 hours



Going out with the other teams at the end of the camp



The team on their way back to Bucharest

Coaching Partners

8 November 2018

Bucharest

Summary

Concomitantly, Andrei, Radu, Alex, Victor, Ema and Denisa, participated at a coaching meeting hosted by Coaching Partners. The meeting was centered on self-image and communication.

We reflected over the chosen themes through interesting activities and discussions. We also talked about our way of communicating with the team and how we can improve in order to make each member feel comfortable and not pressured.

It really helped us understand how we should react in moments of great stress and organize ourselves.

Photos



Photo from the break.



Expressing our feelings.

FTC Demo

17 November 2018

Bucharest

Summary

Today our main focus was the demo. Today we also received confirmation from the Korean Robotics Competition organizers about our enrollment for January's competition.

Today all the people on hardware sat together and tried to find a final design for the robot since the time left is so little. Meanwhile, Sanzi, Radu, Visoiu and Cezar tried to find a solution for programming but they had some difficulties. On one side, Ema, Andrei and Denisa worked a lot on finalizing as many digital documents as possible and also started printing the papers for the badges for all participants that were already involved.

They started working on all the lists since they needed to have:

- Participants and spectators list for the school security
- Pizza lists for ordering the pizza on Friday

After printing both game manuals and all other needed documents for robot and field inspections they also printed the pages for the badges. When they started working on cutting all the badges and setting them up they realized that it was a really good choice to start working ahead since it was taking a lot of time.

Even though we had so little time left till the demo, we were really determined to test as many ideas for the robot. In the afternoon Eliza, Tudor, Visoiu, Mihai and Cezar joined the rest of the team. Tudor, Ema, Denisa and Andrei started working on printing the last documents and then they started disabling the field so it could be moved to the sports hall for the demo. The rest of the members and volunteers continued working one group on finishing the robot and another on doing the programming. While working on the robot we realized we had a few problems with the extension of the robot into the crater since our wires were not long enough.

In the evening, we started taking out tables and chairs from the nearby classrooms, preparing to put them in the sports hall as it was being cleared. Since in order to test the robot we needed to have a field, everyone took a break from what they were doing and we started arranging the sports hall.

We tried to divide into pairs each doing a task but since our roles weren't so well defined it was pretty hard at the beginning with coordination. In the end, after all tables and fields were in place we started working on the video and sound preparations while others were working on the last touches for the robot.

It was a very long day but in the end we were happy to see that we were able to put everything into place and we also managed to finish implementing some last things on the robot since our goal was to test various mechanisms at our demo.

Photos



Victor, Voinea and Mr. Emre looking at our robot tests.



One of the matches with referees from our team.



FTC members from Sf. Sava talking about their robot.

Bionic Royals connections

17 November 2018 started

Bucharest

Summary

Bionic Royals – RO042



We started interacting with Bionic Royals when they came to our demo. We played against them in the finals where they won. We had a very good time playing with them and we were hoping to meet them again soon.

Luck would have it that in the next weekend we were going to the demo they were organizing. There we had the opportunity to pick them to be a part of our alliance and we won this way.

After this we kept in contact and exchanged ideas and solutions over WhatsApp. We also had the chance to meet them again at Natie Prin Educatie's Official DEMO.

Photos



Bionic Royals being happy to win Quantum Robotics DEMO

Skype Brainstormers

12 December 2018

Summary

Today we had a skype call with the mentor of Brainstormers - John Nguyen. Brainstormers are the winning team from last year's Detroit world championship.

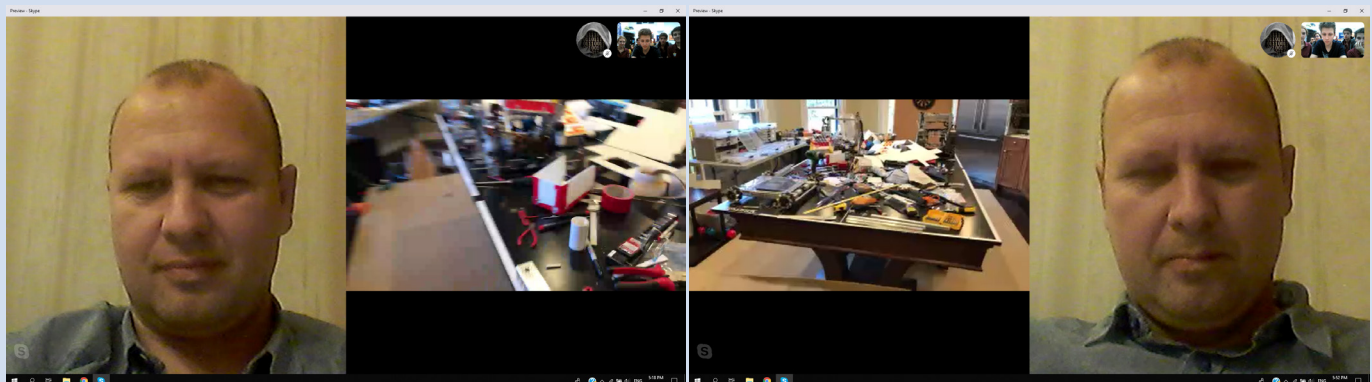
Unfortunately, the members that had won Winning Alliance Captain graduated so we didn't get the chance to talk to all of them. We did, however, talk to John's son and ex-team captain, David.

After a long talk about everything FTC related, we came out with a lot of important ideas:

1. Hardware
 - a. The main strategy was well thought out and we were on the right track
 - b. The mechanisms we had designed had a lot of potential
 - c. We were given tips on the different types of linear motion
2. Software
 - a. They explained the benefits and downsides of odometry wheels
 - b. The library we decided to use – RoadRunner – was a very good choice
3. Notebook design
 - a. It's very important to log daily entries
 - b. The structure of the notebook is as important as the content
 - c. Simplicity is the best way to go

After this talk we truly felt inspired and empowered to achieve our new goals. **Annex 1**

Photos



The team on a video call with Brainstormers and our mentor – Alin Preda.

Laser Max

13 December 2018

Bucharest

Summary

Today the whole team had an amazing day!

Right after school hours we exchanged secret Santa presents. Everyone had the chance to open their presents and we all had sweet surprises.

Afterwards, most of the team went to Laser Maxx for two games of laser tag. It was an amazing experience for all of us both individually and as a team. At the laser max we had a lot of fun and we got the chance to get to know our teammates better but also fight against them.

This way we discovered that Andrei has competition from Cezar for the best player. After this team building we all decided that we need to do this more often since this is not only a fun activity but also an opportunity to get more bonding time.

Photos



Team photo after 3 matches of Laser Max in Park Lake.



Team photo of "Go team"

Discord call

10 February 2018

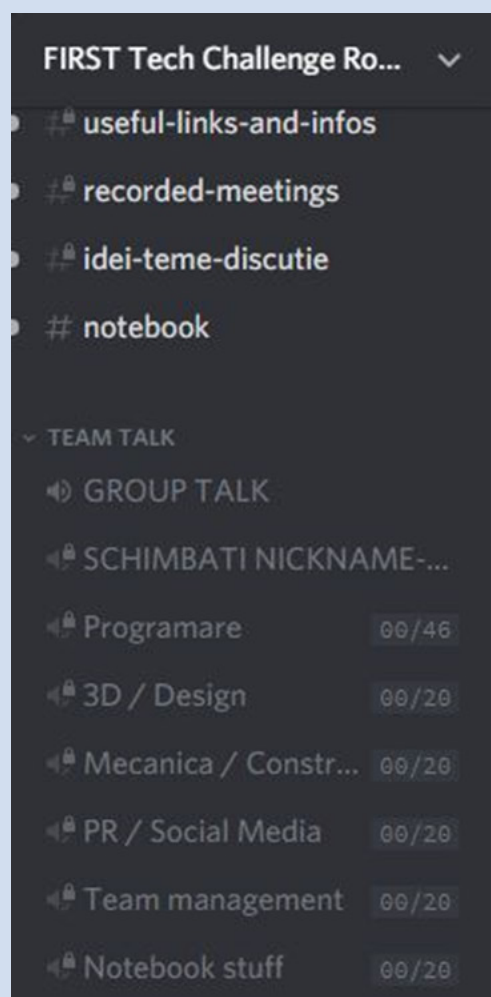
Summary

Today we had an eye-opening Discord group call with a few of the Romanian teams. The call was organized by Alex Budin, the mentor of Technogods. It started with greetings but we quickly got to the important points.

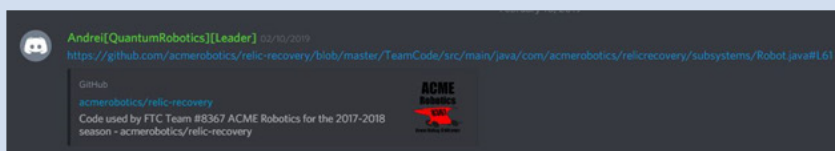
There were a lot of rookie teams in the call so we were excited when we were asked about our experience in the Detroit Championship of last year. As we are always happy to help, we shared our ideas and plans for this season.

We also had the chance to hear the opinions of all the other teams. When we were talking about linear motion, we found out that everybody was recommending a linear motion kit from REV or GoBilda.

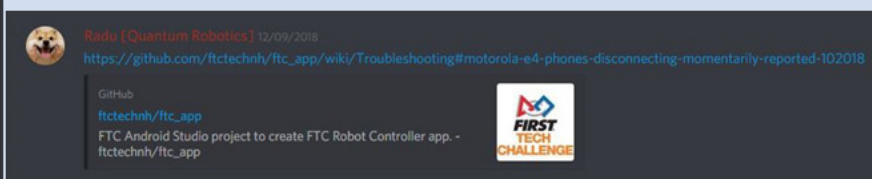
Photos



The channel list of this Discord



Andrei sharing a link about Multi-Threading in Java



Radu sharing a link about troubleshooting Moto E4 phone

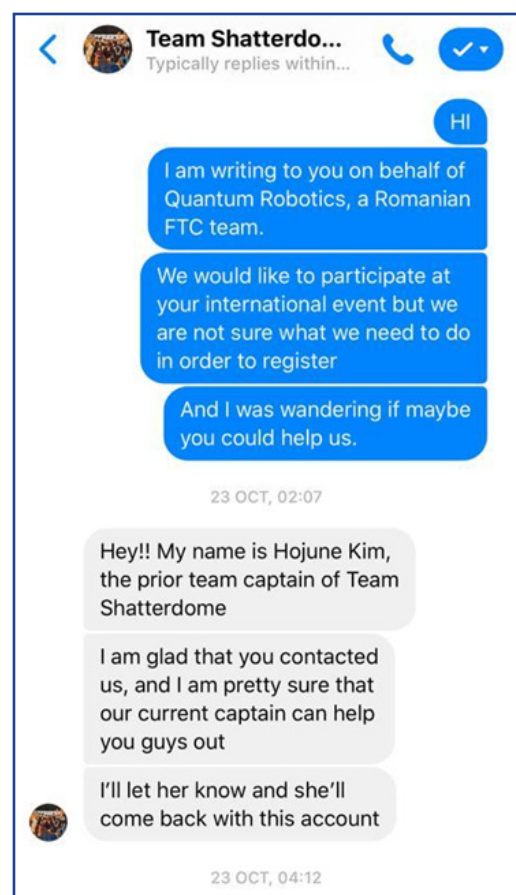
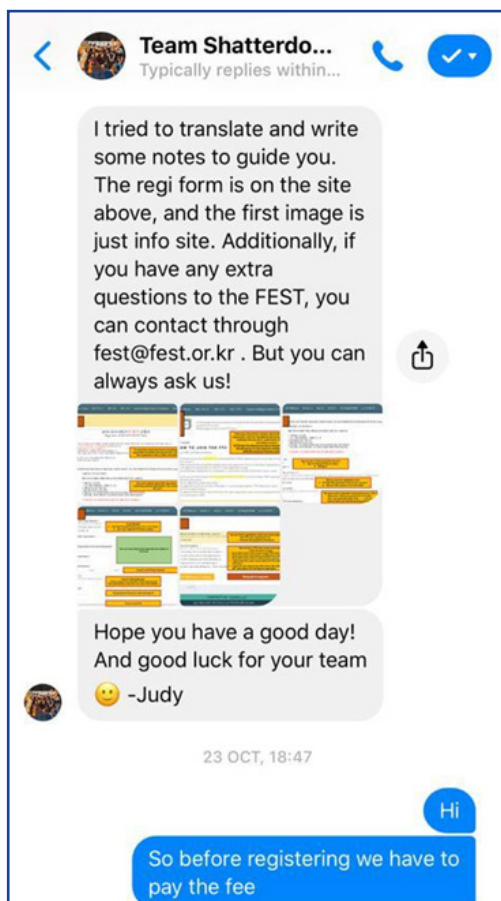
10. International Networking

This year we had the pleasure to interact with a few international teams as well. As always, it was a pleasure to get to know as many teams as possible from outside Romania.

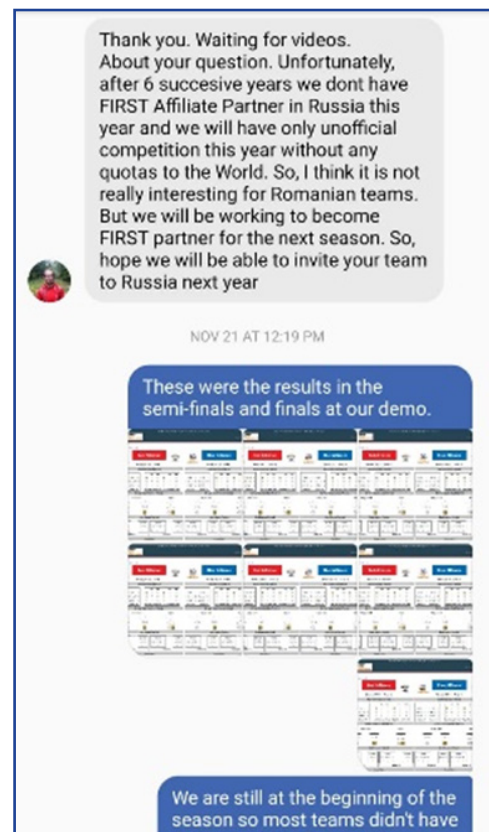
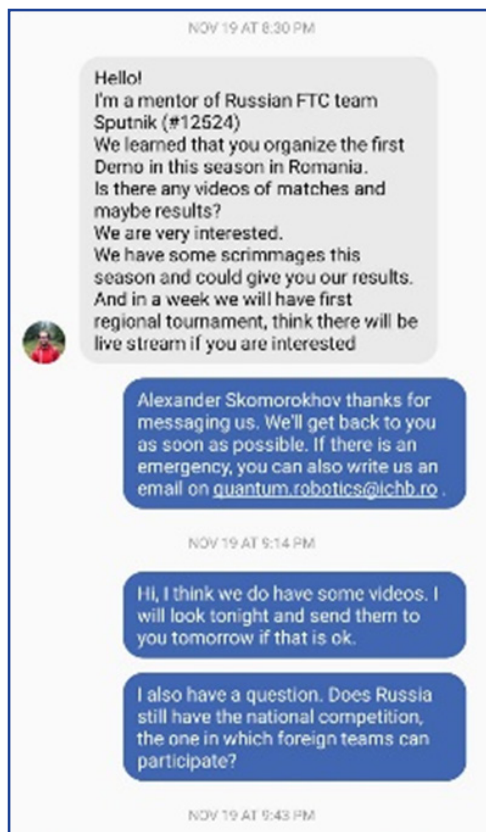
We loved to hear advice from them and also share our own experience that we gained so far.

Besides Brainstomers– The World Champions 2018 - we were connected with other several international teams:

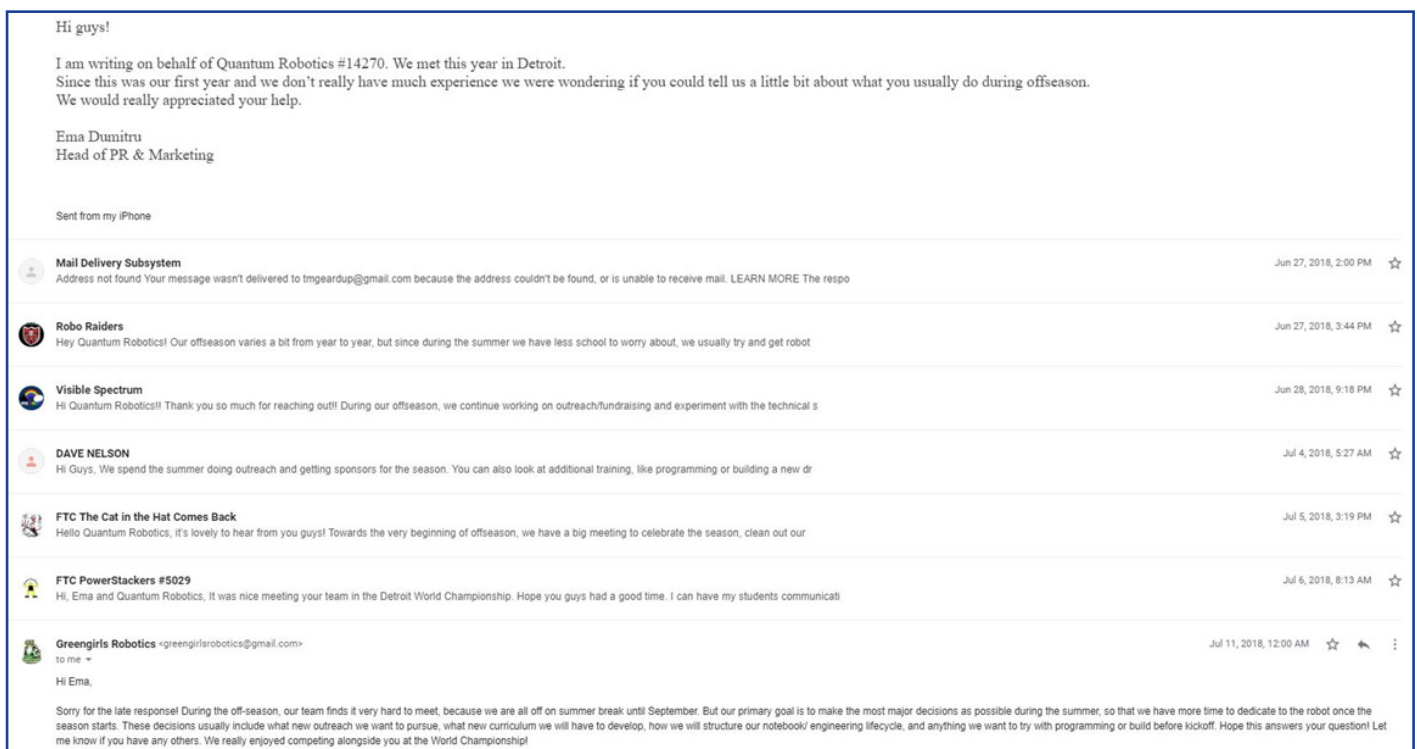
- Green Girls
- PowerStackers
- Robo Raiders
- Visible Spectrum
- The Cat in the Hat Comes Back



The mentor from Team 12524 – Sputnik asked us about the results from Quantum Robotics DEMO. We exchanged some info and inquired about the Russian teams as well



The mentor from Team 12524 – Sputnik asked us about the results from Quantum Robotics DEMO. We exchanged some info and inquired about the Russian teams as well



After last year's season, we emailed all the US teams we contacted in the World Championship. They gave us a lot of advice on activities for the offseason.

11. National Networking & Helping

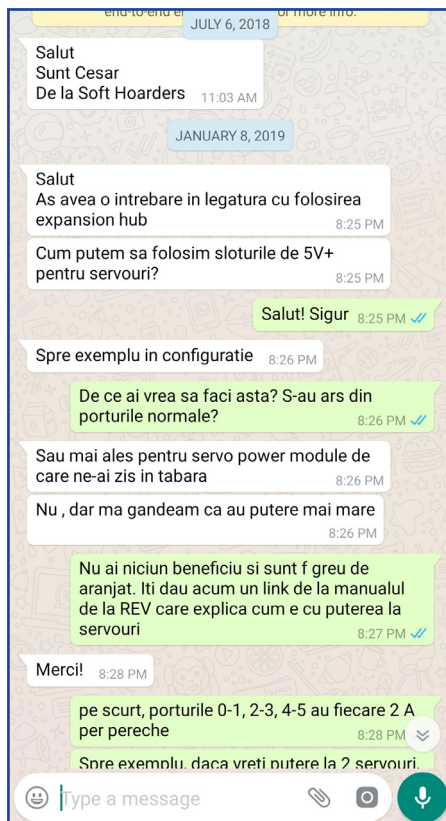
Throughout this year's season, we got a lot of questions from teams in Romania. We were always gracious and happy to help anyone in need.

We mostly interacted with people on Instagram, Facebook messenger and Whatsapp.

Sometimes the messages weren't even from FIRST members, but we were always happy to answer and help anyone. Sometimes we interacted with more than one member from one team, but in the end we interacted with 22 teams through message.

This is a list of some of the teams we interacted with:

- RO132 – LTCDMN
- RO039 – Team Droids
- RO117 – RoboTechs
- RO120 – Ro2D2
- RO010 – DIMCARNO
- RO007 – Gear Maniacs
- RO142 – BroBots
- RO051 – Pyxis Nautica
- RO130 – SNGine
- RO067 – Tehrocuz
- RO042 – Bionic
- RO107 – ILC Robotix
- RO141 – Boogey Bots
- RO015 – Robo Titans
- RO007 – Gear Maniacs
- RO034 – Vectron
- RO092 – UnderConstruction
- RO005 – Esentza
- RO046 – TechnoGods
- RO031 – Soft Hoarders
- RO123 – North East Dynamics
- RO013 – Gamma



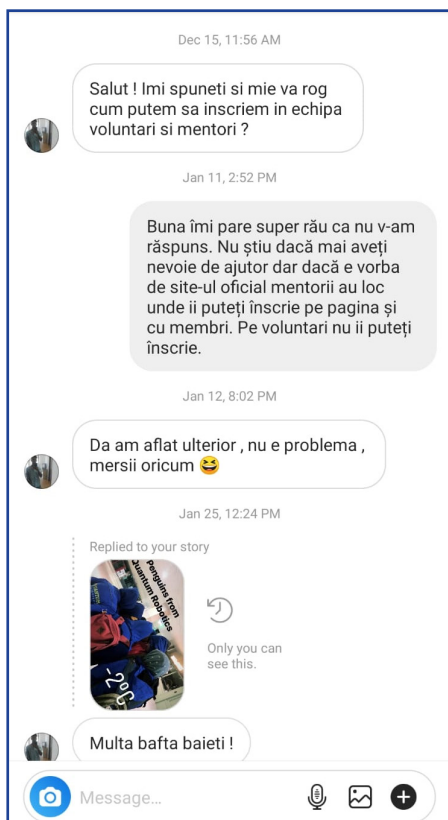
A member from RO031 – Soft Hoarders asking about some technical details about the REV Expansion Hub



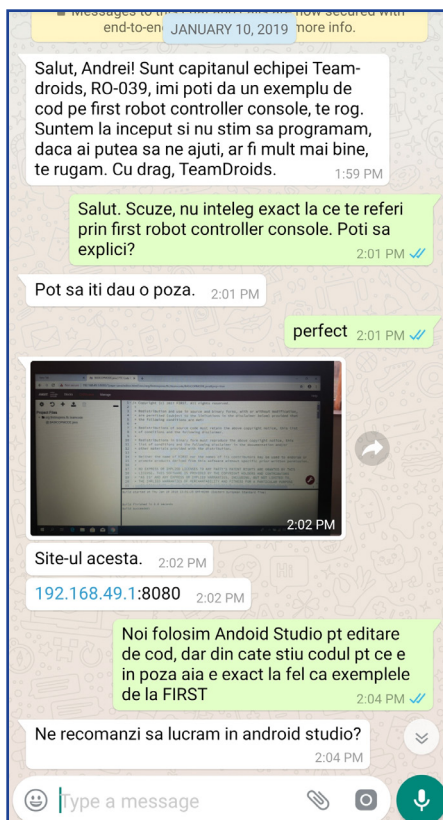
Team RO123 – North East Dynamics asking if they should power their USB Hub if they are using a web cam



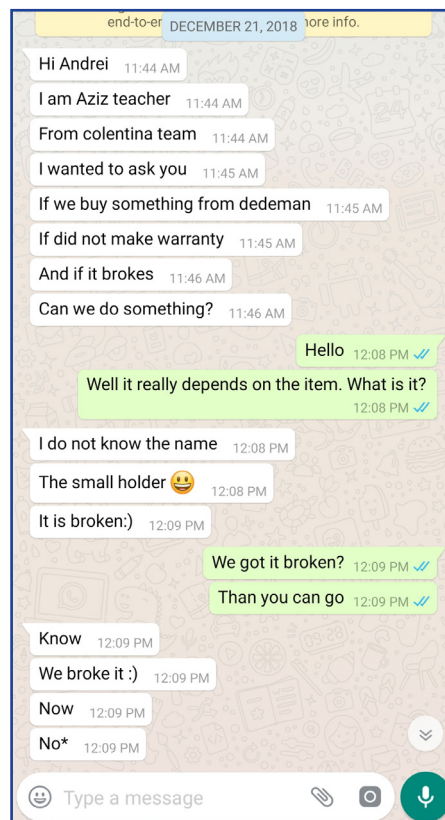
Bogdan from team RO141 – Boogey Bots asking if they could use our FTC field to practice



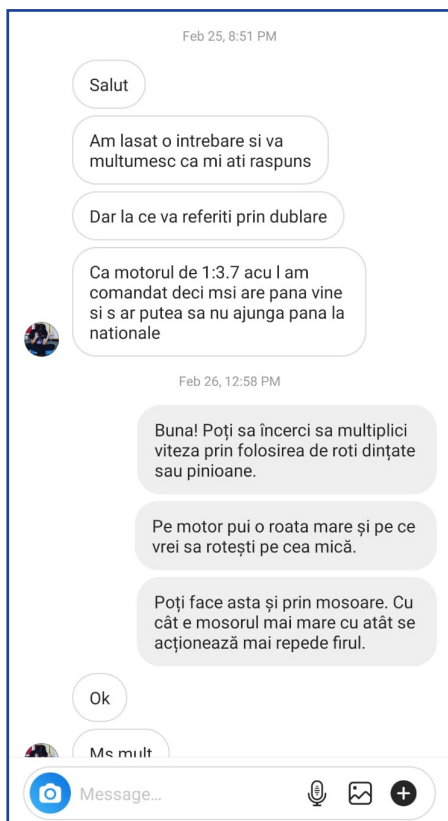
A member from RO132 – LTCDMN Robotics asking how they should officially register their members.



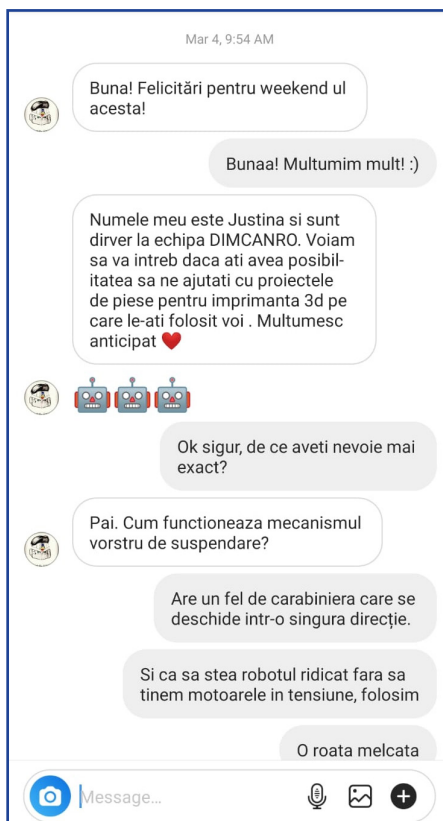
A member from RO039 – Team Droids asking about the basics of programming.



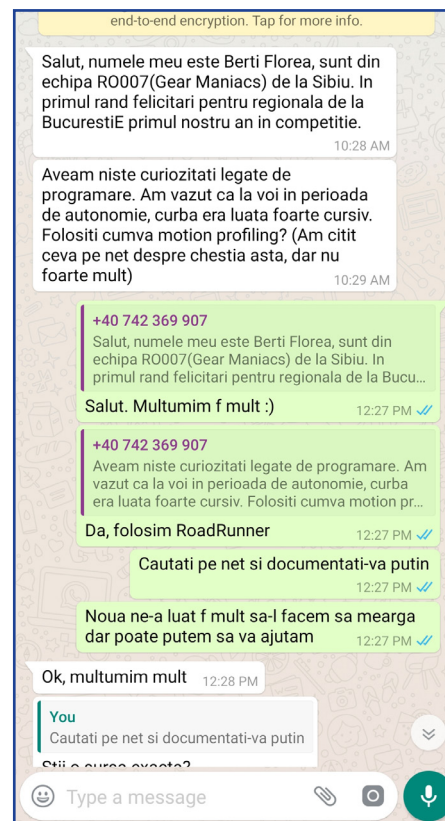
The mentor from team RO117 – RoboTechs asking for tips on a broken vise.



A member asking about the basics of multiplication.



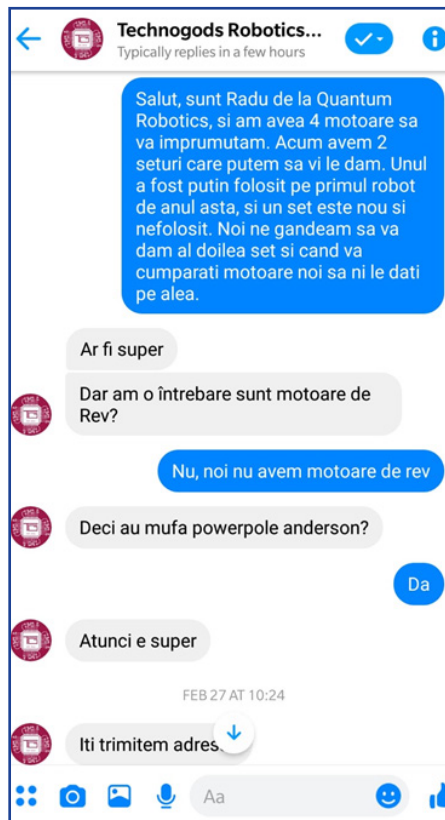
Team RO010 – DIMCANRO asking as about our climb system.



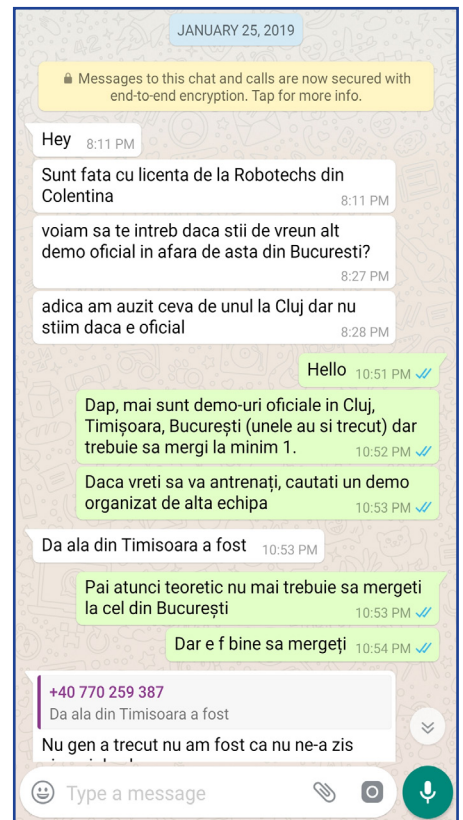
A member from team RO007 – Gear Maniacs inquiring about motor motion profiling.



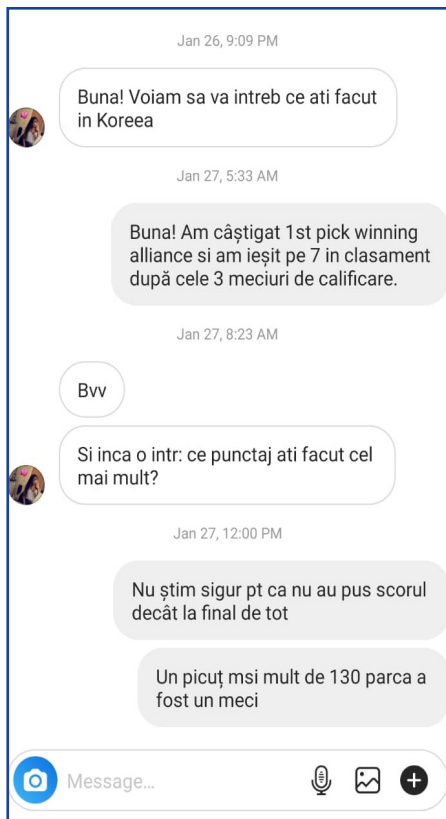
A mentor of Team RO120 – Ro2D2 asking about what Web Cam we are using.



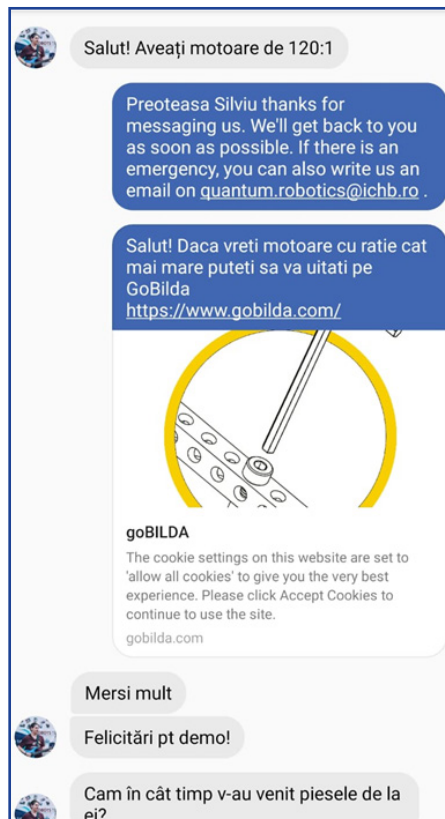
Team RO046 – Tehnnogods asking us for 4 AndyMark 40:1 DC Motors



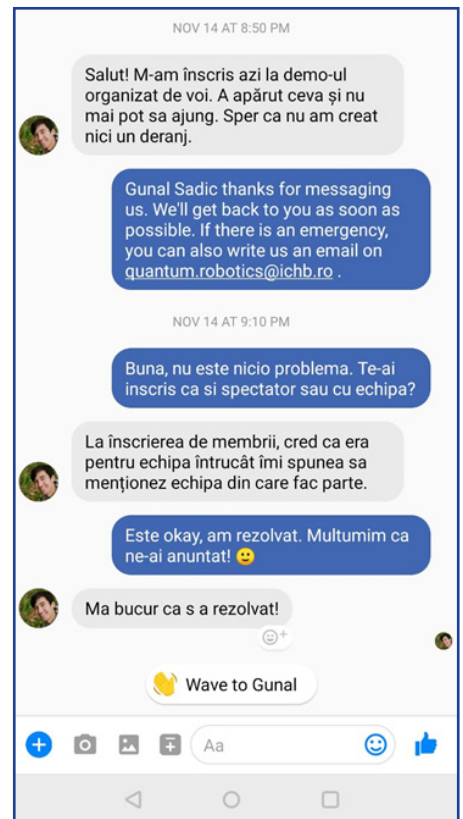
The mentor from team RO117 –RoboTechs asking for tips on a broken vise.



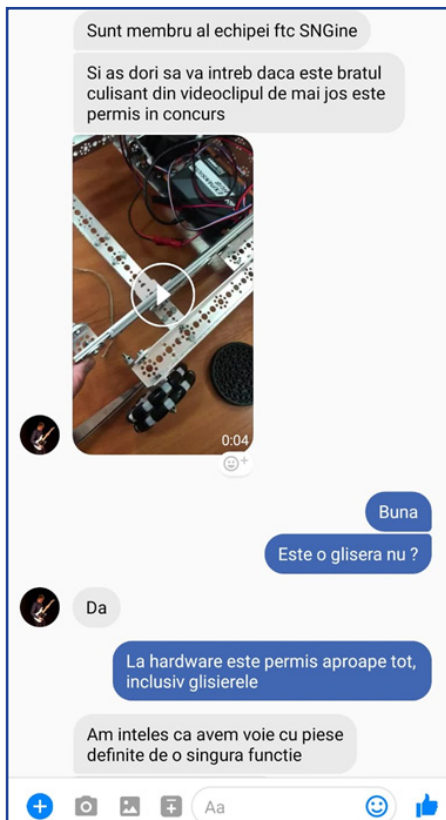
A Quantum Robotics Follower asking as for the results in KRC (Korean Robot Championship)



A member from RO142 – BroBots, asking for advice on different gearboxes for DC Motors



A member from a team from ICHB Constanta canceling a registration for Quantum Robotics DEMO



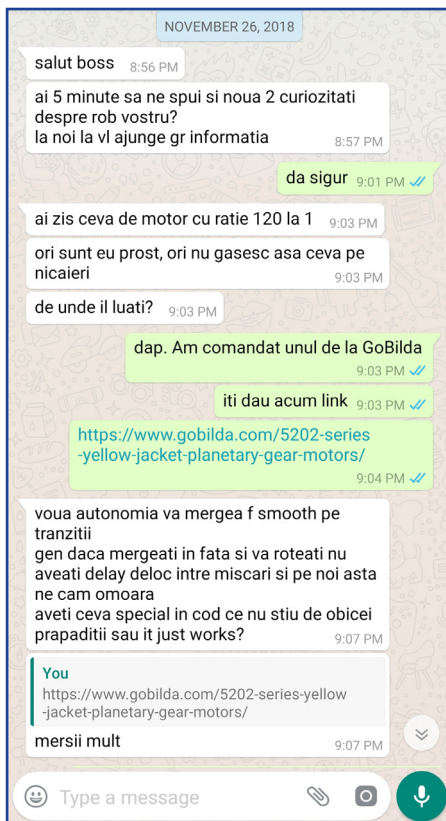
A member from RO130 – SNGine asking if sliders are allowed in the competition



A member from RO130 – SNGine asking us about the details of Quantum Robotics DEMO



A member from RO067 – Tehrocuz inquiring about our climb system



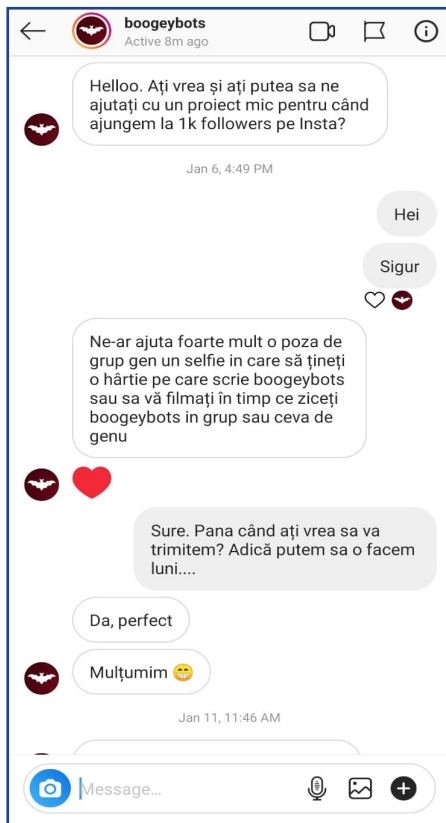
A member from RO042 – Bionic Royals asking for a 120:1 DC Motor



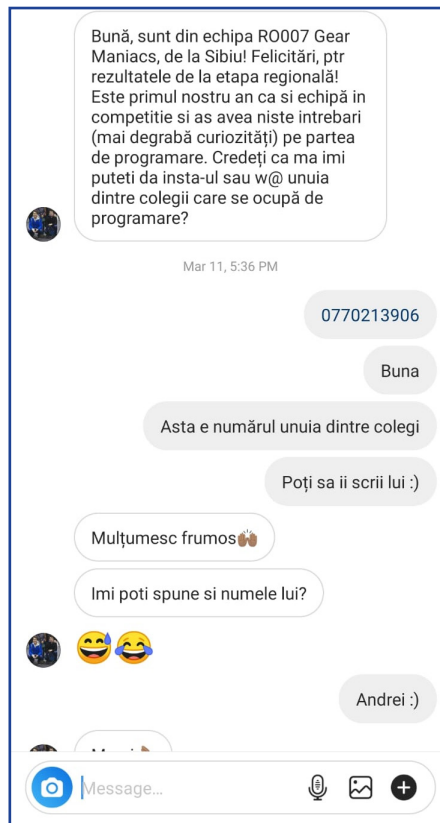
A member from RO107 – ILC Robotix, asking for our opinion on a good printer under 1000 euro.



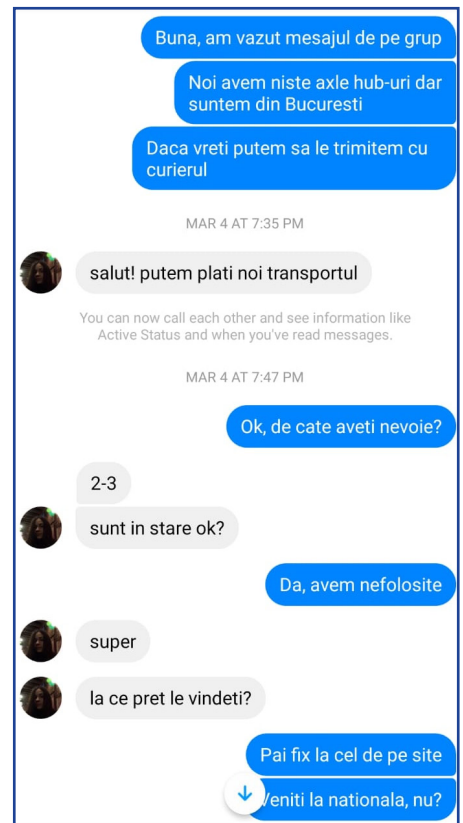
Team RO015 – Robo Titans and RO013 - Gamma asking us if we could print some parts for them.



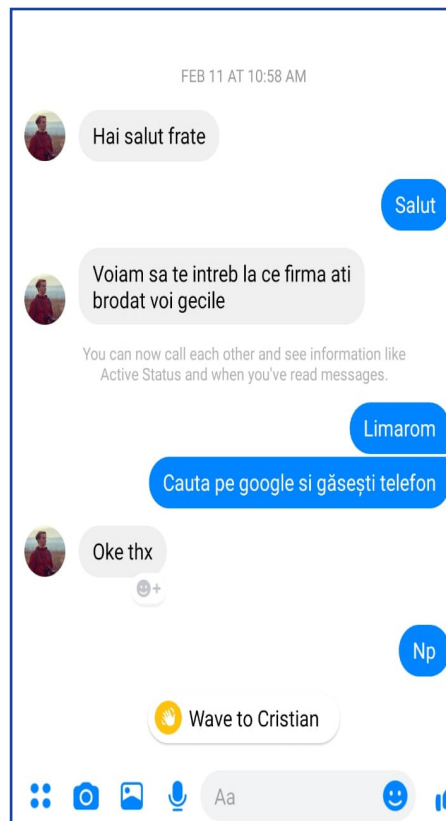
Team RO141 – Boogey Bots asking if we could promote their 1000 follower milestone



A member from R0007 – Gear Maniacs asking us for a phone number of one of our programmers



A member from R0034 – Vectron asking if we could provide them with Axle Hubs



A member from team RO092 – UnderConstruction asking about our embroidered soft shell jackets



A member from team RO005 – Esentza Robotics asking for a link to our translated FTC manuals



Alex Budin – The mentor of team RO046 TechnoGods asking about our intake tubes

4.7. Connecting with the STEM professionals

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Summary

Starting with September 2018, the PR team was focused by promoting FIRST values and gaining awareness of the STEM community. Our main goal was to identify companies from engineering sector for set up meetings with key persons for introducing the Quantum Robotics team.

We had the opportunity to discuss with important people from engineers, CEO, mentors and university professors, and we received strong support from them.

We were impressed by Renault creativity lab and their philosophy to build cars, by Google head-quarter and their marketing suggestions for improve our team actions or visiting Elettra communication factory where the company produce components for AIRBUS - airplanes.

Also, this first season the team is always looking for ways to be more financially stable and sustainable. We are very proud that we convince top engineering companies to support us, like: MarcTel, Roel Group, Elettra, Eurocom Industrial.

Our STEM friend from Detroit

27 April 2018

Detroit

Summary

During the world championship in Detroit, we met Mr. Silviu Pala, a Romanian engineer established in Detroit, US. Mr. Pala keeps working in promoting STEM, robotics included.

Now, he is chairman to SID Metro Detroit and Vice-president to Society of Automotive Engineers Detroit. He remains our supporter after the worlds and we share the news from engineering sector.

In this respect, you can read the letter wrote to encourage and motivate our team.
(See **Annex 2**)

After the Rover Ruckus theme was launched, we communicate several times with Mr. Pala about some technical issues such displaying messages, video cameras, phones and other technical devices. We were very interested to use new devices and techniques on our robot.

He was the person that convinced us to use the new phone Moto G5 with 5Ghz band.
Thank you for your clues and hope to meet you soon.

Photos



Photo from Detoit

Kevin Whitehead

11 May 2018

Bucharest

Summary

Today, during our volunteering at Info-Matrix we had the chance to meet with Kevin Whitehead a robotics program director from New York.

We had the pleasure of talking with him during the lunch break of the event. He is also part of the FIRST community and we were really happy to meet someone that could not only give us tips on the topic of robotics but also on running an FTC team.

Our talk with him was really productive and he told us his opinion on our plans for next season. He also gave us some ideas for events and contests.

In the end he gave us his card so we can stay in touch.

Photos



Photo of our team's volunteers and mister Kevin Whitehead.



A photo of the business card we received from Mr Whitehead.

Wolters Kluwer

12 May 2018

Bucharest

Summary

Today, in our last day of volunteering at Info-Matrix we got the chance to set a meeting with one of the sponsors of the event, Wolters Kluwer.

We had a meeting with one of the employees from the company and we presented him both FIRST and the concept and our team.

A member of the CRESTEM association that organizes FLL contests in Romania also joined the meeting.

With help from both representatives we managed to get some advice on how to make a pitch and on how to present ourselves.

Even though we might not collaborate for a sponsorship right now, we'll be in touch for more help.

Photos



Ema presenting the basics of FIRST and FIRST Tech Challenge to Mr. Gabriel and telling the journey of the team.



The business card we received from the representative of CRESTEM from Lego League.

Renault

6 June 2018

Bucharest

Summary

After the welcoming meeting for the new members, today we were offered the perfect opportunity to bond, but also to reach out to our community to learn more. We made a visit to the Renault headquarters. We gathered together in our lab, in order to talk about what we were going to do there, and to offer the new members Quantum T-shirts.

You could see how excited the new members felt, knowing that they will take part in such a meeting. The entire subway ride was filled with conversations and laughter. You could see strangers staring at us – a group of teenagers, presenting a unite front with their matching t-shirts and joy filled conversations.

When we reached the last subway station, a half of us took the bus and the other ordered a taxi, after betting on how could get there first. After all the members were in front of the building, we met with our mentor, Alin Preda, who joined us for the meeting.

We were welcomed in their Creativity Lab, where Costi Dragoi, an engineer that works there and a partner for us now, talked about the history of their business, showed us different technological prototypes and told us about his great passion for engineering and the passion projects he engages with at home. Next, he gave us the opportunity to talk about ourselves, what we are doing, and what is the FirstTech competition all about. He listened to all we had to say, and put questions where he didn't understand.

Each member had, in one way or another, the chance to respond to the questions from his or her department. Costi Dragoi gave us some advice he has about robotics in general, and told us about some markets from which we can safely purchase robot pieces.

The meeting ended in a very nice way. We took a few group pictures, we talked about possible sponsorships, they even gave us some pen and agendas marked with their brand's logo. We left with the promise to keep in touch and reach out if we need any further help!

Photos



Photos with all team members in front of the Renault building.

MarcTel & Celesta

18 September 2018

Bucharest

Summary

Today we visited a potential sponsor, MarcTel.

After presenting our team, FIRST, this season's info and our sponsorship request we also had the opportunity of seeing MarcTel's headquarter and we also got some info on what they do.

While the money sponsorship is still under evaluation and discussions, they offered to help us with cutting our chassis at a CNC after they saw us impressed by one of their workshops.

This company, affiliated with Celesta has sponsored an FTC team last year and they were very impressed with our results and our robots and once they will find out whether last season's team wants to keep collaborating or not, they will extend another invitation for us to talk on the financial issues.

This visit was a very educative one since we also learned a little bit about the business of providing surveillance mechanisms for the country and about repairing these devices.

Photos



Photo we took with the potential sponsor after the presentation and our visit.

Renault

1 October 2018

Bucharest

Summary

Today we had a special visit from two Renault representatives, an engineer and the one in charge of the Renault Creativity Lab.

We presented our team, the FTC competition, our goals and ambitions for this year. They seemed very interested to hear us out, and we really appreciated that. At the end, they gave us constructive criticism, giving us advice for when we present ourselves in the future. We took notes, and discussed them at our next meeting with the team.

Although it is hard to hear criticism sometimes, we realised that we have the opportunity to be better, to improve the way we do things, and this can only help us in the long run. That's why we were really thankful for the time and advices they offered us!

It was a productive day, in which we learned how to better present ourselves.

Photos



Presenting our sponsorship deck to the two guys from Renault.



Showing the lab and descusing some details about the comeption.

Bucharest

The website map

Wolters Kluwer 2

5 October 2018

Summary

Today we went to WK to present our team and FTC, seeing them as potential sponsors.

There we delivered a presentation, where we explained what we do and who we are, what FTC is, our ambitions and goals. They asked us some questions, and we were happy to see they were curious about us.

At the end, they told us that they really liked what we do and that they respected our work, but unfortunately they didn't have the necessary financial possibilities to sponsor us.

Although, we didn't have them as our sponsors, we were thrilled to see their support for what we do, and we were happy to share our story!

Photos



Walters Kluwer logo



Ema being happy to pause the presentation at 0:00.

3D printing seminar

10 October 2018

Bucharest

Summary

Our 3D designer, Voinea and our mentor, Emre Sertel participated in “3D modelling and printing” interactive workshop organized by ECDL Romania.

It was held on 10.10.2018 in National Public Library Bucharest.

The workshop was part of a project by “the National Association of Public Libraries and Librarians in Romania” – (Asociatia Nationala a Bibliotecarilor si Bibliotecilor Publice din Romania) ANBPR entitled “Focus on 3D Printing - New Tech’s learning activities in libraries”, funded by Google.

Photos



The presentation room.



Mr. Emre and Voinea

Google

8 November 2018

Bucharest

Summary

After our visit at Coaching Partners for a teambuilding session we went to Google to meet with Dani Oros, the PR and Marketing Director. It was a unique opportunity for us, as we not only visited the Google quarters, but also received advice regarding sponsors and how we should present ourselves.

We presented FTC and this season's theme, which left Dani deeply impressed. We left on a positive note and the promise to keep in touch!

We were excited to see the innovative working space at Google head-quarters. Everything was really welcoming and all restrictive elements from a normal office were eliminated. We plan on rethinking our lab as well after seeing the office.

Photos



Photo with Dani Oros from Google Romania. We had a great time, and we were amazed by their comfy couches they had everywhere and the Google sign.

“Titu Maiorescu” University

12 February 2019

Bucharest

Summary

Visiting the applied computer laboratory

Objectives

Brainstorm about Materials and Material Properties.

Brainstorm about mechanics of the robot

Reflections

We learned how different material properties affect the robot parts how stiff, strong and rigid a material is.

We learned about wheels and methods to efficient traction

We call Mr. Lucian Stefanita Grigore, Conf.univ.dr.ing. and titular professor to Applied Informatics in Robotics and Artificial intelligence courses. Mr. Stefanita is Mechanical Engineer and have Automotive Tank Specialization.

He expected us in the very well equipped laboratory for robotic, arranged in partnership with Siemens.

After the FTC rover Rockus theme presentation and the duty of our robot Mr. Stefanita explained us the role of materials in componence of the robot. The load forces of the pieces and the efficiency of placing the robot parts in the body of the robot.

Also, he advised us for adapting the system of equations that governs the speed of rotation of the wheels; the search for tire materials with increased adhesion index; and Strengthening the structural ensemble. (See **Annex 3**)

Photos



Presenting our robot and how it works.

Faculty of Automation and Computers

12 February 2019

Bucharest

Summary

Meeting with Daniel Rosner, professor to Politehnica University – Faculty of Automation and Computers

Mr. Daniel Rosner is doctor Computers and Information Technology, Professor to the Faculty of Automation and Computers and Coordinator for Analogic and digital Electronic Lab.

Our main objective was to find a way to accurately return a coordinate location of our robot on the field. After the discussion with the engineers from Marctel we didn't find a reliable solution and we investigate more, and we met with Mr. Rosner professor.

At the beginning we introduce Mr. Rosner the Rover Ruckus theme of the FTC competition. After the technical details and competition limitation, he agreed that the best solutions is creating odometry encoder wheels for accurate positioning of the robot.

Using the encoders on the motor is not reliable because the wheels can slip. One way to solve this problem is to have encoder wheels that are independent of the motorized wheels.

Because we have problems with the weight of the robot, we decided to use small wheels. We found 40mm diameter omni-wheels, which would allow us to have an omni-directional drivetrain. The wheels have a metal structure.

Again, the weight limitation guided us to design a CAD piece to sustain the small wheels.

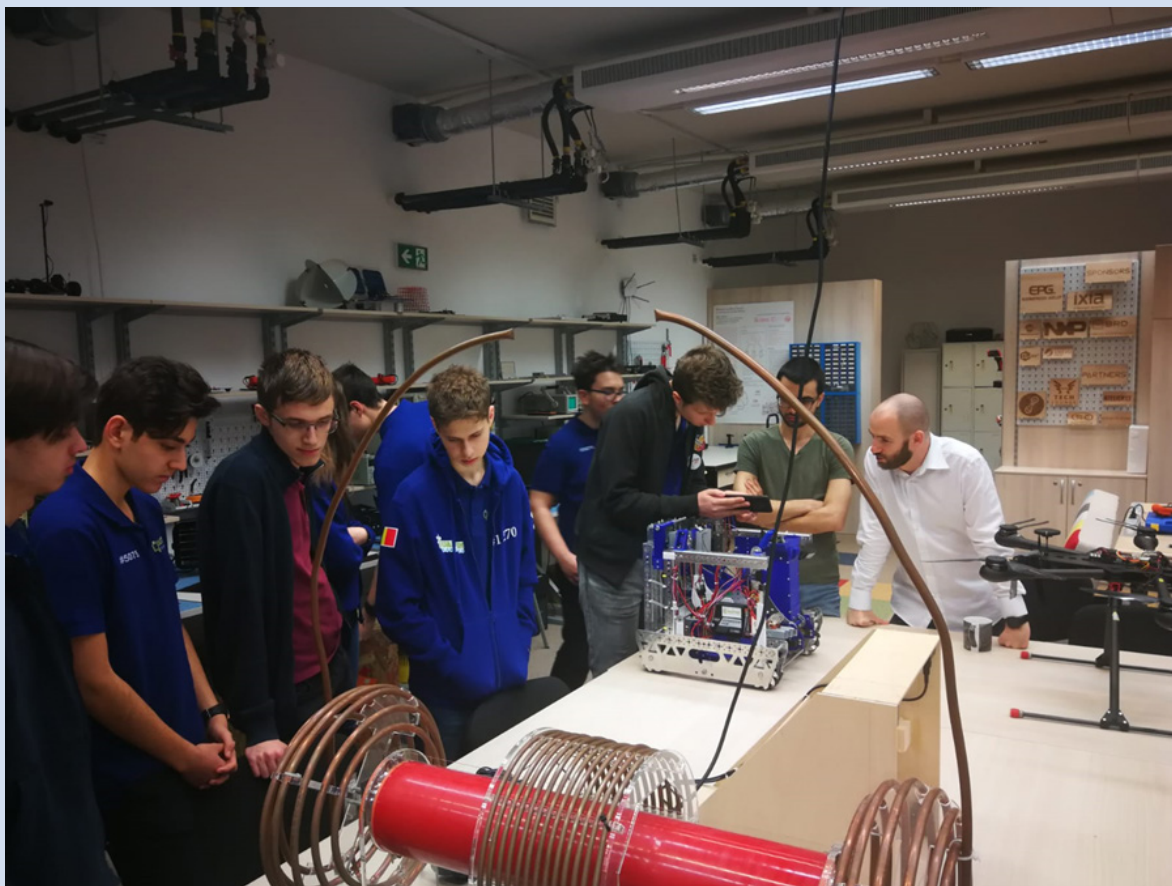
The omni mount needs to be on an angle relative to the mounting piece so that when the robot lands or is placed on the ground, the omni mount and wheel always pivot to contact the ground. This will allow the drives to also touch the ground.

We were very impressed by Mr. Rosner way to understand and propose the solutions to our problems.

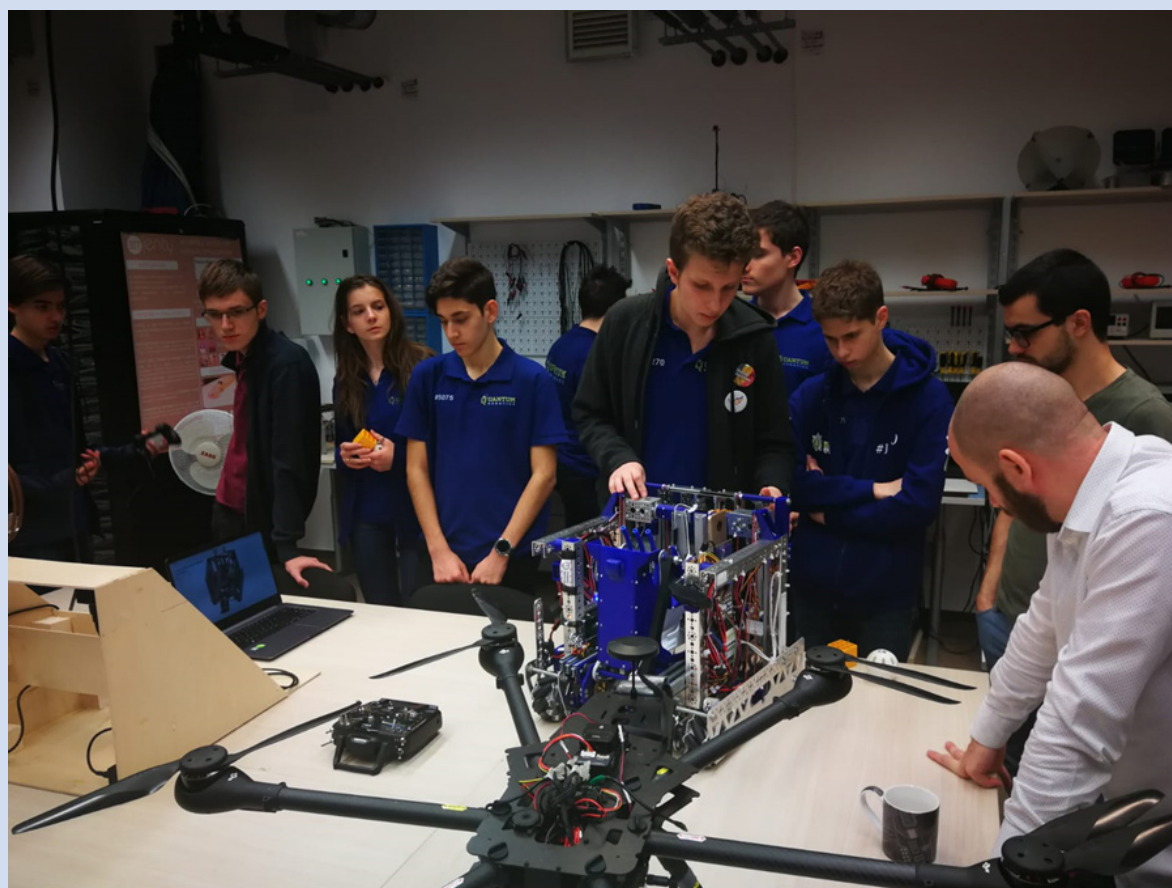
Together with our mentors we decided to invite Mr. Rosner to be our Technical Mentor. Due to the time-consuming activity, he said will think about and will give us an answer soon.

(See Annex 4)

Photos



Our team members intrigued by the lab



Explaining robot parts

Elettra Communication visit

26 February 2019

Summary

Our main sponsor Marctel has a lot of partners in the field of engineering. Even at the beginning Marctel helped us with some metal parts catted to the CNC. We didn't know which their partner company is, and we were very curious to know them after we have received the first set of high-quality metal parts. They organized for us the meeting on 26th February and we accepted the challenge to visit the Elettra factory, located in the outskirts of Ploiesti city.

Before starting the visit, we did a short research about the company and we found out that it is a integrated factory for manufacturing of telecommunications equipment, development of new products, accessories and subassemblies in telecommunications and production of aviation equipment. The company is a member of Leonardo Italian group of companies, a huge international holding main provider for AIRBUS and European defence industry.

After a short presentation of the robot, the management team invited us to visit their impressive factory. We couldn't realize that in a factory you must dress the white robe, like in the hospitals. We saw an integrated factory that produce the electronic devises for board AIRBUS planes. We have the chance to see all steps of producing the electronic boards and lighting boards. This is not a easy task due to the highest quality of control system imposed by airplane regulations.

Photos



The team presenting their robot and how it works.

FWD

12 March 2019

Bucharest

Summary

For our promo materials we got in contact with FWD, a company specialized on printing and e-commerce.

We went to meet them with the aim that we will talk about our team plans for the Romanian National FTC competition which is coming (22-24th of March 2019) and about how they could help us with promo materials.

Besides what we were thinking of like: t-shirts, flags, pens, notebooks, etc., they came up with new proposals. One of them was to print tattoos with different designs related to our logo, motto, robot, etc. We were happy to hear this idea as we have not seen teams giving tattoos at an FTC competition before.

This meeting was a very constructive one as we talked with some professionals in the area of advertising materials and presented them the FTC competition and our team.

They also seemed happy to see high school teenagers interested in their help and as a result they were pleased to meet us and give us their ideas. We thank them for the proposals they came up with.

Photos



Photo from the meeting and the design process

rotidintate.ro

13 March 2019

Bucharest

Summary

After the Bucharest regional games, we had some problems with the REV servos which rotate the scorpion. During the 2 days competition we changed 5 REV servos. Even in the final in the last match the servos have broken.

We brainstorm the improving REV servos and gears in order to avoid future problems to nationals. We called Mr. Eduard Filipescu, an electronic engineering, the owner of www.rotidintate.com, a small workshop which produce all sizes of gears, from all types of materials: alloy metals, plastic, steel. He was very happy to meet us and to debate together the gears issues.

After we explained the robot tasks and the scorpion and outtake system, we considered that the low quality of brass structure of the gear is the problem of deterioration. Mr. Filipescu said that before assuming wrong conclusion we should investigate the real cause of the gear broken and he asked us about what forces act to the servos. Victor drawn and explained how the scorpion unloads the minerals and identified that the speed of the rotation and the weight of the scorpion itself can generate a strong force. The gears support this strong force, at the end of the rotation.

Solutions	Diagnostic
Rotation to be more natural	Low speed of the unload
Using a counterweight	No space, risk of tangle
Reduce the weight of the scorpion	Good
Reduce the rotation angle	Good
Change the servos with more power	Good, but there are some limitations of the models. We can not find powerful servos with the angle of 270 degrees rotation.
Using the servos with steel gears	Risk: The steel gear can resist but can broke the engine
Using a system with pulley and resort	Good. Should be investigated and we do not have too much time
Increase the power of the servos with reduction gears system	Good, but it reduces the speed of the rotation and time for unloading

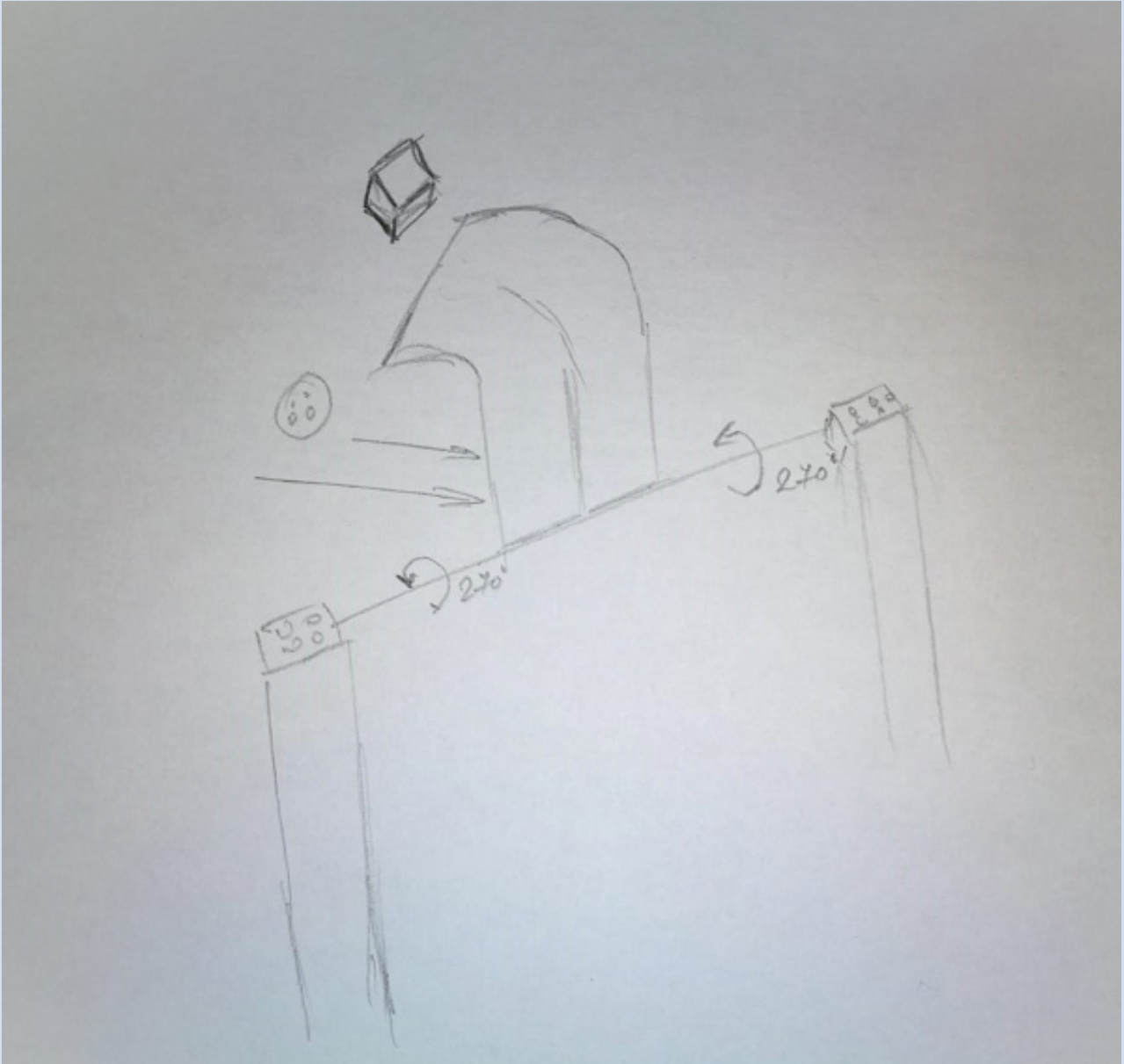
Conclusions:

We must redesign the outtake system in order to:

- reduce the weight of the scorpion
- reduce the rotation angle of the scorpion to 90 degrees

These decrease the pressure of the forces to the servomotor's gears.

Photos



The sketch of the "Scorpion"



The broken part

Telecommunication day

2 April 2019

Bucharest

Summary

We were thrilled to be invited as guests to the official Telecommunication Day Conference! It was the perfect opportunity for us to spread the word about FTC and look for more people or organisations who would like to sponsor us and help us along our journey. We talked to a lot of important people about what we do and how we built our robot. We loved interacting with known people from this domain. The organizers were also kind to present us shortly in front of the participants and asked us a few questions about ourselves. It was a very interesting and educational experience!

Photos



Photo at the beginning of the day

hp

4 April 2019

Bucharest

Summary

This morning we had the pleasure to be part of an internal event at hp where we presented FIRST, our team and our robot. People were really impressed by our presentation and we had a lot of questions and even some small donations from the participants and a collaboration promise from hp innovation department.

Photos



Photo from the presentation

Metro Systems

4 April 2019

Bucharest

Summary

Yesterday afternoon we presented FIRST and our team to the amazing people from Metro Systems. They were impressed by our work and passion and it was a pleasure to explain more details about our robot and the competition to everyone interested. Different from our presentation this morning, we had a lot of 1 on 1 interaction after the presentation rather than having many questions. We also had more technical questions from this amazing people and a promise of a sponsorship from Metro Systems Romania.

Photos



Photo from the presentation

5. Operational plan

5.1. Season goals and tasks to achieve

With the experience of the first season, the Quantum Robots is the primary focused this year on organizing the team for building a competitive robot. Our time frame goal was to complete the new robot within three-month time frame. Starting from the first meeting our team set the tasks for starting the season, which will be improved for the next season.



5.2 Preseason meetings

The season started in October, when we found out the new game theme of this year – Rover Ruckus. Before starting the season and during the school time, our team started to recruit members. The time needed for this activity was six weeks. Team meets on a weekly basis as determined by student availability. Meetings meant for communications purposes and socialisation.

5.3 Season schedule

Starting with 1st September 2018 team meets to begin work on the annual challenge. The schedule is as follows: Tuesday, Wednesday from 1:30pm - 5:00pm and occasionally Saturdays and Sundays from 9:00am - 13:00pm. All members of Quantum Robotics are required to put in at least two hours of work time every week during the building of the robot. Those not meeting this requirement are no longer considered members of the team for the competition season.

Saturday morning from 9:00am - 9:30am is specifically for team leadership communication. The team leaders as well as mentor meet to determine the status and needs of each group to ensure all changes are communicated and everyone is getting the resources necessary to be successful.

Following the first Saturday session, all prospective members (including those returning) complete a form indicating their sub team preferences. Mentors of the team also make their recommendations. The head and assistant coaches then place students into the sub teams where their requests as well as team needs are honoured.

5.4 Project Management

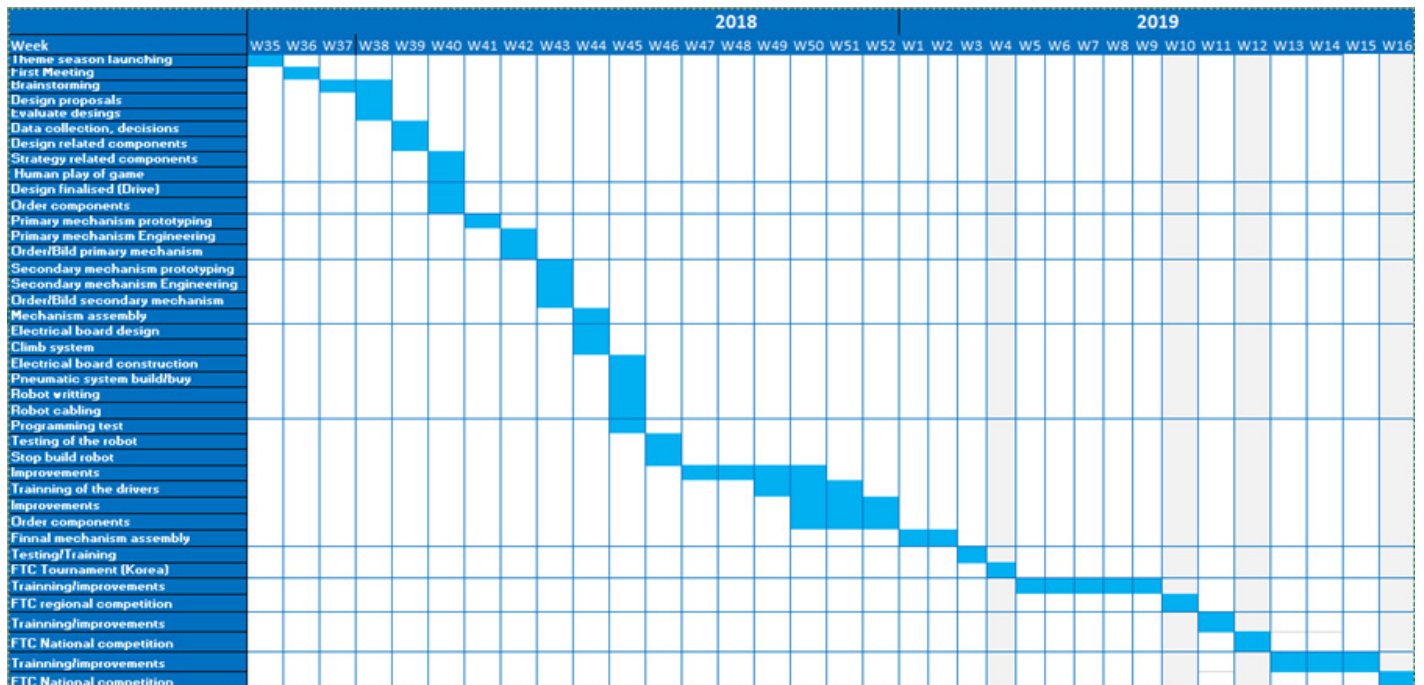
From our FIRST experience, the project management is important to our success journey during the FIRST build season. Our team prior to the start of build season sets the chart from 6th September 2018 – and ended on 17th November 2019. This is a very ambitious plan but must be correlated with competitions we plan to participate.

Successful time management is known to be a key to success in FIRST Robotics. This chart is reviewed at the end of each meeting during build season and aids in creating the agenda for the following session.

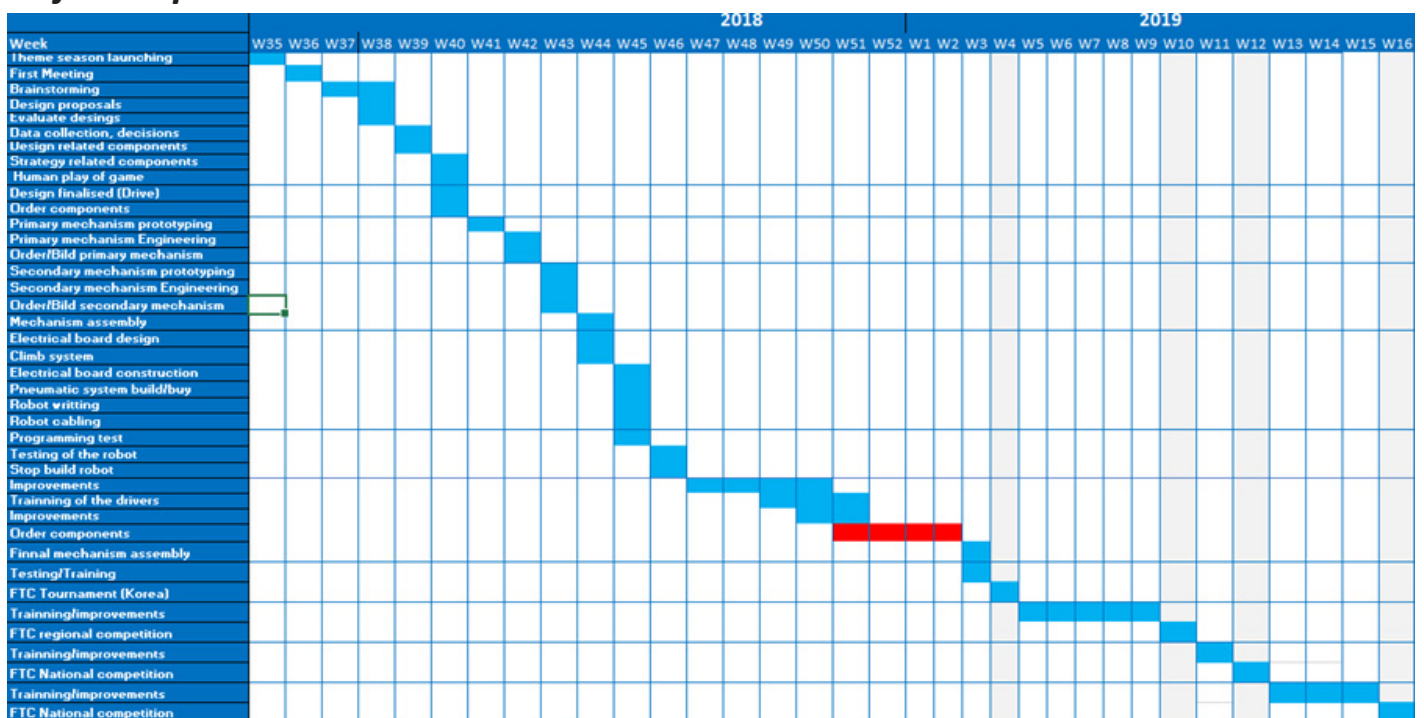
Each aspect of analysing the game, designing the robot, building the parts and programming the machine is mapped out in time. The business and team captains are responsible for ensuring the subteams can keep up with the schedule.

The Mentor or Team leader also makes use of a board to review the project schedule. During our first experience we met a lot of new challenges and problems and we adjusted many times our initial plan. You can see final version below. This year experience will help us to avoid futures problems or delays.

Initial plan



Adjusted plan



This season our team was more organized comparing with the last year. The planning was followed in detail by the team almost every week apart from the red period (see the adjusted planning), almost 4 weeks, when the order for components to Gobilda was delayed due to the holyday season.

5.5 Communication

5.5.1 External

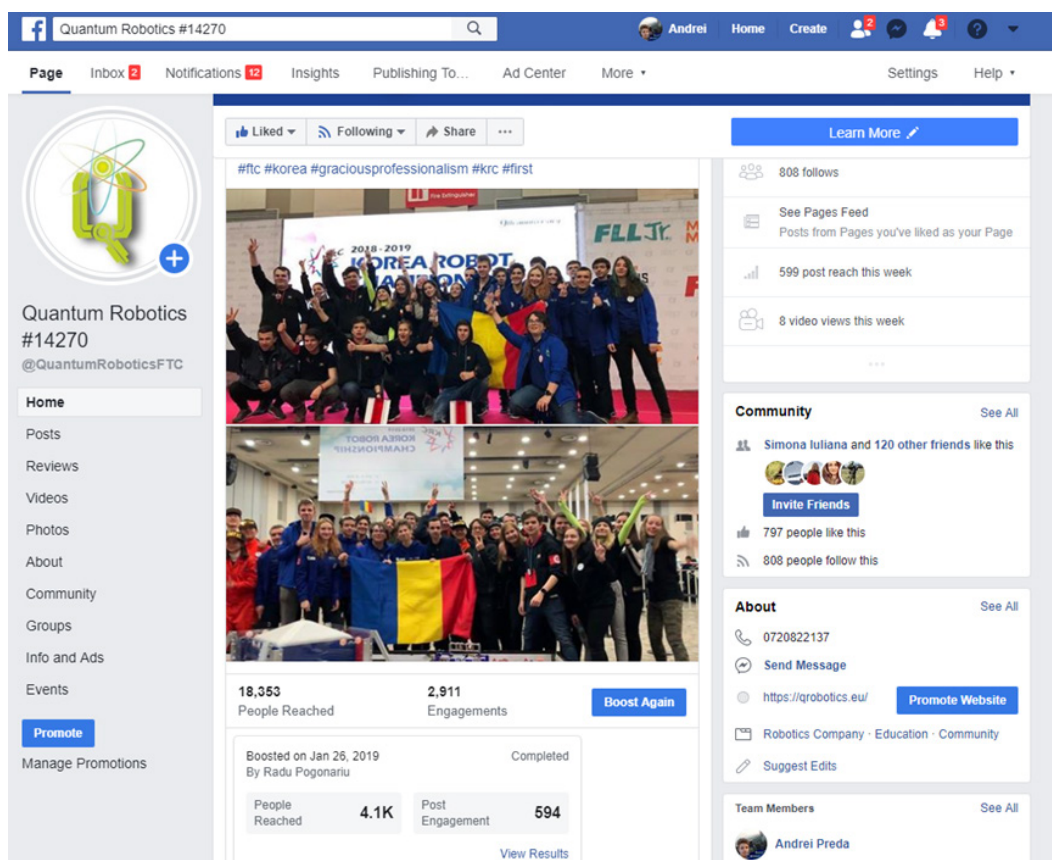
For the external communication our team covers all social media presence: Facebook, Instagram, LinkedIn, YouTube, Gmail. We have a growth in followers in all aspects since they were started in 2017.

According our communication plan we launch the website audience and our audience growth month by month.

Our website www.qrobotics.eu provides information about the team members, sponsors, awards and news. In the last month our website achieved the performance of **2454 impressions**, generally from Romania and USA (see the annexes section)

The website provides ways to communicate, allowing us to present the team image. It also acts as an immediate way to promote news and offers to an international audience.

By thinking outside the box in terms of our website, you can use this platform to build an integrated and successful communications strategy.



Whether we use an online form, social media icons or just include contact information, the ability to get in touch with us directly will help build a relationship with target audience. The Facebook page is weekly updated with news from events and is very well appreciated. Our top post is dated 26th January 2019, and it has **18,353 people reached**.

5.5.2 Internal

For the internal communication we created a WhatsUp Group in order to inform fast all team members and mentors.

Also, we use emails to send documents, presentations and proposals.

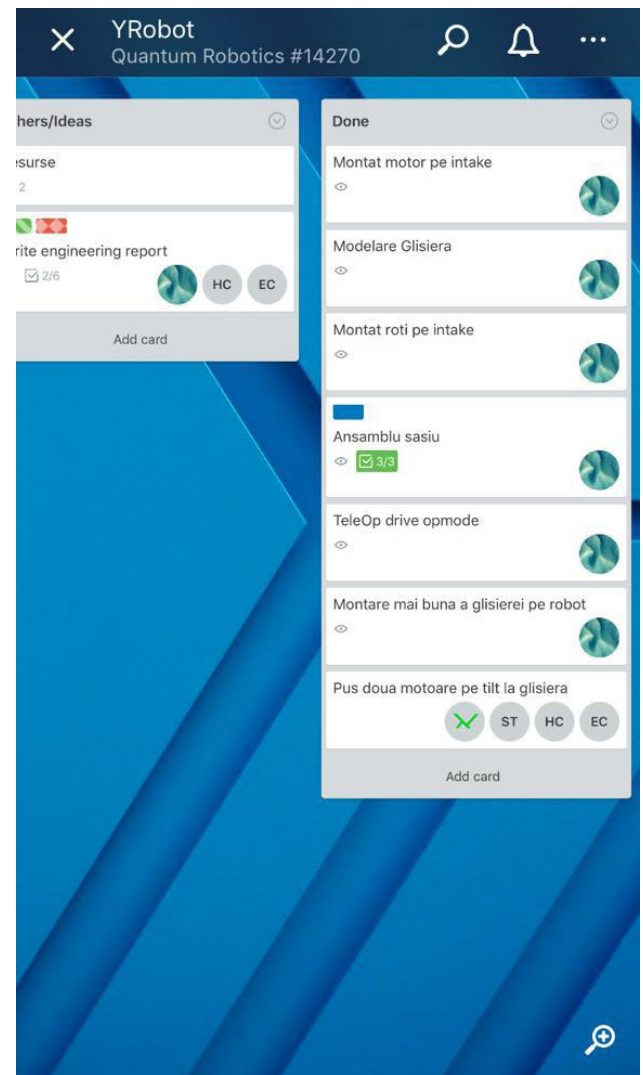
Trello online Journal

For the online projects work the team implemented the Trello application.

A Trello board is a list of lists, filled with cards, used by each member of the team. Trello is helpful to organize our robotic project.



Screenshot from whatsapp



Screenshot from Trello

6. Marketing plan

Romanian key figures

In 2019 the population is estimated at 19.48 million, which ranks 62nd in the world. With a total of 238,931 square kilometres of area, the population density is approximately 82 people per square kilometre. This earns the country 134th rank in overall population density. The average take-home salary in Romania in 2019 is around \$700, and the unemployment rate is 4.8% in 2018. The GDP per capita in Romania was last recorded at 12,285 USD in 2018, ranking the 8th place in Europe. (for more details Annex #6)

6.1. Target Audience

Our High School Administration – International Computer High School of Bucharest (ICHB)

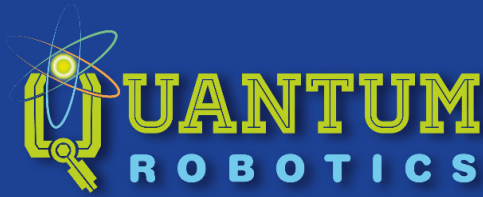
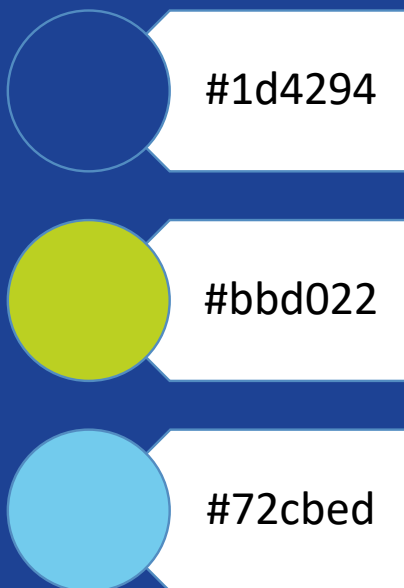
We market ourselves to the administration high school to ensure their strong, continued support through formal meetings and casual conversations. We also formally invite them to attend our annual FTC season in the Robotics Laboratory, so they can see the progress we have made throughout the season. Our current administration is very supportive of the program and has written coaching positions into the teacher contract to aid in recruitment and retention of lower level coaches. Due to our effort, the director of the ICHB has responded positively and he was present to the Regionals FTC tournaments and supports us in the competitions.

Sponsors

Sponsors provide the largest financial support and guide resources to our program. We have 3 different types of sponsors: Companies, Parents and Friends. We target potential sponsors through direct contact from our team leader and marketing communication team. We plan that periodically our students and/or mentors to keep sponsors up to date, and to visit sponsors and thank them for their assistance.

Potential Team Members & Mentors

We consider that human resource is the most valuable component of our team. We used internal communication to attract our colleagues and we succeeded to attract mostly students from the first grade. This is very important due to the fact that they can learn and teach future members, at least 3 years. Also, utilizing the internal communication system, we plan to invite our colleague to sustain us in the FTC tournament.

*Our Logo**Color scheme*

6.2. Branding

The branding is an integral part of our marketing, allowing us to become more recognizable and memorable within the FIRST community. We strive to be cohesive in every aspect, from team t-shirts, to online, to the robot's graphics.

Our Logo:

Due to the team efforts and brainstorming meetings we choose the best sign we consider that represent us.

Philosophy:

"Our mix of Olympic members put their abilities, skills and knowledge in order to produce the positive reaction and create the sufficient energy to success. Quantum Robotics"

For design of the sign we collaborate with a professional art designer.

Our Slogan:

Philosophy:

"One of the top ten major unsolved hurdles in robotics is developing artificial intelligence that can "learn how to learn" and use common sense to make moral and social decisions".

Quantum Robotics FTC team is happy to accept this challenge and prepared its FIRST robot prototype.

Therefore, we agreed that **"We.Make. Smiling Robots"** is our representative team slogan.

Our Motto:

Philosophy:

"We need to find a solution to provide stimulating educational programs and encourages youths and student's growth for life-long learners in our growing and diverse STEM community."

"Winning is temporary, learning is forever"

6.3. Marketing channels

On-line

Our Facebook webpage has being updated and shared to sponsors and social media accounts to which all students have access to. Launched in December 2017, our Facebook page has 839 followers. We started to get awareness using the writing articles in the online newspapers. Our first article invited our target audience to watch us to the Romanian FTC competition. Also, we invited the TV's stations to visit our stand the BRD First Tech Challenge championship and to take some interviews with our team members and attenders. We also use other online platforms like Instagram, LinkedIn and YouTube. Even though this ones aren't as developed as Facebook, Instagram is closing in. Our website is also a very important marketing channelw especially with sponsors, this and our LinkedIn.

Public events/fairs

We travel to different events, demonstrate our robot, and speak to attendees about FIRST, the team, and robotics. TechFest Bucharest is one major even we participated with a huge impact to parents, teenagers and students. (see the Outreach section)

7. Sustainability plan

We focus on long-term financial sustainability to ensure success. Financial support comes from three different sources: sponsors, team member fees from parents and contributions. This season we launched our own financial vehicle: **"Quantum Robotics" Association**, a non-profit organization created to support all students passionate to STEM disciplines. The association was founded by parents, mentors and ICHB Highschool Administration Community outreach is an important piece to growing long term sponsorships and fundraising as the Team demonstrates the value of the program to increase STEM educational opportunities throughout the community.

Sponsorships and Fundraising help support the team and provide the students with opportunities to explore the business side of the team to ensure that we can build a high quality robot and prepare the Team for the next season. For Christmas and Valentine's Day we produced to the 3D printer some small gifts and sold them during specific fairs.

Future plan

Being a part of Quantum Robotics, we aspire to be able to spark an interest and increase the participation of STEM, particularly in ICHB High School. The main goal of launching the **Quantum Robotics Association** is to support and guide passionate students for studding STEM disciplines by offering technical support, courses, workshops, financial support. Our passion is to promote Science, Technology, Engineering and Math everywhere and inspire them to become a part of the FIRST experience so that together we can show that we are fully capable of participating and enjoying robotics. We continue to do this throughout the non-FTC season.

7.1. Financial statements

Our approved budget this year is 61,511.08 USD, and this includes the robot components, FTC competitions and travelling costs and marketing expenses. This year we succeeded to collect 66,393.08 USD, from different source as follow: sponsors, donations, parents, prizes, school administration. Actual remaining budget available to the disposal of the team is 4,882 USD, but we still need to collect 6,500 USD for participating to the Maryland Tech Invitational (MTI) competition.

Quantum Robotics - estimated budget for competition 2018-2019

Budget			
Team	Quantum Robotics	Season	2018-2019
Responsible	Team leaders and Mentors	Structure	Sponsors, School Administration, Parents

Budget Status				
Approved Budget	Planned Expenditures to Date	Actual Expenditures to Date	Variance	
\$61,511.08	\$61,000.00	\$61,000.00	\$0.00	
	Planned Remaining Budget	Actual Remaining Budget	Variance	
	\$511.08	\$511.08	\$0.00	
Additional \$ needed	\$6,500.00			MTI travelling costs

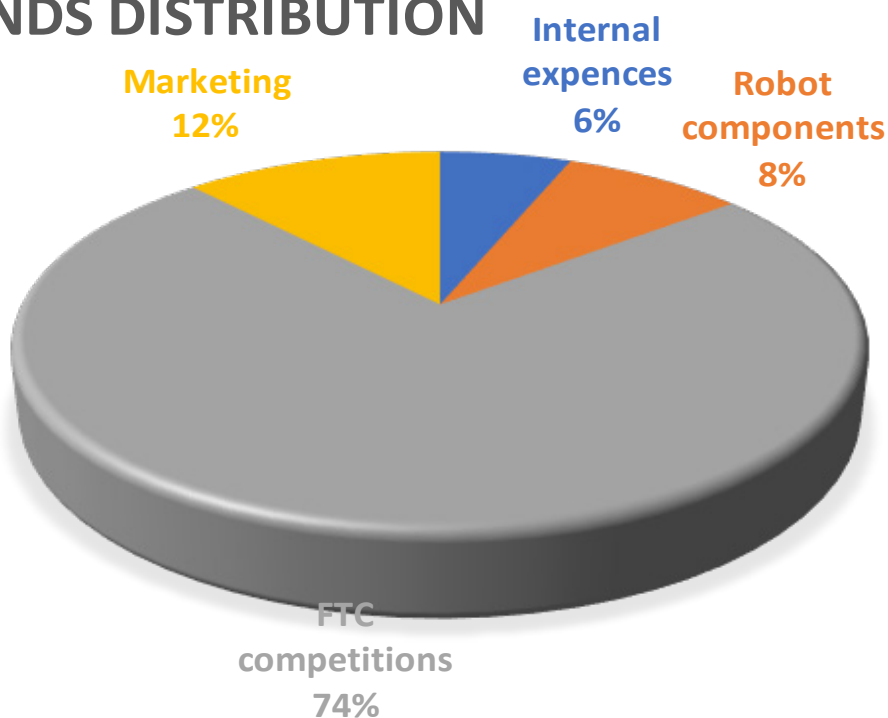
Budget Details					Sources of funds
Internal Expenses					
Laboratory expenses	Values	UM	Total Cost		
Tools	\$494.00	1.00	\$494.00		Sponsors, team sources
Servers and Computers	\$670.00	1.00	\$670.00		Team members/ parents
Internet connection	\$15.00	12.00	\$180.00		ICHB
Boards and Markers	\$85.00	1.00	\$85.00		ICHB
Tables, Chairs	\$0.00	5.00	\$0.00		ICHB
3D printer material	\$125.00	1.00	\$125.00		ICHB
Other Internal Expenses			Total Cost		
3D printer material			\$125.00		ICHB
Travelling/accommodation to local competition/demo			\$1,250.00		Parents, Sponsors
Food			\$750.00		Parents, Sponsors
Total Internal Expenses				\$3,679.00	

Robot components / FTC competitions			Sources
Robot components	Total Cost		
Robot Components 1	\$1,482.08		Team budget
Robot Components 2	\$278.00		Sponsors, Team budget
Robot Components 3	\$1,734.00		Team budget
Field 2018-2019	\$1,596.00		Sponsors, ICHB
FTC competitions	Total Cost		
Korea FTC	\$13,255.00		Sponsors, Parents
Regional Bucharest	\$900.00		Team budget
National Bucharest	\$1,800.00		Team budget
Word Championship	\$29,200.00		Team budget
Maryland Tech Invitational (MTI)	\$350.00		
Marketing	Total Cost		
Events/Demo 17th November	\$1,250.00		Sponsors, ICHB
Marketing visuals (business cards, badges, visuals, stickers)	\$4,890.00		Sponsors, ICHB
T-shirts	\$1,097.00		Sponsors, Parents
Total External Expenses		\$57,832.08	
Total Budget		\$61,511.08	

Robot components expences			
Team	Quantum Robotics	Season	2018-2019
Responsible	Team leaders and Mentors	Structure	Sponsors, School, Parrents
Robot components / FTC competitions			
Robot components 1	UM	Values	Total Cost
REV Hub+Cable Conversion Kit	1	\$149.95	\$149.95
TETRIX® FTC Competition Set	1	\$529.00	\$529.00
Allen Wrench Hex Key Set	1	\$6.99	\$6.99
Eklind Power-T T-Handle Hex Key	1	\$4.80	\$4.80
Eklind T-Handle Hex Key 3/32"	1	\$3.21	\$3.21
Mini Bar Clamp 2 Pack, 12"	1	\$21.00	\$21.00
LG Google Nexus 5	2	\$89.99	\$179.98
Hitec X2 AC Plus 2 Port AC/DC Multi-Charger	1	\$99.99	\$99.99
#25 Chain, 10'	1	\$10.20	\$10.20
#25 Connecting Chain Link	8	\$0.64	\$5.12
NeveRest Orbital 20 Gearmotor	4	\$32.00	\$128.00
NeveRest Orbital 3.7 Gearmotor	2	\$28.00	\$56.00
NeveRest Classic 40 Gearmotor	4	\$28.00	\$112.00
NeveRest Classic 40 Gearbox	2	\$12.50	\$25.00
Cable Tie Gun	1	\$17.00	\$17.00
#25 Half Link for Roller Chain	4	\$1.10	\$4.40
0.770" - 0.625" Pattern Adapter	4	\$2.24	\$8.96
Standard Hub Shaft ServoBlock 25T	2	\$20.24	\$40.48
REV Smart Robot Servo	2	\$30.00	\$60.00
SRS Programmer	1	\$20.00	\$20.00
Field Rover Ruckus 2018-2019	1	\$1,596.00	\$1,596.00

Robot components 2			Total Cost
Servo Power Module	1	\$40.00	\$40.00
2M Distance Sensor	1	\$18.00	\$18.00
XT30 Power Distribution Block	1	\$10.00	\$10.00
USB Retention Mount and cable	1	\$10.00	\$10.00
Resistive Strap	1	\$4.00	\$4.00
Color Sensor V2	1	\$14.00	\$14.00
XT30 Connectors	1	\$7.00	\$7.00
Small Pulley Bearings	1	\$10.00	\$10.00
1.2MM Cord	1	\$5.00	\$5.00
Aluminum Servo Horn	6	\$4.00	\$24.00
Compliant Wheels	4	\$6.00	\$24.00
NeveRest Classic 40 Gearmotor	4	\$28.00	\$112.00
Robot components 3			Total Cost
Encoder omni wheels	4	\$15.00	\$60.00
Phones Motorola Moto G5	2	\$130.00	\$260.00
Gobilda order (100 pieces)	1	\$1,250.00	\$1,250.00
Batery charger	1	\$60.00	\$60.00
Webcam	1	\$62.00	\$62.00
OptimusDigital	1	\$42.00	\$42.00
Total Robot Components Expenses			\$5,090.08
Total Budget			\$5,090.08

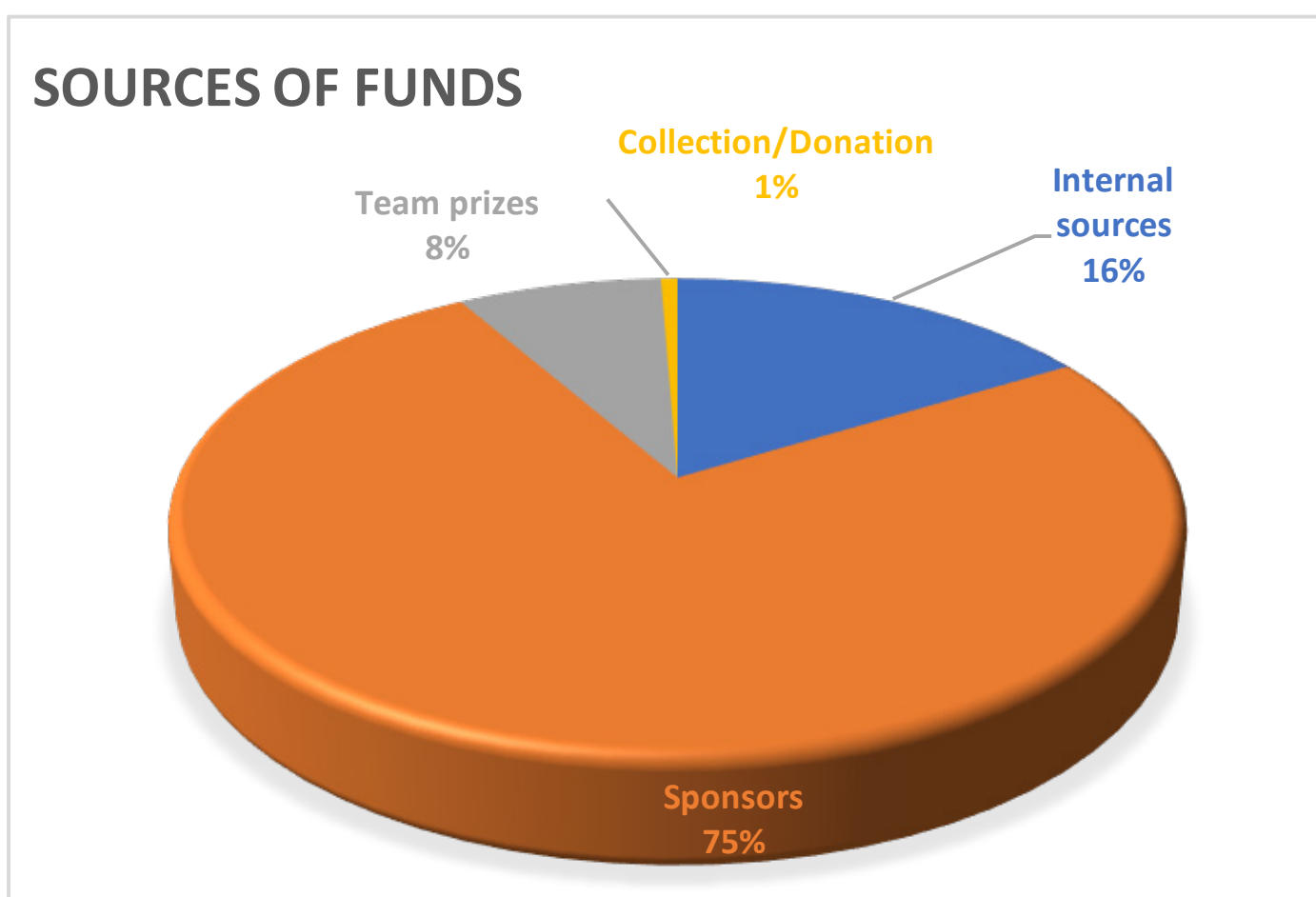
FUNDS DISTRIBUTION



7.2. Sources of funds

Companies provide contributions to Quantum Robotics as handled by our High School ICHB. In return contributing companies have their names and logos featured in accordance to the team's table of benefits. Companies are advised to consider these contributions to Quantum Robotics as advertising expenditures for purposes of accounting. Our goal is to retain enough money to cover the costs of both FIRST registration fees and robot parts.

Funds distribution



The estimated financial plan was achieved. Our team succeeded to collect the amount necessary for the internal and international competition. The financial plan should be revised for the FTC Championships at the middle of April.

Fund Details		
Internal sources		
Internal sources	Total Cost	
Rollover from previous season	\$2,155.00	
School administration (ICHB)	\$7,695.00	
Parents	\$950.00	
Total Internal sources		\$10,800.00
External sources		
Sponsors	Total Cost	
MarcTel	\$4,000.00	
Roel	\$5,990.00	
TCM Tuning	\$3,750.00	
Eurocom Expert Industrial	\$3,864.08	
Celestra Comexim	\$500.00	
Reloc SA	\$6,678.00	
Kruk	\$3,407.00	
Alpha Bank	\$6,600.00	
Metro System AG	\$1,650.00	
"Natie Prin Educatie" Fundation	\$9,400.00	
"Artificial Intelligence & Robotics" Romanian Association	\$1,100.00	
Products & services	Total Cost	
Elettra	\$935.00	
Ipod	\$215.00	
SolidWorks	\$1,450.00	
ATF	\$123.00	
WaterBlast	\$420.00	
Team prizes	Total Cost	
2nd Prize Hakathlon TechFest Bucharest - Sponsor Vodafone Romania	\$3,500.00	
2nd Prize NASA - Sponsor Emag	\$1,200.00	
Robocode Hacathlon - MetroAG	\$400.00	
Other sources	Total Cost	
3D printing Gifts	\$78.00	
Donations to FTC Demo ICHB	\$83.00	
Collection from ICHB Uniform Day	\$250.00	
Total External Sources		\$55,593.08
Total Budget		\$66,393.08

7.3 Our Sponsors

This season we succeeded to collect **66,393.08 USD** through our successful presentations to the companies. We are very proud to represent top companies from various industries: engineering, telecommunications, automotive, aeronautical, sealing, education, financial, railroad traction. Our sponsors are private companies, joint-ventures, educational foundation, high school administration and friends and family that fund almost all our team expenses, for starting the season and participate to the competition.

Many thanks to:



Since 1991, the company is specialized in outsourced services for all printing, copying and scanning of documents. Roel is a partner for Romania for top companies: RICOH, SAMSUNG and SHARP



MarcTel S.I.T. is a medium privately-owned Romanian company, established in 1998, which provides integrated engineering services in the field of military and governmental telecommunications networks, IT and optoelectronics.



Celesta Comexim was established in 1993 and performs trade, consultancy and service activities in the field of test and measurement equipment dedicated to telecommunications and fiber optic networks, as well as to industrial applications.



Autonomous Flight Technologies (AFT) is a private company, leader of UAV (Unmanned Aerial Vehicle) industry in Romania. AFT develops and produces aerial platforms, since 2004. AFT sponsored our team with aluminium parts for our robot chassis.



Part of the Italian Leonardo Group, S.C. Elettra Communications S.A. is a Romanian-Italian mixed capital company whose main activity is the manufacture of high-tech telecommunications equipment, designed especially for the aeronautical industry (Airbus provider), for both defence and civilian sectors. The company also provides installation, assembling and testing of the fixed and mobile telecommunication stations as well as other production activities and related services.



Design Faster and Smarter with the Power of SOLIDWORKS

SOLIDWORKS® solutions can help boost productivity, harness intelligence, foster innovation, and facilitate collaboration. Through tight integration, SOLIDWORKS tools enable you to leverage 3D models throughout the organization, bringing processes together so you can get products to market faster. SOLIDWORKS provided this season 15 licences for the team.



TCMTuning is market leader of software automotive tuning companies, produce modified files based on your original file readout, providing solutions for all types of car software. TCM is our sponsor for the second year.



Eurocom Expert Industrial is a leading Romanian distributor of industrial gaskets and sealings, which are used in power engineering, chemical, gas, oil, petrochemical and general machine-building industries.



Also, the administration of the Lumina Education (ICHB is member of this organization), participated with sponsorships for each team member for covering the travel costs of the FTC tournaments.



The International Computer Highschool of Bucharest administration sustained Quantum Robotics for the establishment of the team, with the infrastructure (Olympic Laboratory equipped with all needed tools, computers and 3D printer).



Electroputere has always been at the forefront of innovation in railroad traction. Increasing the efficiency of diesel-hydraulic locomotives and reducing pollutant emissions is a very important objective for our engineers, who have begun a broad research and have the possibility of implementing a battery-powered electric propulsion system, as well as a radio control system at Distance for LDH 1250CP and LDH 450CP locomotives.



KRUK S.A. is a leader global financial group, specialising broadly in debt management. The KRUK Group comprises a number of companies offering a comprehensive range of modern integrated services, which we are ready to tailor to the needs and expectations of our partners in order to recover payments owed to them.



“Natie prin Educatie” Foundation is an active force in the field of STEM education, acting as a link between High Schools – STEM Universities – STEM business environment in Romania. “Natie prin Educatie” is the strongest FIRST ambassador in Romania and organizer of the BRD First Tech Challenge Competition in Romania. Thanks to “Natie prin Educatie” for sponsorship our team with the cost of travelling to Detroit of 6 team members and 1 mentor.



ALPHA BANK

25 YEARS
IN ROMANIA

A commercial bank that offers a wide range of services and products both for the segment of the market dedicated to individuals, as well as for the SME and corporate sector through a network of units located in Bucharest and other large cities in the Romania.



Performance, innovation and service in IT: this is what Metro Systems offers around the world for METRO Cash&Carry. With a team of 800 IT professionals working for 29 countries, METRO SYSTEMS Romania is innovating daily and is keen in leading METRO world of retailing into the future.



FAIR

AI and Robotics Forum

FAIR – Forum for Artificial Intelligence and Robotics is a private, non-profit, scientific organization devoted to promote research in, and responsible use of, artificial intelligence. FAIR also aims to increase public understanding and acceptance of artificial intelligence (AI), improve the teaching and training of AI practitioners, and provide guidance for research planners and founders concerning the importance and potential of current AI developments and future directions.

Friends and Parents – are very supportive to our main goals. Besides, the direct financial involvement they are helpful, understanding and online all the time. We cannot estimate in values all the travels with the robot to the events, foods or long nights waiting for us.

Also, with their support we succeeded this year to launch **“Quantum Robotics” Association**, which we consider a vehicle in training new generations of STEM passionate.

8. Strategic plan

8.1 Team Strategies

The Quantum Robotics team have a long-term strategic plan (5years) that is used to develop our team, to make team improvements, manage risk and enhance team sustainability. The strategic plan identifies six long-term team strategies with supporting action plans.

Quantum Robotics team strategies 2017-2022

1.	Developing strong team by selecting new members/mentors
2.	Project management – organizing the team members by roles, tasks, duties
3.	Learn by building a successful robot
4.	Gain knowledge by research and experimentation and mistakes
5.	Develop an excellent team financing plan and sponsor relationship
6.	Spread the message of FIRST and STEM

Our long-term strategic plan was implemented last year, and you can see below what the status and actions we done to respect this during the season 2018-2019

Strategy	Up to date
Developing strong team by selecting new members/mentors	<ul style="list-style-type: none"> • Designed process for selection new members/mentors • Advertising layouts for new members • Channels for adverts • New members evaluation • Awarding and promoting scheme
Project management—organizing the team members by roles, tasks, duties	<ul style="list-style-type: none"> • Designed roles by preferences, abilities and skills • Management of the financial and planning • Weekly update of the plan • Acquisition plan
Learn by building a successful robot	Build a robot with the new members in order to learn and test the system. See RobotY
Gain knowledge by research and experimentation and mistakes	Evaluate the last season mistakes and try to organize and decide
Develop an excellent team financing plan and sponsor relationship	<ul style="list-style-type: none"> • Design presentation corporate letters for sponsorship and corporate meetings • Selecting the members in-charge for meetings • Design thanks diploma for sponsors • Organize an event for our sponsors • Launching our non-profit organisation
Spread the message of FIRST and STEM	<p>Mentoring rookie teams</p> <p>Presentation in schools (2 new teams in our school)</p> <p>Focusing on to meet the companies from engineering sector</p> <p>Focusing on meeting technical professors</p> <p>Connection with foreign teams</p> <p>Community support</p>

8.2 SWOT analysis

The Quantum Robotics completed a SWOT analysis for all six strategies to identify team strengths, weaknesses, opportunities and threats. The composite SWOT analysis chart below combines the SWOT analysis for six strategies.

SWOT analysis Quantum Robotics strategies

Strengths	Weaknesses
<ul style="list-style-type: none"> ❖ Team leader experience attract new team members and mentors ❖ ICHB support ❖ Good image brand ❖ Acceptable on-line presence ❖ Business plan ❖ Strong community outreach ❖ Passionate members with strong interests in STEM ❖ Organizers support ❖ Keeping the right time planning ❖ Marketing materials readily available ❖ Sponsors appreciation 	<ul style="list-style-type: none"> ❖ Some problems in organization and time management ❖ Too many things going on ❖ Lack of human resources ❖ Workspace and equipment ❖ Team members selection/training ❖ Overlapping responsibilities ❖ Lack of good inter-team communication ❖ Quality control planning ❖ Reactive purchasing ❖ Presentations to judges, to the sponsors ❖ Student ideas not always well-considered ❖ Long time to receive the robot parts ❖ Low sponsors meeting presentations ❖ No plan for avoid mistakes/delays ❖ Difficulties in transporting the robot to events

SWOT analysis Quantum Robotics strategies

Opportunities	Threats
<ul style="list-style-type: none"> ❖ New sponsors interested by our team ❖ ICHB students are STEM profile ❖ Sponsors and mentors can provide internship for students ❖ The interest in STEM and robotics increased in the last years in Romania ❖ Good media coverage of robotics news ❖ Good sources of promoting the brand awareness for teams and sponsors ❖ Team interested to develop leadership skills ❖ Many students are attracted by robotics competition ❖ Involve more school staff (from Our Organization section above) with team ❖ Recruit more team members ❖ Recruit more mentors 	<ul style="list-style-type: none"> ❖ Loss of students or mentors in key team roles ❖ Loss of financial support ❖ Loss of top sponsors ❖ Loss of build space/equipment ❖ Loss ICHB support ❖ Loss of means to transport robot

8.3. Action Plans/Strategies

Quantum Robotics Strategy #1: Developing strong team by selecting new members/mentors

Action plan	Responsible	Completion
❖ Promote team members involvement within the school and utilize school video news for promotion, growth and recruitment	❖ Mentors ❖ Team Leaders ❖ Sub Team Leaders	❖ Annually
❖ Create job description for each position	❖ Mentors ❖ Team Leaders	❖ This Autumn
❖ Create an effective internal system for communications	❖ Marketing leader	❖ Annually
❖ Develop, print, and place locker posters during build season	❖ Mentor ❖ Team Leaders	❖ This Autumn
❖ Make a time table with presence / task responsibilities	❖ Team Leaders ❖ Sub Team Leaders	❖ This Autumn
❖ Document new team strategies, initiatives and risk mitigation in teams' Business Plan	❖ Team Business Plan	❖ Annually

Quantum Robotics Strategy #2: Project management – organizing the team members by roles, tasks, duties

Action plan	Responsible	Completion
❖ Project management program	❖ Mentors ❖ Team Leaders ❖ Sub Team Leaders	❖ Annually
❖ Implementing planning control system	❖ Mentors ❖ Team Leaders ❖ Sub Team Leaders	❖ Annually
❖ Increase the communication between sub teams	❖ Marketing leader	❖ Annually
❖ Training students for each job descriptions	❖ Mentor ❖ Team Leaders	❖ Annually
❖ Conduct a season wrap-up and planning activity to identify, prioritize and plan future team strategies, initiatives and risk mitigation	❖ Team Leaders ❖ Sub Team Leaders	❖ Annually

Quantum Robotics Strategy #3: Learn by building a successful robot

Action plan	Responsible	Completion
❖ Implement Quality Control plan	❖ Mentors ❖ Team Leaders ❖ CADLeaders	❖ Annually
❖ Implement methods to improve design and CAD processes	❖ Engineering Mentor	❖ 20 th September
❖ Enhance fall workshops to include more “hands-on” learning	❖ Fabrication team/ design team	❖ Annually/ 20 th September
❖ Improve purchasing and material management practices (move to proactive) for commonly used materials:	❖ Organization team	❖ January
❖ Improve pit organization: ❖ Design and build a wheeled rack for small storage ❖ Design and build a compact battery and charger unit	❖ Organisation team	❖ January

Quantum Robotics Strategy #4: Gain knowledge by research and experimentation and mistakes

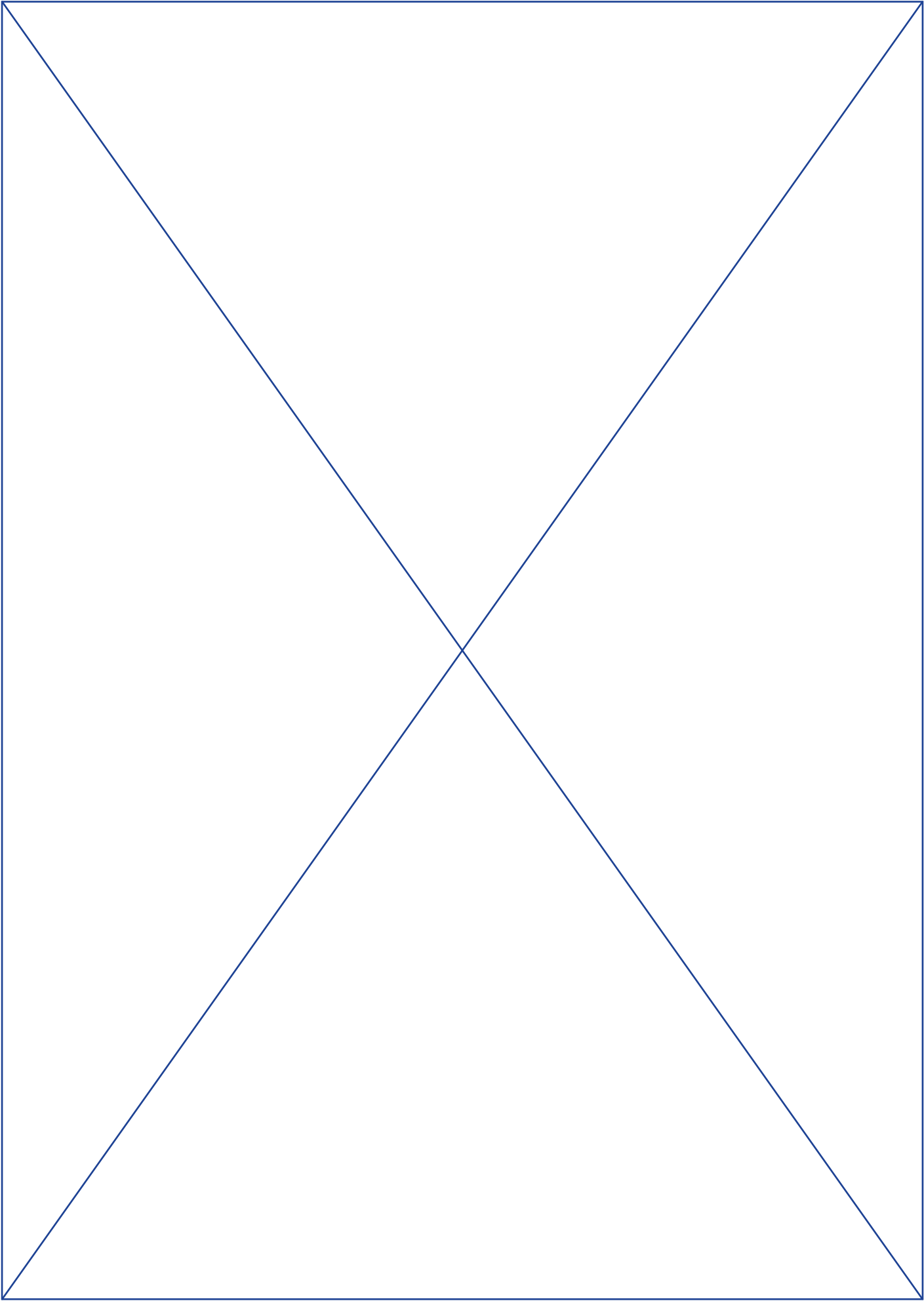
Action plan	Responsible	Completion
❖ Writing the engineering notebook and revising at the end of the season	❖ Team Engineering	❖ Annually
❖ Writing the business plan and revising at the end of the season	❖ Team Business plan	❖ Annually
❖ Note the mistake and avoid in the future	❖ Each member	❖ Annually
❖ Create and internal code based by past experience	❖ Mentor/Team Leaders	❖ Annually
❖ Periodically revise the panning process and implement improvements	❖ Mentor/Team Leaders	❖ Annually

Quantum Robotics Strategy #5: Develop an excellent team financing plan and sponsor relationship

Action plan	Responsible	Completion
❖ RISK MITIGATION: Gain at least one new sponsor every year	❖ Financial Manager	❖ Annually
❖ Improve planning and purchasing of special equipment, tools, computers and software	❖ Program Leadership, Financial and Purchasing Managers	❖ Annually
❖ Contact sponsors to determine internship opportunities for Quantum Robots students	❖ Financial Manager	❖ Annually
❖ Better prepare students to present team information to a variety of audiences	❖ Presentation Team	❖ Annually
❖ Develop and send a high quality electronic newsletter to thank and update sponsors, school, community leaders and parents.	❖ Marketing	❖ Annually

Quantum Robotics Strategy #6: Spread the message of FIRST and STEM

Action plan	Responsible	Completion
❖ Mentor FTC Team each year	❖ Financial Manager ❖ Outreach team	❖ Annually
❖ Conduct community services and outreach projects, robot demonstration	❖ Outreach team	❖ Annually
❖ Organize “Open doors” for sponsors, administration, parents	❖ Marketing team	❖ Before Season Starts
❖ Influence STEM curriculum in ICHB	❖ Mentor ❖ Team Leaders ❖ Sub Team Leaders	❖ On Going

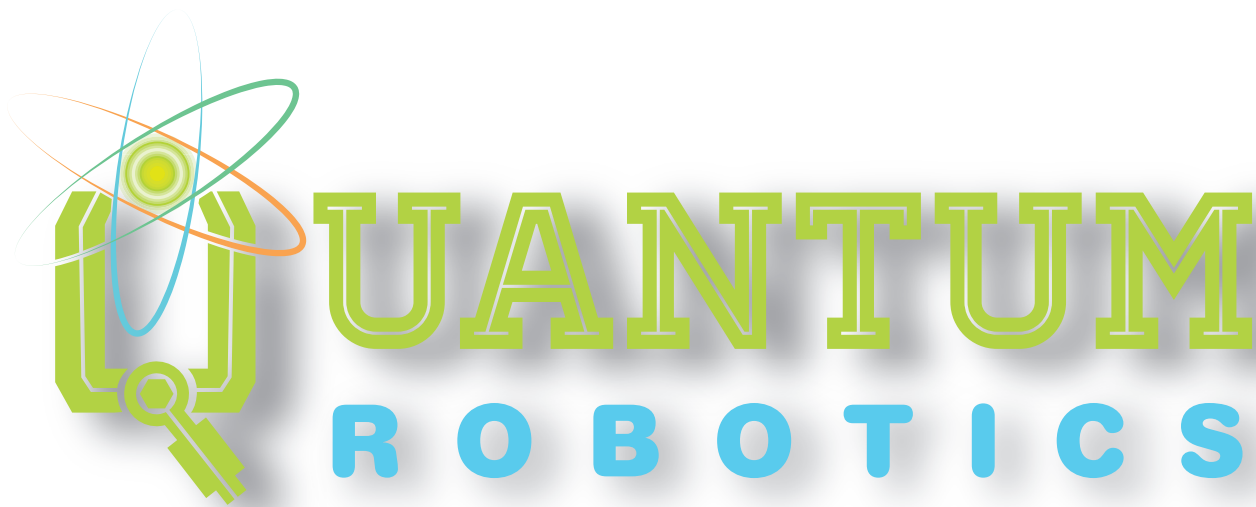


FIRST **CHAMPIONSHIP**



April 24-27, 2019

Detroit, MI



Engineering

2018-2019

Summary

This year on engineering we wanted to push for the top. Even from the beginning of the season our targets were set:

1. Reliable

Make a robot that will run smoothly even in dire situations. Introduce as many automations to make this process better.

2. Performance

Our goal this year was to build a bot that would be able to compete in the top championships of the world.

3. Accessible

We wanted to make the robot as easily as possible to drive. We tried to implement as many automations in our TeleOp to make the driving experience less stressful. This also ties well to our Performance task.

Through our work, we managed to build a robot out of more than 2000 parts that can have a solo score of up to 300 points

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1) Hardware

1. Drivetrain

1.1. Drivetrain Options

1.1.1. Introduction

When we first began working on the chassis, we already knew we wanted to improve on the last year's design. Since the chassis has to leave room for a wide intake system, we decided to try to make the drive as narrow as possible.

We came up with a few different types of drives:

I. Tank Drive

Advantages:

- Durable robot
- Easy to design, maintain and program

Disadvantages:

- Cannot strafe (this would make it nearimpossible to hang back on the lander)

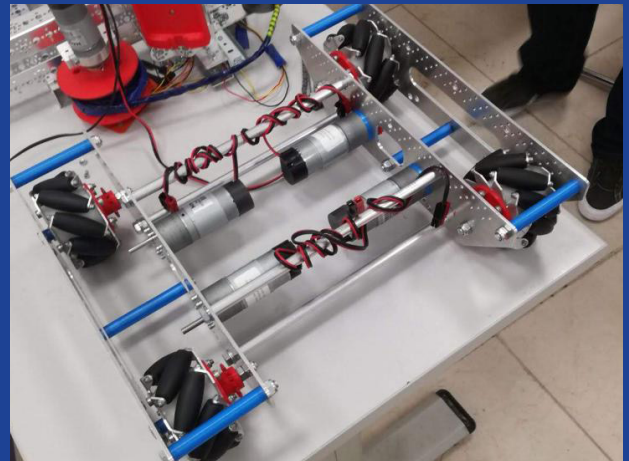
II. Omni Drive

Advantages:

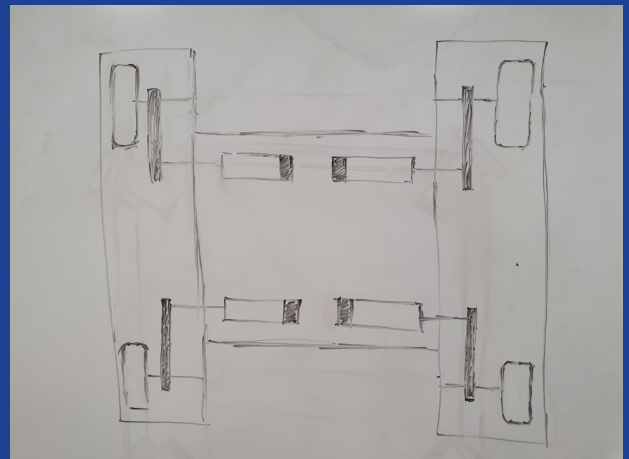
- Easy to design and maintain.
- Has the ability to strafe (very useful for mineral collection and hanging)

Disadvantages:

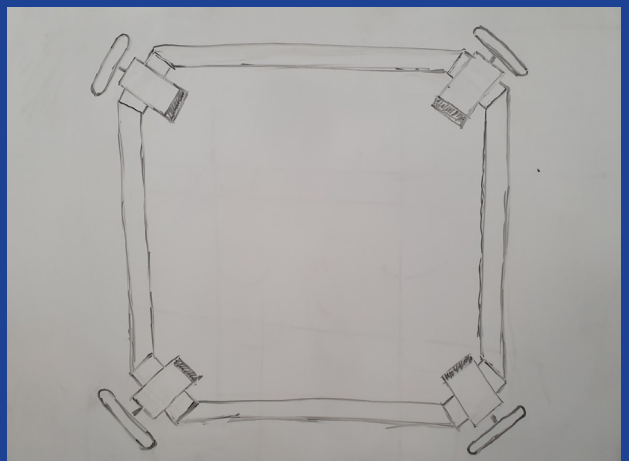
- Quite fragile.
- Takes up a lot of space



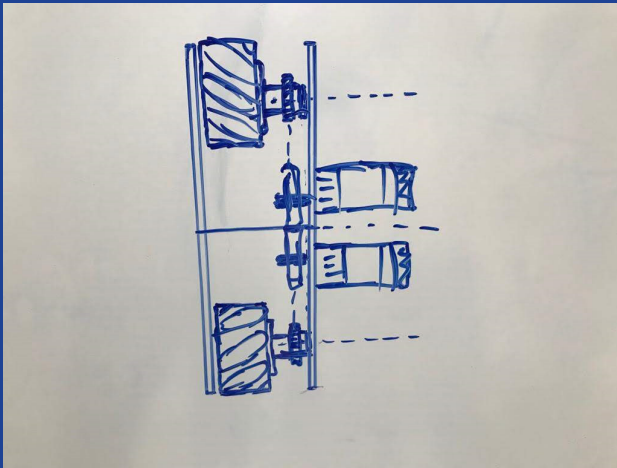
Last year's Chassis



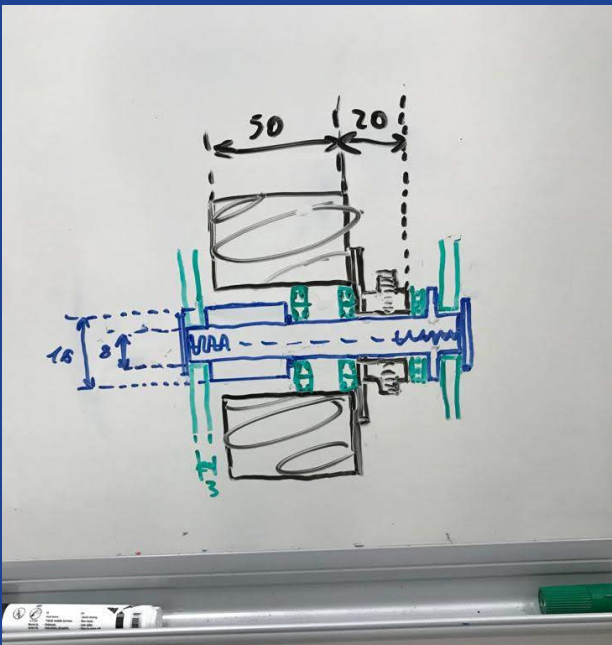
Tank Drive



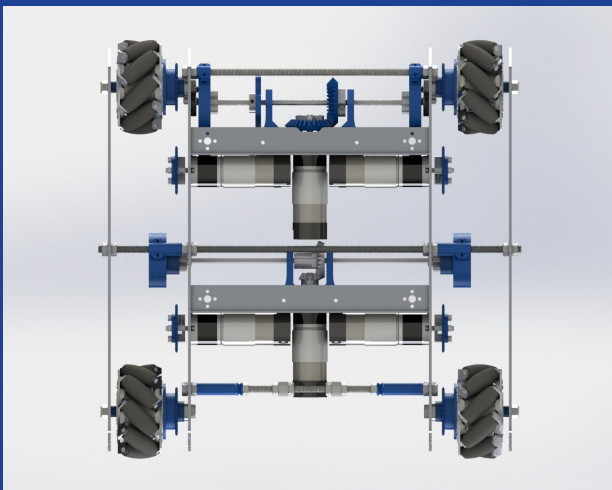
Omni Drive



Mecanum Drive



Mecanum Wheel Drawing



Mecanum Drive Render

III. Mecanum Drive

Advantages:

- As durable as a Tank Drive.
- Has the ability to strafe (very useful for mineral collection and hanging)

Disadvantages:

- Difficult to maintain, design and program.
- Slower sliding than a traditional Omni Drive.

1.1.2. Conclusion

Although the Mecanum Drive was more complex than all the other drives, we decided to go with this one as we believed we had enough experience from the previous year.

The added chassis strength combined with the limited space required was too good to pass. Given the success of last year's TileRunner inspired Drivetrain, we decided that this year we could do the same.

We started by getting a basic sketch ready. Then, the sketch was turned into a CAD model and sent to a friend of ours that cut it using a CNC machine.

1.2. Power Transmission

For our first iteration of the chassis, we decided to focus only on the intake and outtake systems. This meant we didn't have to allocate weight to the climb

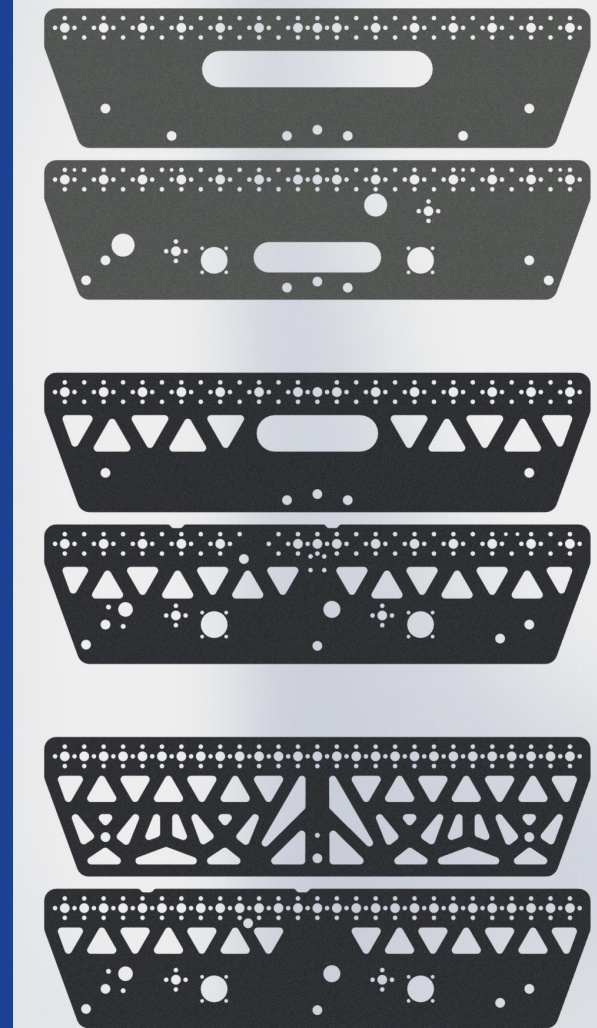
system. At first, to give power to the 4 mecanum wheels, we used 4 NeveRest 40:1 motors with a 24 teeth to 16 teeth multiplication. This meant we would have sufficient speed to drive around and still maintain the high torque of the motors. Next up, for our second iteration, we used 4 NeveRest 20:1 motors as they gave us more room to work with the PID. The wheels we decided to use are the same ones as last year: 4 Nexus Mecanum wheels. To power them, we used 3D printed adaptors. The whole structure of the chassis is made out of four 3mm aluminum plates (two for each side).

1.3. Chassis Plates

In the first prototype, they were quite simple, having holes for mounting the motors straight on them, holes to connect the chassis together using 8mm threaded rods and a simple Handle.

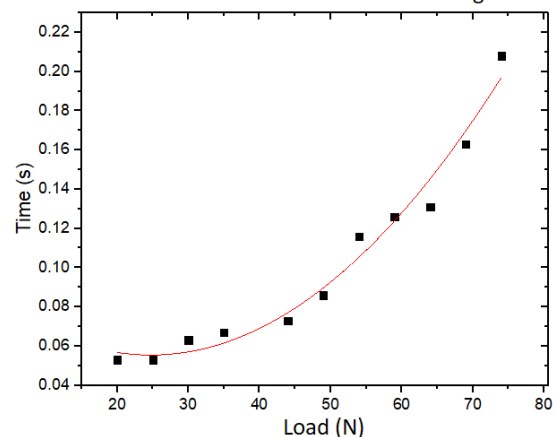
In the second prototype, the plates got a lot more complex, as we added holes for ease of access to some shafts, and triangular holes in order to reduce the weight while maintaining structural integrity. We also recalculated the angle of attack of the plates to avoid getting minerals stuck in the drive train.

The third iteration saw the addition of aggressive pocketing of the two external plates.



Chassis Evolution

Variation of RPM with load on a NeveRest 20 gearmotor



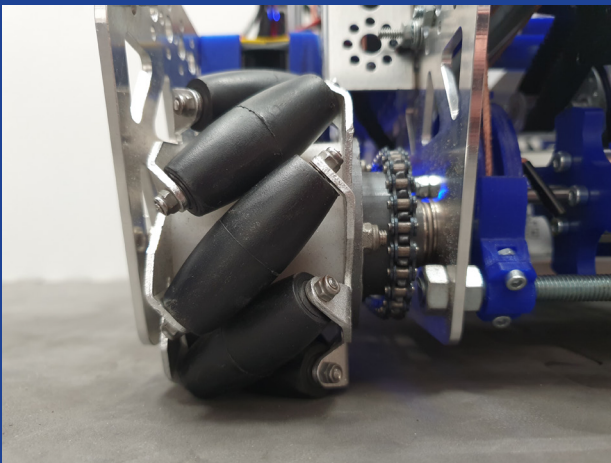
1.4. Wheels Assembly

We chose to use M8 screws and threaded rods instead of machined extrusions or 3D printed spacers to connect the plates of the chassis, since they allowed us to tweak the distance between them.

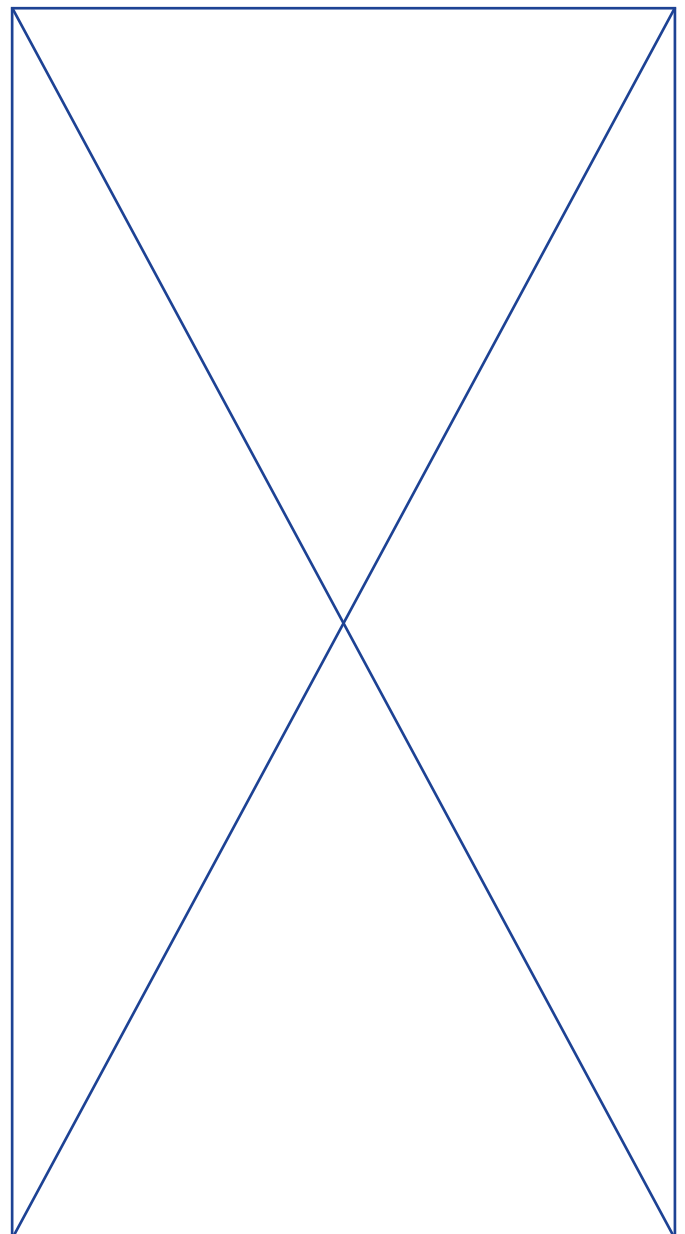
At first, we only had a set of ball bearings on the inside of the Mecanum wheels, but in our second iteration we decided to add a set of thrust bearings between the metal plates and the spinning wheel. The thrust bearings we used were purchased off of eBay.



Thrust-Bearing



Mecanum Wheel Assembly



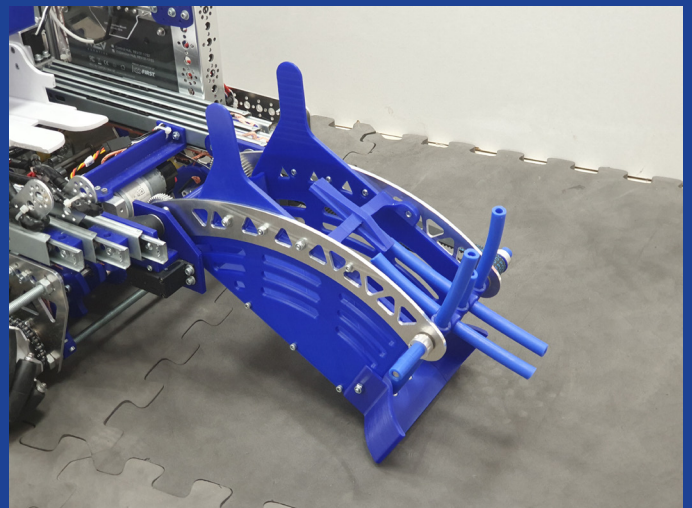
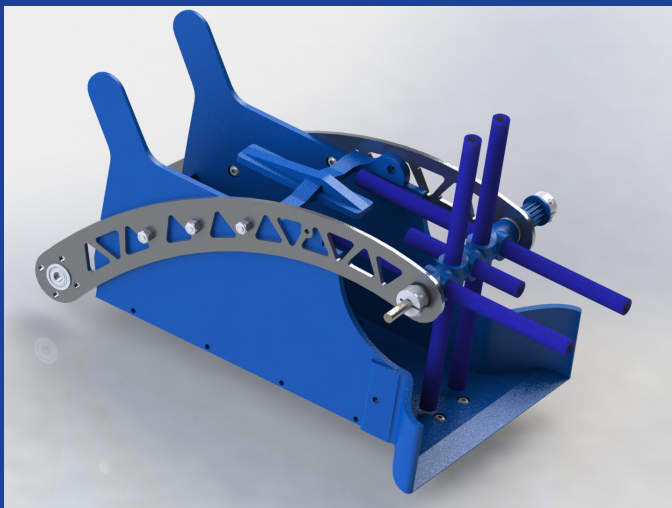
2. Intake

2.1. Introduction

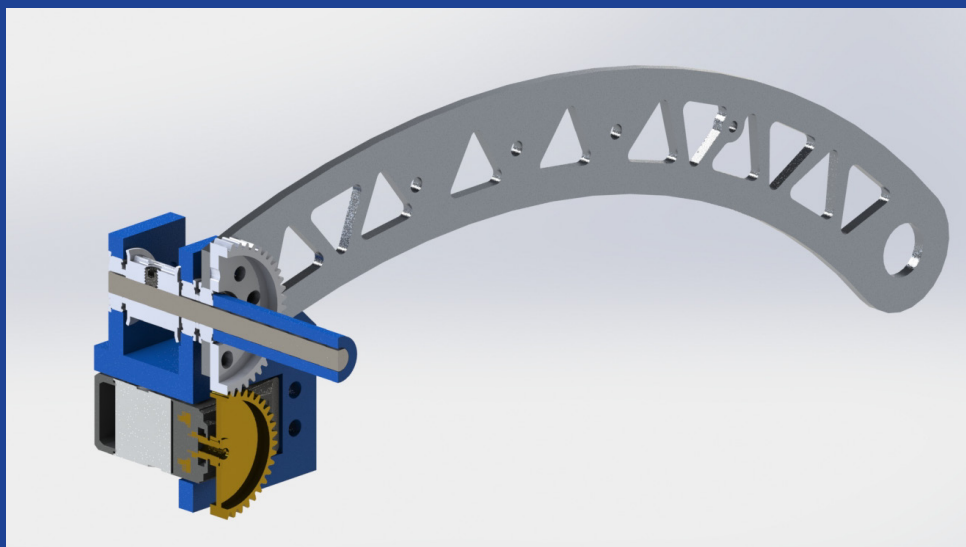
At the beginning of the season, we didn't really know what path to take.

We had a couple ideas for different intake systems, so we proceeded to build prototypes to test them on the field, with the goal of finding out which one works best.

We believe that going inside the crater would be very time consuming, consequently decreasing our total numbers of cycles that we can do between the crater and lander. Based on our previous experience with robotics competitions, we developed this philosophy: Don't climb over terrain if you can. Therefore, we figured out that the most effective bot will not move around the field a lot, but instead have multiple linear slider systems that extend to collect minerals or deposit them.



Intake Assembly CAD vs reality



Section Cut Through Intake Pivoting Axle

2.2. Collector Mechanism

We didn't know for sure what type of Collector would work best, as we had almost zero experience manipulating this year's minerals. After doing some research by looking at older FTC games, we've found out that there were 2 very common feeding systems used among teams: rubber bands or silicon tubes.

Since we had an early start this season and felt very motivated, we tried out something new that has never been done before, using quite a new product: compliant wheels.

I. Compliant Wheels

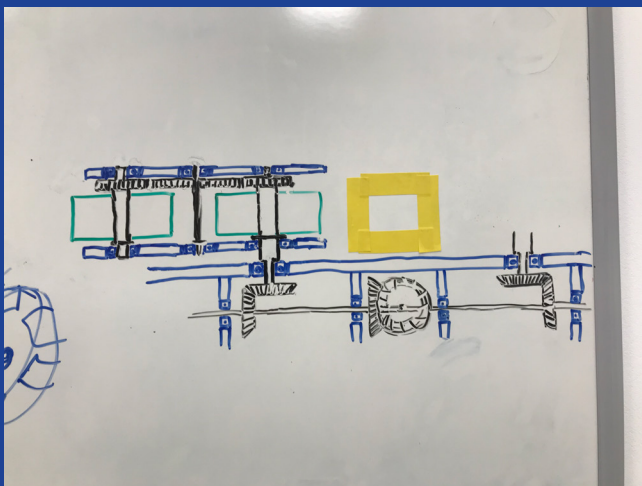
This system is designed to have two arms, each one having 2 compliant wheels, that are spring loaded and pivot around an axle. The goal was to use only one motor to spin all the wheels, therefore requiring a shaft with bevel gears that goes underneath.

Advantages:

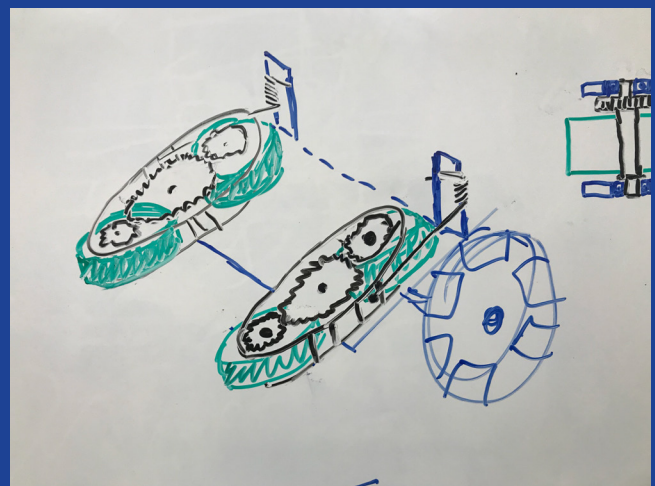
- Fast collecting time
- Small chances of minerals getting stuck

Disadvantages:

- Intricate design
- Requires a lot of fine tuning to make it work properly
- High maintenance cost



Compliant Arms



Compliant Wheels Transmission

II. Rubber Band

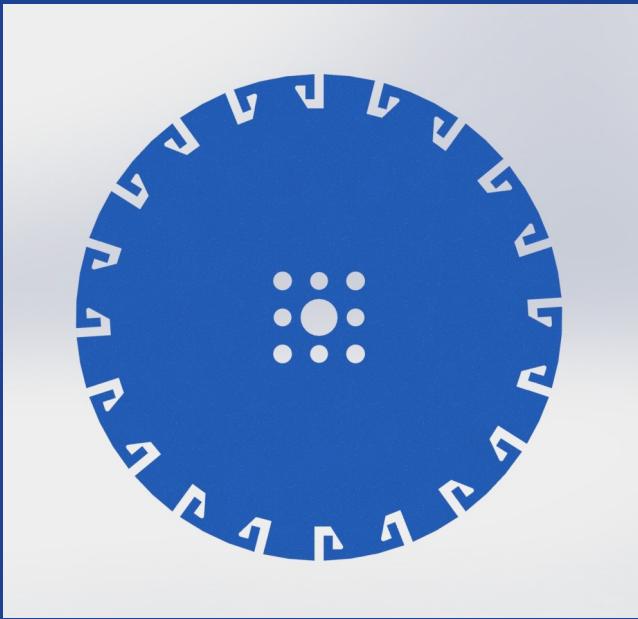
This system would use horizontal rubber bands held together by a 3D printed disk on each side.

Advantages

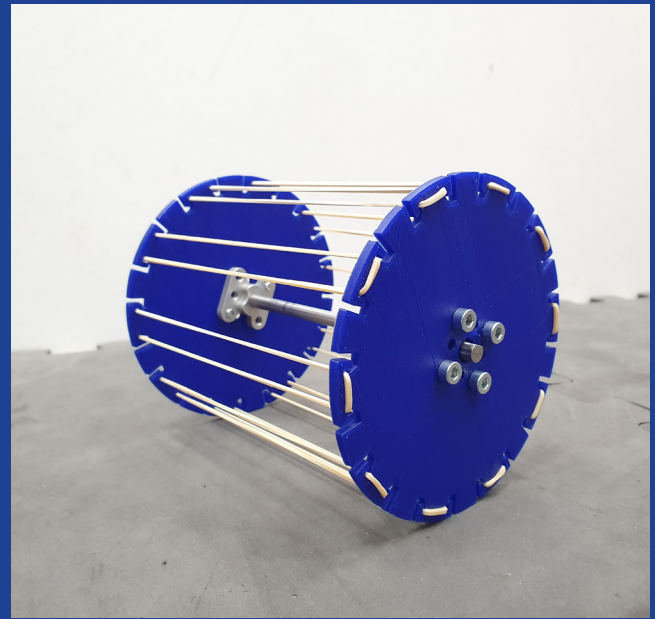
- Very accurate and fast
- Easy to build
- Low maintenance cost

Disadvantages

- Fragile
- Cubes get stuck frequently



3D Model of Disk



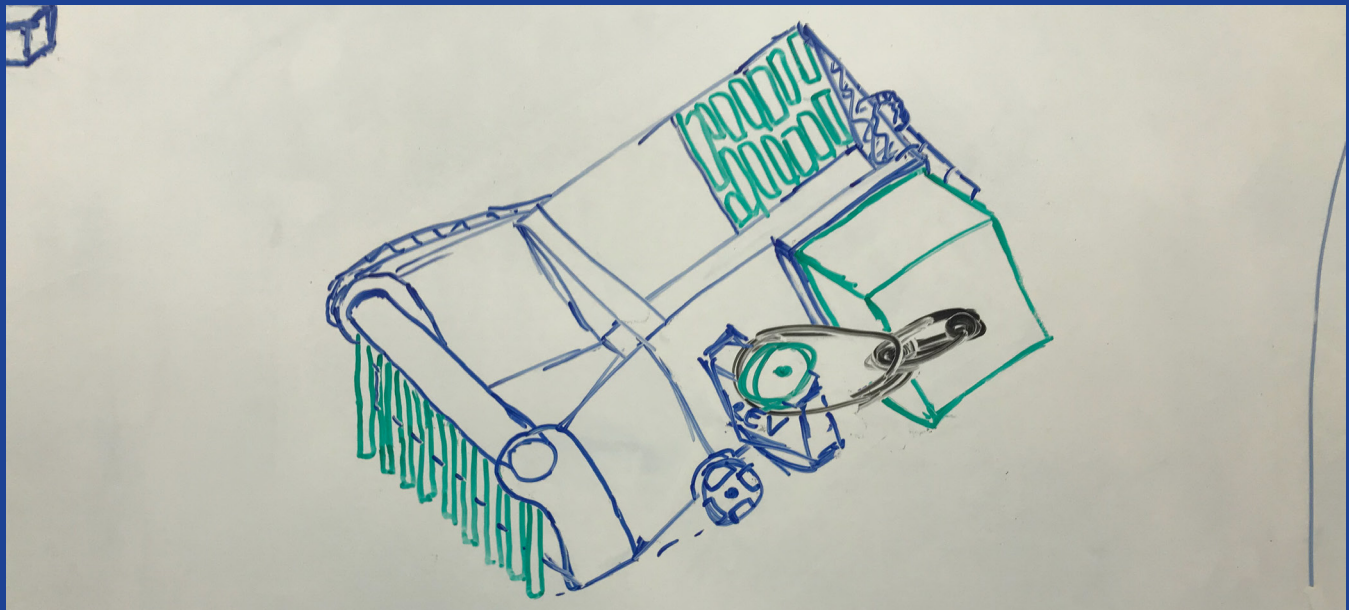
Rubber Band Collector Assembly

III. Silicon tubes - “Slapper”

In the initial version of this system we tried to mount the silicon tubes through a PVC pipe and then use screws to fix them in place. This setup required an adapter to mount the PVC pipe onto the D-Shaft. This was rather big and clunky. As a consequence, the balls would not fit through and the design didn't allow the use of a lot of tubes for small shafts.

Ergo, we went back to the drawing board and redesigned the mounting system for the tubes. The main changes were:

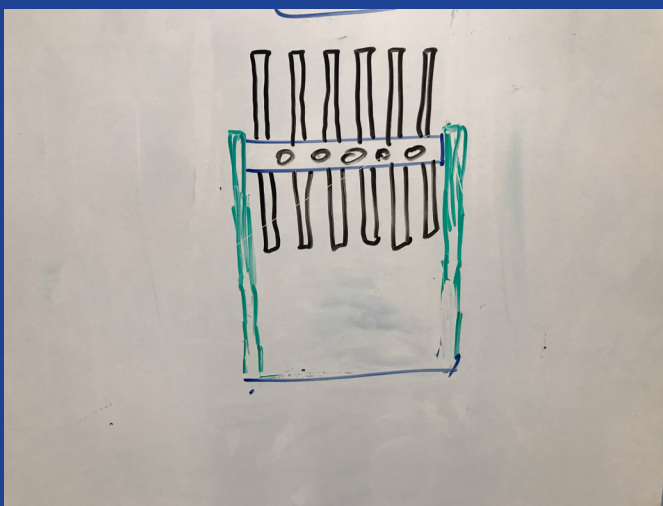
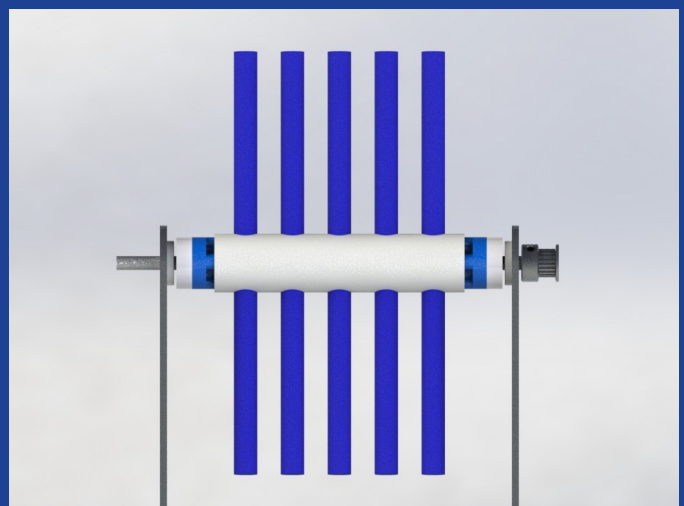
- We designed a 3D part, with the purpose of putting the tubes directly on a D-Shaft removing the need of the PVC pipe
- We added one more line of tubes perpendicular to the one which was already there

*Initial Intake Idea*Advantages

- Fast collecting time
- Infrequent jams
- Easily adapts to variation of size and shape of the minerals

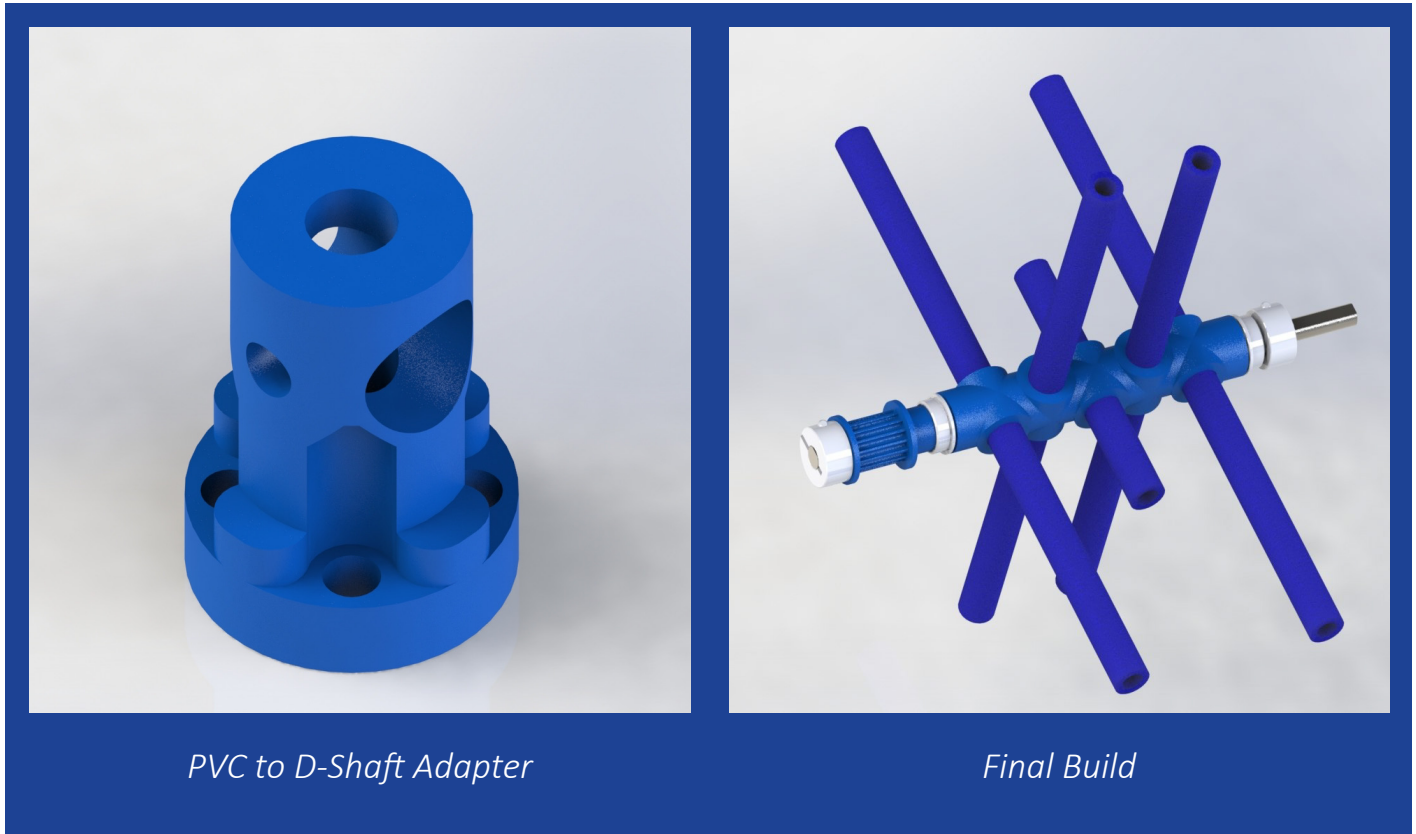
Disadvantages

- Chaotic and not as accurate as the others systems
- Very difficult to remove only one mineral if you collect 3 by mistake.

*Drawing of "Slapper" Design**PVC Pipe Prototype*

Final conclusion

After testing out all of the prototypes mentioned, we realized that it would be a lot more efficient if we could sort the minerals in our Outtake and just collect whatever is closer to us from the crater. Therefore, we went with the fastest feeding system, which is the last concept, having a wider feeding opening than the others.



2.3. Storing Box (Căruță)

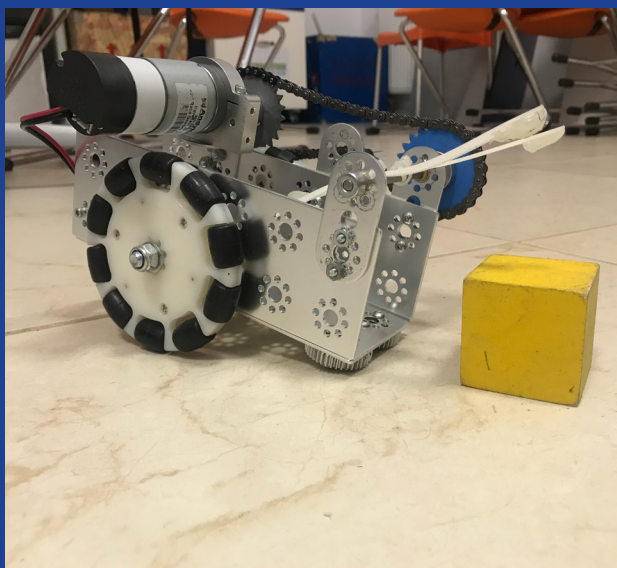
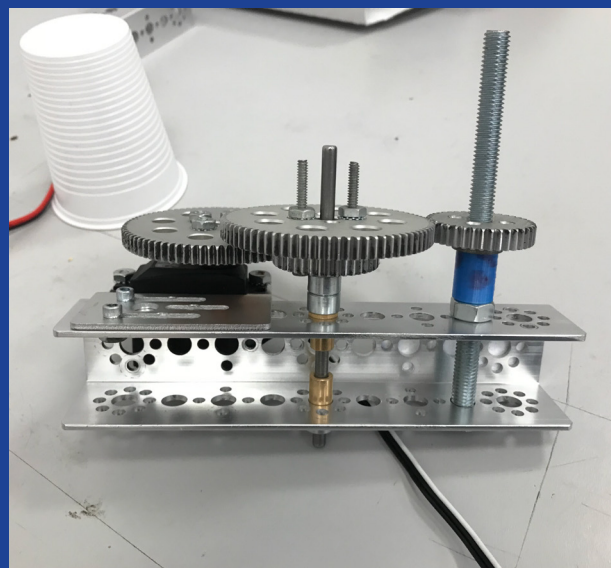
The Storing Box is the place in which the minerals are collected and remain until the transfer between Intake and Outtake is made.

First Prototype

We made a simple proof of concept. It was mostly used for sizing and visualization purposes.

Second Prototype

It was designed to replace the motor that spins the collector with a servo and a custom gearbox, in order to make the system lighter. We started out building the box out of Tetrix parts and quickly realized that the structure started to become really heavy, defeating the only purpose of this prototype, so we stopped working on it.

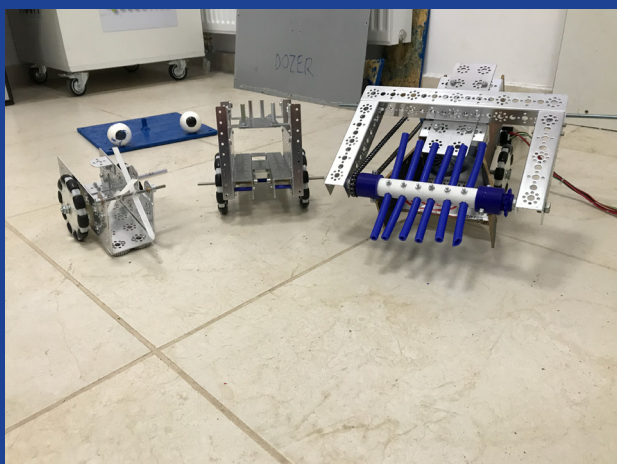
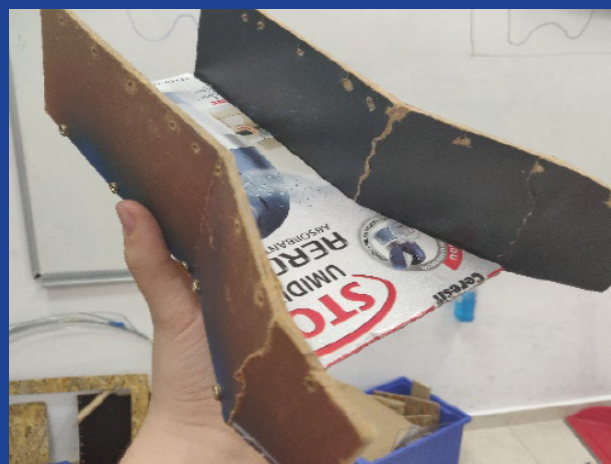
*First Prototype**Servo Gearbox*

Third Prototype

After our last design, it started to become clear to us that using aluminum parts from kits would not work well and would make it bulky. Thus, we started developing a new structure out of MDF and OSB. This Storing Box had a big opening in front for easily collecting multiple minerals at once and also had a smooth floor, letting the minerals slide in.

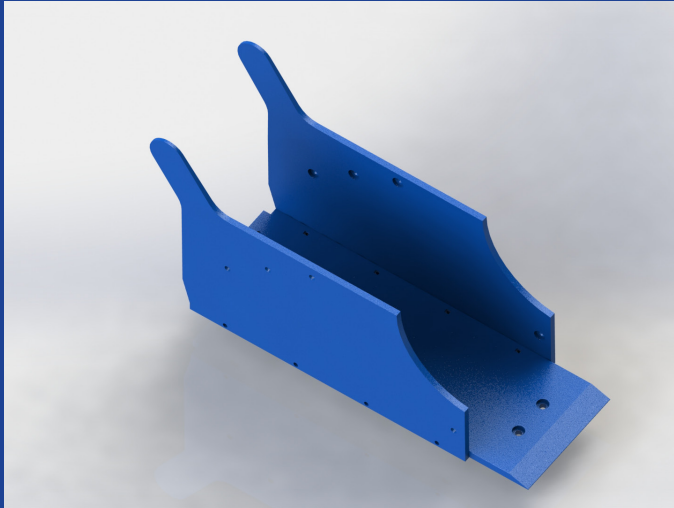
Forth Prototype

This was the next iteration of the wooden Storing Box, using only MDF for its structure to make it lighter, with a narrower opening since 2 minerals would sometimes get stuck. The last improvement was to add a roof to keep the minerals from not getting thrown out while collecting them.

*First three prototypes**Forth Prototype*

Fifth Prototype

For our last and final prototype we analyzed all the ups and downs from our previous attempts and started to design a 3D model for the whole structure in SolidWorks. We have strived to create a modular design that allowed us to quickly change different parts or customize the final shape.



CAD vs reality for: Fifth Prototype

Casters

To relieve strain from the servo we decided to disable the PWM port while collecting. Therefore the Intake required some sort of caster on which it would slide.

I. Omnis

Advantages:

- Easy to implement and use

Disadvantages:

- Bulky & Heavy

II. Custom Mini-Omnis

Because the omni wheels from AndyMark were too heavy and clunky, we considered that reducing their size and weight was a good idea. Further, we designed a double omni body with 8 rollers in total and 3D-printed it.

Advantages:

- Small foot print
- Little friction

Disadvantages:

- Still heavy
- Require many iterations

*4 in. Omni Wheels Assembly**Custom Mini-Omni*

III. Bearings

Since the caster system was still too heavy we thought of using small ball bearings that have a relatively low friction coefficient with the pads.

Advantages:

- Small and very light

Disadvantages:

- The intake would often bump into the ground
- Leaves white traces on the pads

IV. Docker

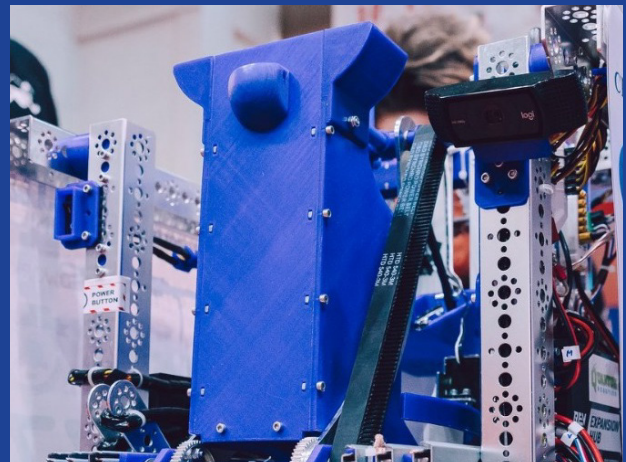
We also tried to use a 3D-printed docker with a smooth surface, making it slide with ease on the tiles. We are currently using the docker thanks to the stability and mobility it offers.

Advantages:

- Easily slides
- Lot of stability and mobility
- Easy to control them

Disadvantages:

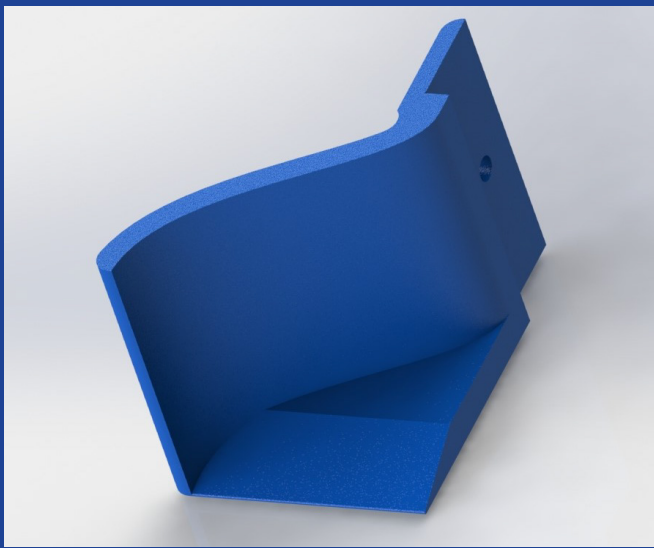
- Has to be well polished in order to slide easily

*Caster made out of bearings**Docker*

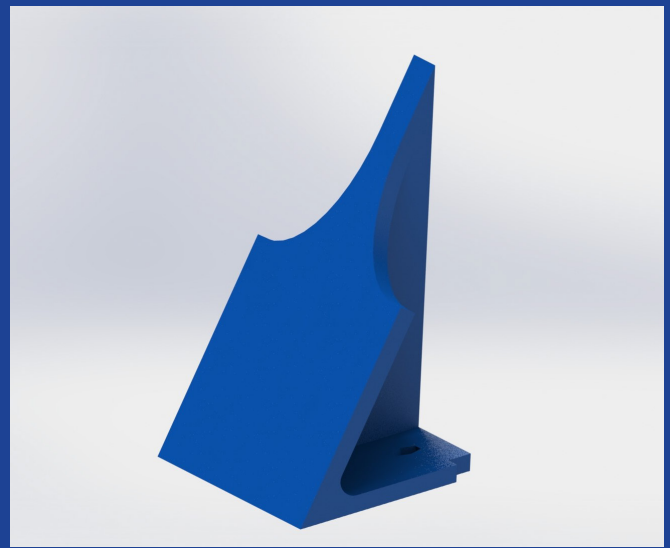
Improvements & Additions

After creating the foundation for the Storing Box we started to develop and improve it by adding the following 3D printed parts to the assembly:

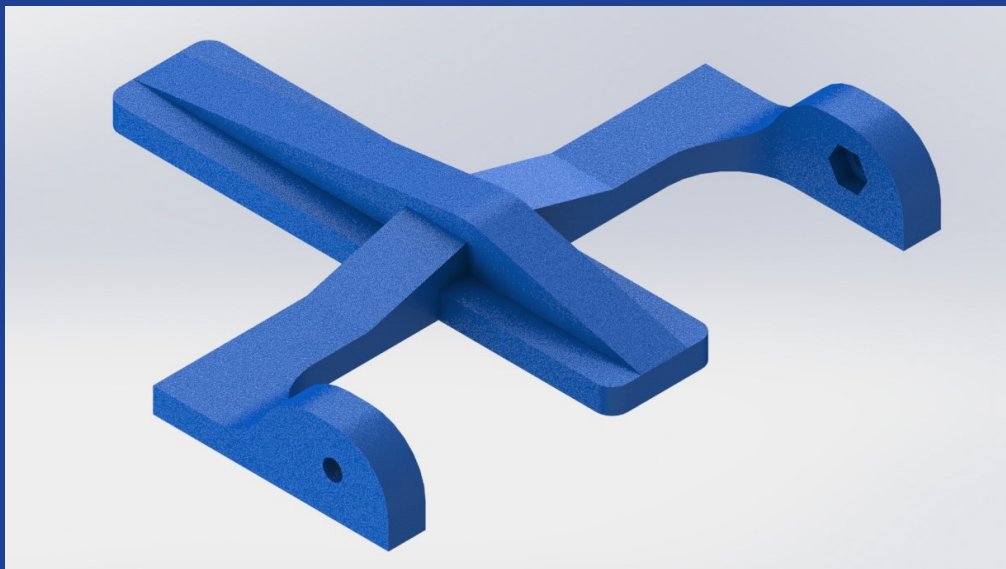
- **Ears & Angled Wall** - helps us achieve a reliable transfer between Intake and Outtake, stopping the minerals from going inside the robot or getting stuck
- **Roof** - keeps the minerals from getting thrown out while collecting them.
- **Funnels** - create a wider range for picking up the minerals as they are larger than the collector



Funnel



Angled Wall



Roof

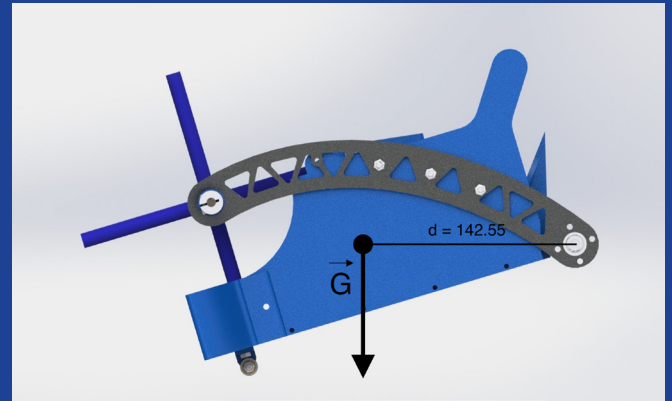
Intake Pivoting Axle

The Collector had to be driven by a motor with a relatively high RPM while the Storing Box is lifted up by 2 servos. Since we didn't want to put a lot of load on them, we had to mount the motor as close to the pivot point as we could. One of our ideas was to mount it underneath the Storing Box, but this wasn't the most effective solution as we figured out that it would be best if we can put the motor on the linear sliders instead of putting it on the rotating structure.

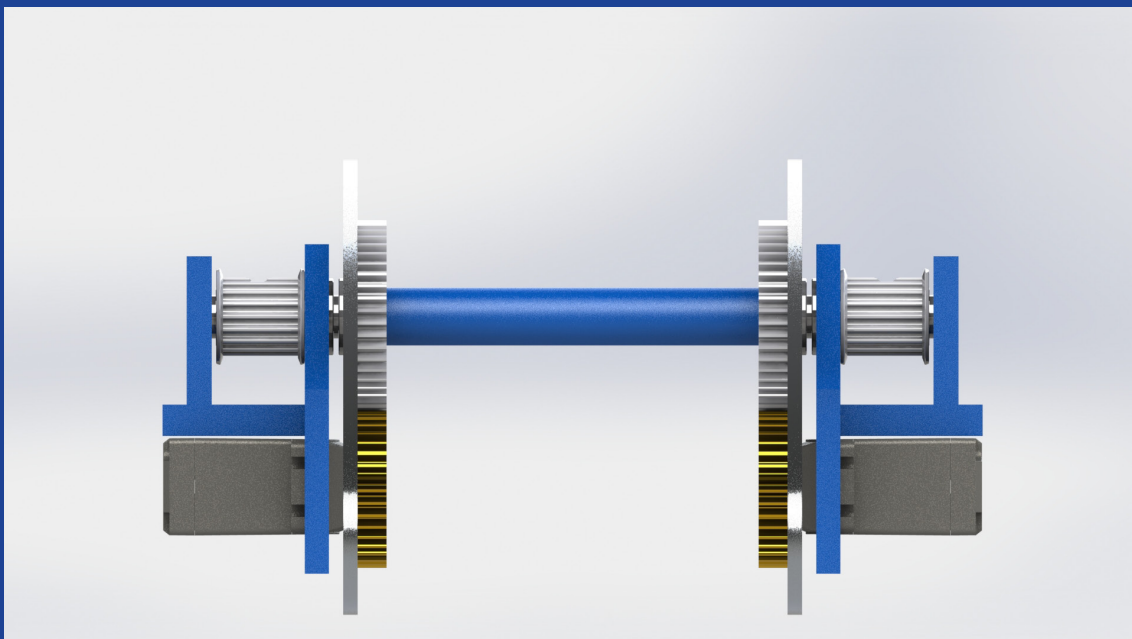
Said and done, we fixed the motor on a spacer between the opposite-sided linear sliders. With the help of a belt on the right-hand side, the motor rotates the axle on which the Intake pivots around. At its turn, the axle has another belt which is fixed on the lefthand side and rotates the Collector. The rotation of the Intake is produced by 2 gears, mounted on the Exoskeleton, that are driven by servos.



Intake Pivoting Axle V1



Intake Center of Mass



Intake Pivoting Axle V2 3D Model

Physics Section

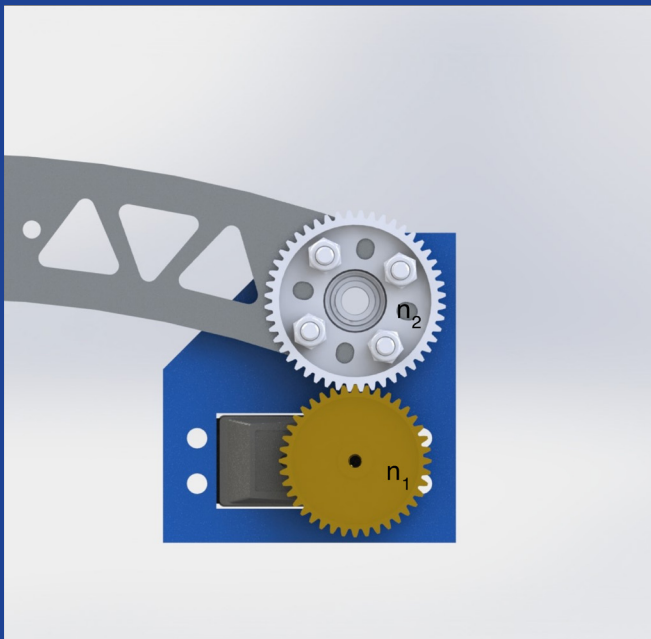
$$\text{RequiredTorque} = m \times d = 0.70332 \text{ kg} \times 14.255 \text{ cm} = 10.03 \text{ kg} \times \text{cm}$$

$$\text{AvailableTorque} = 2 \times M_{\text{servo}} \times \frac{n_2}{n_1} = 2 \times 13.50 \text{ kg} \times \text{cm} \times \frac{48}{40} = 32.40 \text{ kg} \times \text{cm}$$

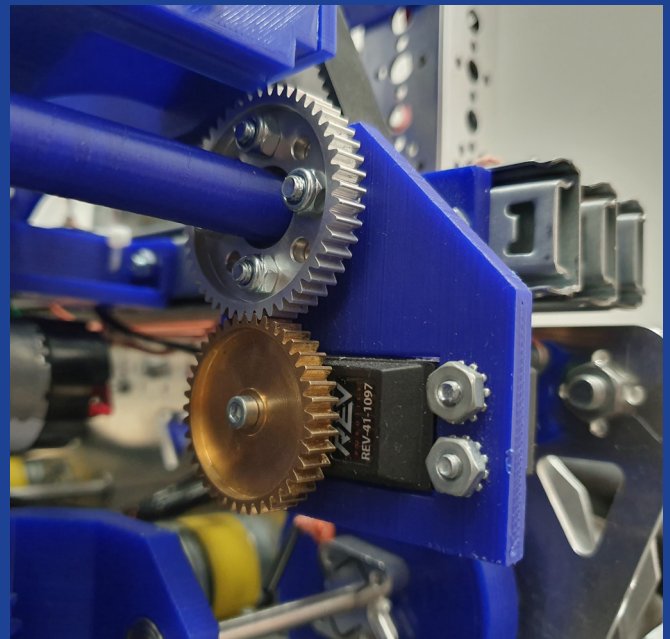
We wanted to see if our REV Servos had enough torque to lift the Intake. Since we had 3D modeled the whole system in SolidWorks, we used the built-in Mass Properties to measure the distance of the center of mass from the axis of rotation. The stall torque of the 2 Smart Servos was taken from the listing on REV's website. We also took into account the reduction from the transmission gears.

$m = 703.32 \text{ g}$, $d = 142.55 \text{ mm}$, $n_1 = 40 \text{ teeth}$, $n_2 = 48 \text{ teeth}$, $M_{\text{servo}} = 13.50 \text{ kg} \cdot \text{cm}$

As we can see, the AvailableTorque is ~3.24 times greater than the RequiredTorque, so the servos should have no problem actuating the intake.



Intake Pivoting Axle V1

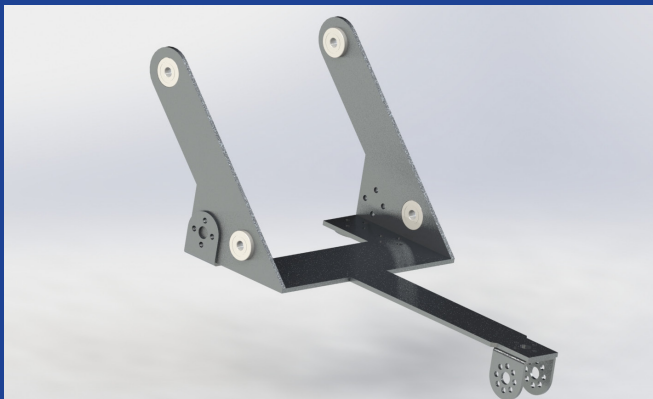


Intake Center of Mass

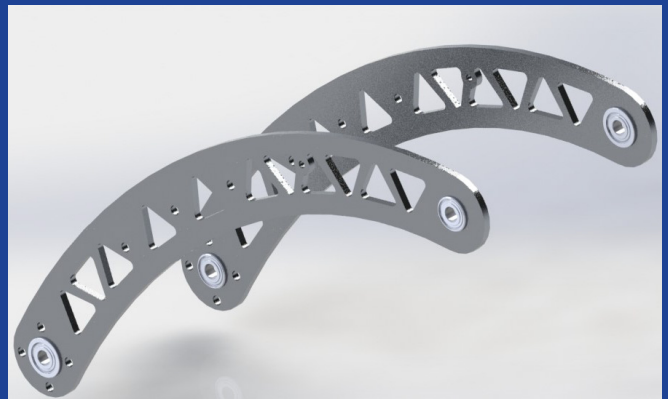
Exoskeleton

The Collector and the Storing Box are each individually mounted on an aluminum frame, fact that makes the Intake system very modular, allowing us to effortlessly test different prototypes.

Initially, the superstructure consisted of 3 pieces connected between them with Tetrix parts and fixed on the DShaft in only one point. Since this was a big problem for us and the design was heavy and considerable in size, we decided to find a new design. Moreover, the weight distribution wasn't very efficient. As a result we came up with a curved aluminum part that is freely spinning on the Axle, with the help of ball bearings.



Exoskeleton V1



Exoskeleton V2

2. 4. Extension System

Exoskeleton

Types of Linear Movement Mechanisms

There are three methods that we thought about which could handle the extension and retraction of the Intake System at a great distance: the scissor extension mechanism, linear sliders and the lever arm.

Scissor Mechanism

Advantages

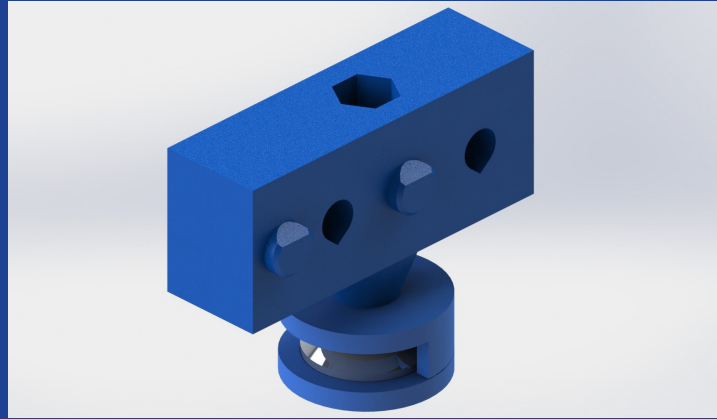
- Covers a great distance in its extended state

Disadvantages

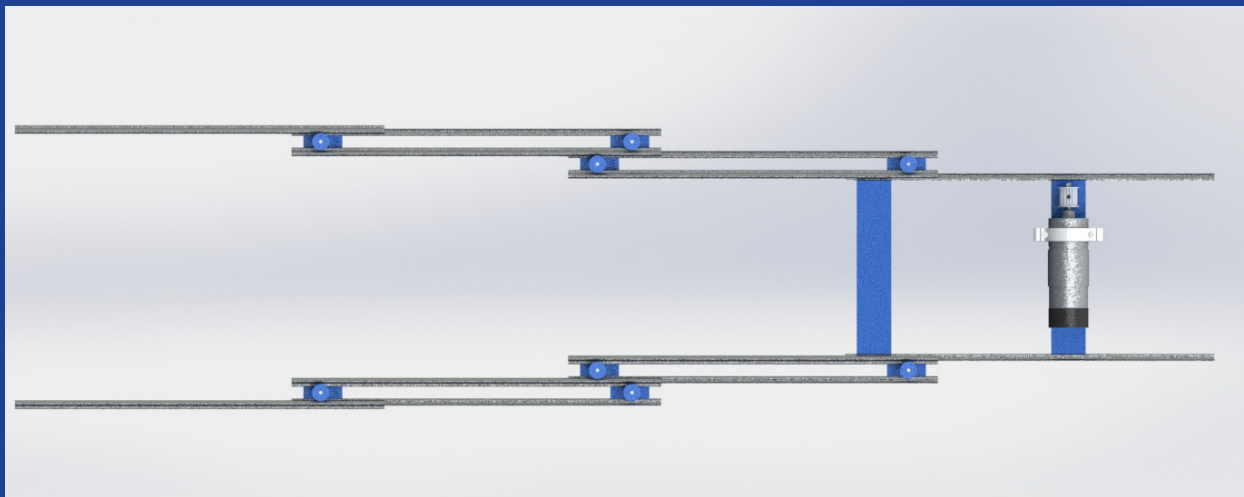
- The system needs to be very sturdy and rigid in order to be stable when it's extended
- Takes up a lot of robot real estate

Lever Arm

What we could use wasn't long enough for our application so we excluded it from our options since we couldn't prototype the system from the beginning of the season.



Slider Block With Pulley



Linear Sliders

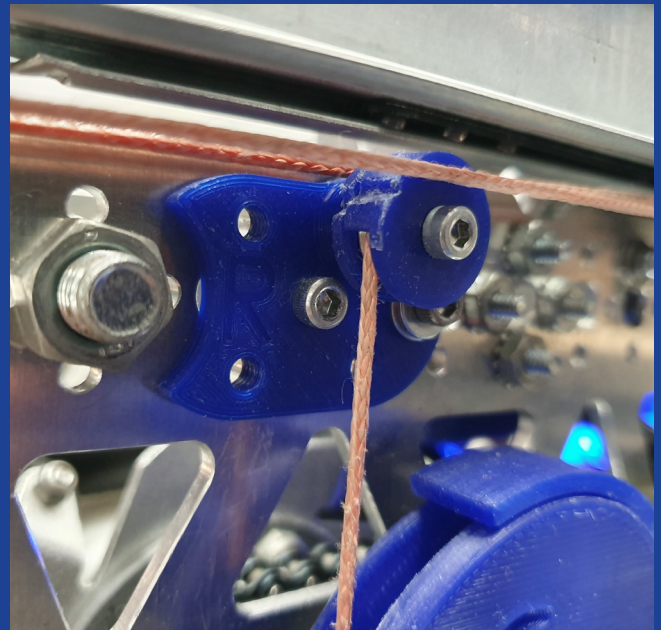
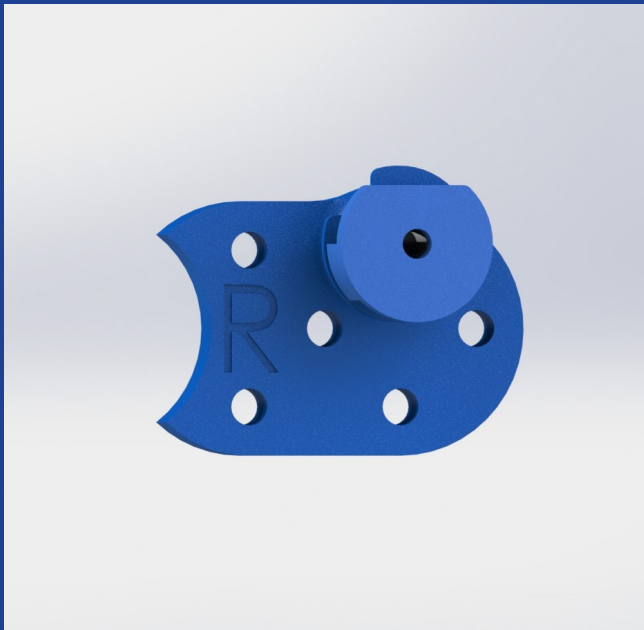
The linear sliders

Advantages

- Flexibility since you can stack as many linear sliders as you want
- Compact when retracted

Disadvantages

- Cable is likely to snap. This would result in a failed extension/retraction



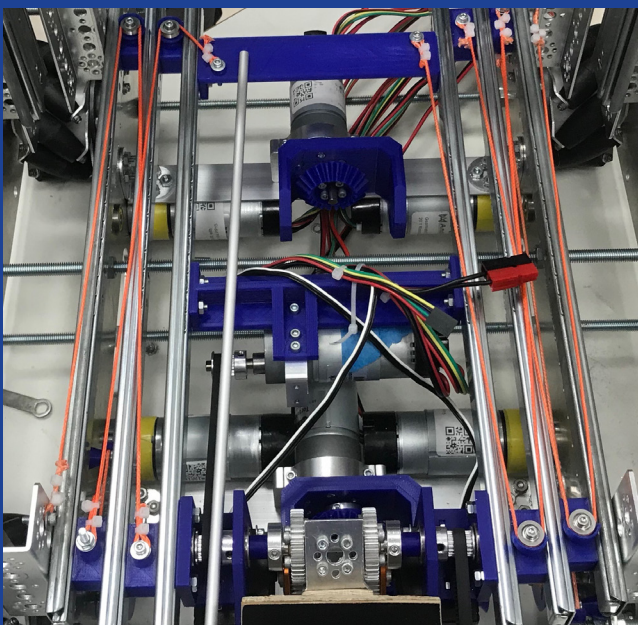
CAD vs reality: Tetrix Pulley Mount

Final Conclusion

By analyzing the previous options we decided that the best choice would be to use the linear slider mechanism due to its flexibility and small size when retracted. Our system consists of multiple linear sliders driven by a system of pulleys on which the string can be routed in two configurations:

Continuous

- Low cable tension
- The final stage extends first and retracts last
- Simple cable routing



Continuous String Configuration

Cascading

- High cable tension
- All the stages extend at the same rate, fact which gives more speed
- Complex cable routing

In the end, considering the great advantages of the Cascading configuration and its compatibility with our system, we used it on our robot. Combined with a high torque motor, it achieves the same accuracy as the Continuous configuration.

Try	Motor	Gear		Final Ratio		Torque(oz/in)	RPM	String Config
1	TorqueNADO	60:1	3D Printed	1:1	60:1	700	100	Cascading
2	TorqueNADO	60:1	3D Printed	1:1	60:1	700	100	Continuous
3	NeveRest	20:1	goBILDA	2:1	40:1	350	170	Continuous
4	NeveRest	3.7:1	goBILDA	2:1	7.4:1	64.4	892	Continuous
5	NeveRest	3.7:1	goBILDA	2:1	7.4:1	64.4	892	Cascading
6	NeveRest	20:1	goBILDA	2:1	40:1	350	170	Cascading
7	NeveRest	20:1	3D Printed*	1:1	20:1	175	340	Cascading

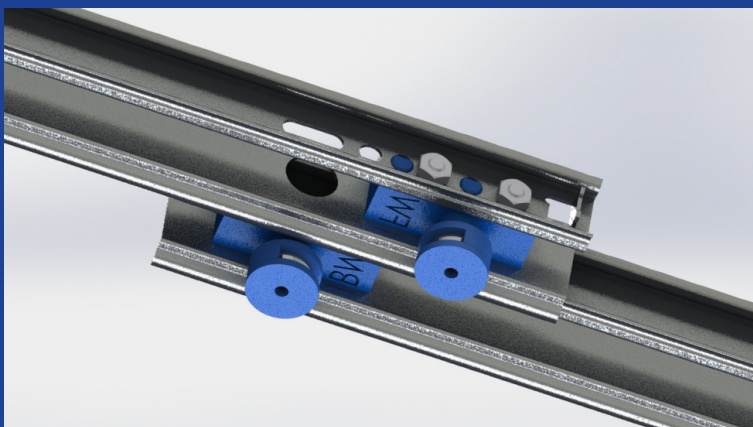
*Designed by us in SolidWorks

Spacer Blocks

The Spacer Blocks were created in SolidWorks as a way to interconnect the sliders and fix string on them.

On our robot there are 2 sizes of Spacer Blocks:

1. Little - which is used for connecting the sliders between them in the front and in the back. The second purpose of this piece is to attach the string system.
2. Big - which is used for connecting the left-handed set of sliders with the one on the other side

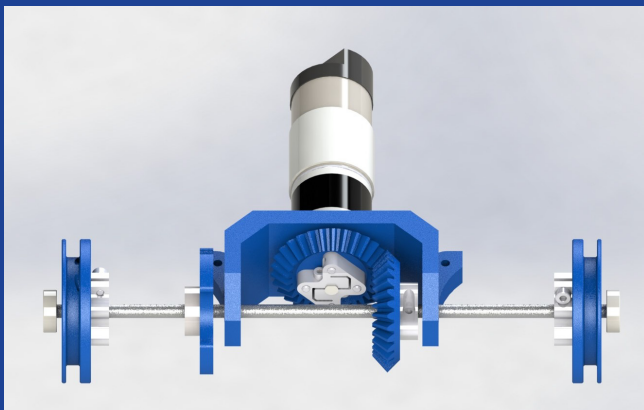


CAD vs reality: Focus on small Slider Block

Motor Placement and Transmission

The Sliders are driven by two spools which are mounted on a stainless steel 6mm D-Shaft. We mounted bevel gears to position the motor in the center of the robot, perpendicular to the D-Shaft, rather than on a side. Furthermore, it helped to distribute the force equally to the spools, preventing damage to the axle. As a bonus, we also lowered the center of mass.

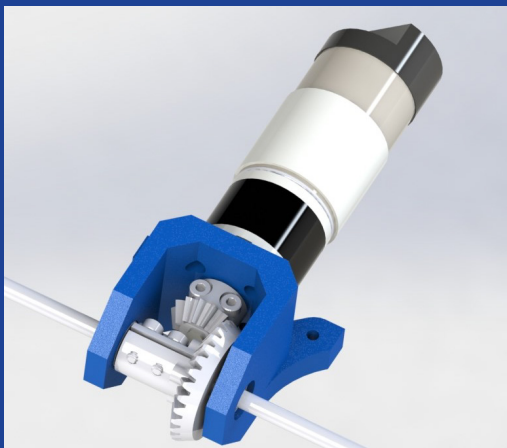
In the 1st try we used a cascading string configuration, but we changed to a continuous one, thinking it was too fast. We quickly realized the opposite, so we started changing motors in order to get a faster speed in exchange for torque. After the 4th try, precision became an issue, but we solved it by using a slower motor and also 3D modeling a 1:1 custom bevel gear so we could get a good amount of speed, but still enough torque.



CAD vs Reality: 90 degree transmittion

Wire Management

The first idea for wire management that we came up with, involved using a drag-chain, but problems started appearing. The biggest issue was that it only doubles its length and we needed to triple it. We found a solution that consisted in making a spiral in the air, for it to extend enough. Unfortunately, it was too heavy so we came up with a new idea. Since we had space above the Sliders, we used it to tie all the wires to the spacer blocks and make a little loop when the intake is extended.



Gobilda Bevel Gears



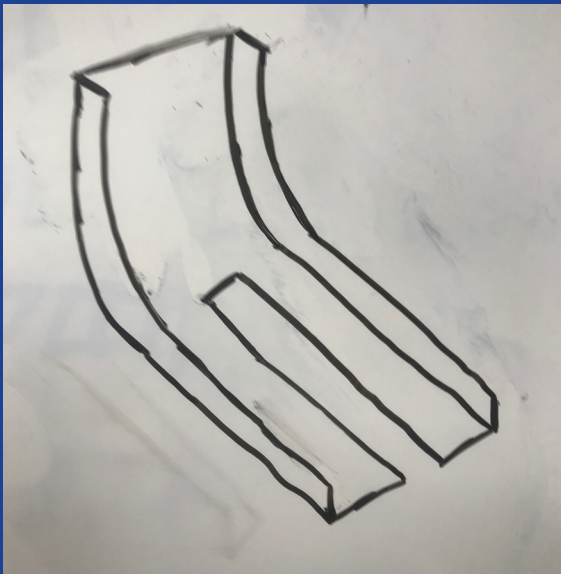
Wire Management

3. Outtake

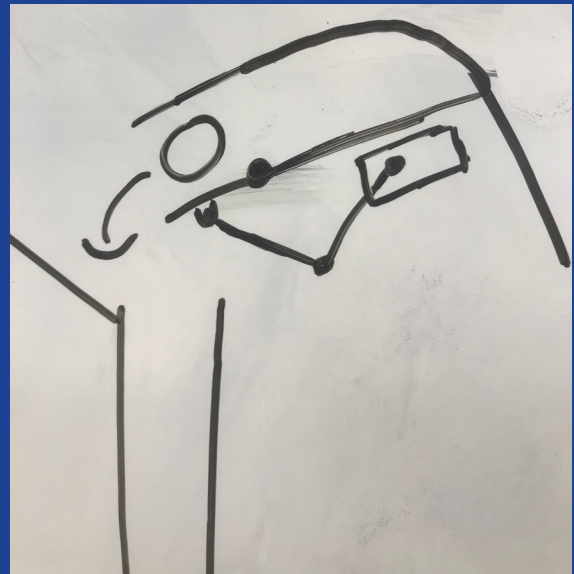
3.1. Design

After an initial brainstorming session, we have come to the conclusion that the best approach for scoring Minerals would require building 2 different subsystems, one for collecting, the other one for depositing.

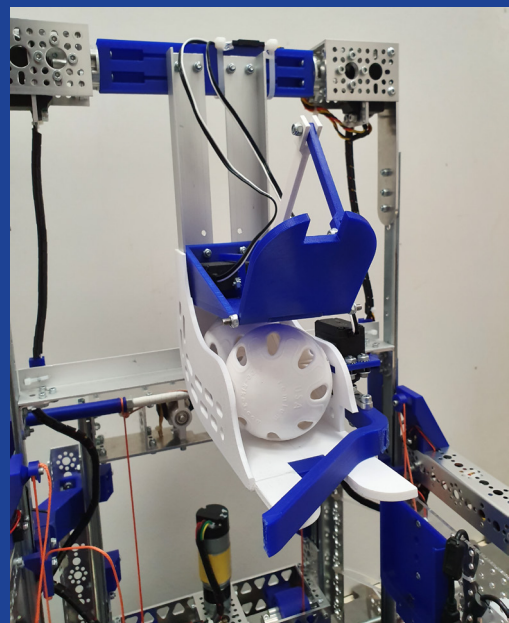
The plan was to have a storing box that could be extended above the Lander for the purpose of easily scoring Minerals in both Cargo Holds. In order to move the Storing Box along the x & y axes, we had to develop an off-centered arm that could rotate 180° to reach over the Lander, looking similar to a Scorpion's tail.



Scorpion Drawing



Dump Position Drawing



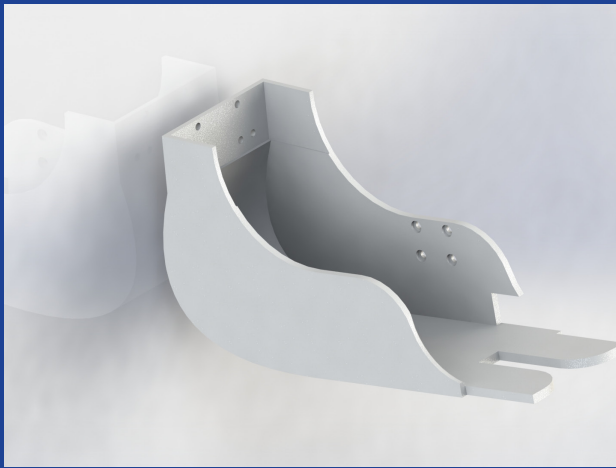
CAD vs Reality: Scorpion 3D Model

3.2. Development

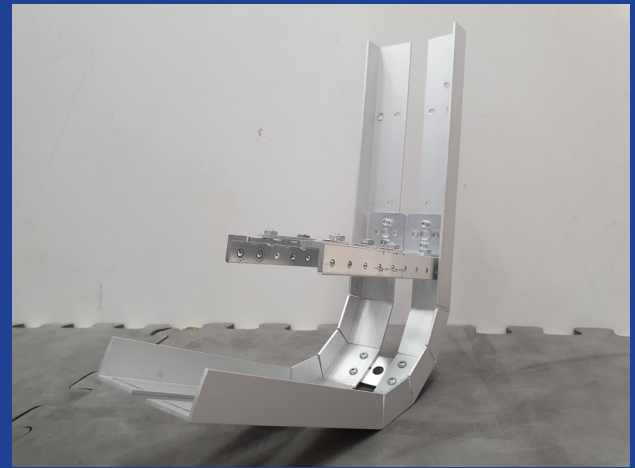
Building and iterating over this design was a hard task since we couldn't use any aluminum parts that came with the Building Kits.

This setback was quickly overcome by making cardboard prototypes to get a clear idea of the design and then moving forward to create it from corner profiles, by creating multiple V shapes along a straight axis to bend it.

After testing multiple versions, the subsystem was 3D modeled to get a very precise final piece that could be fine-tuned for our preferences.



Storing Box



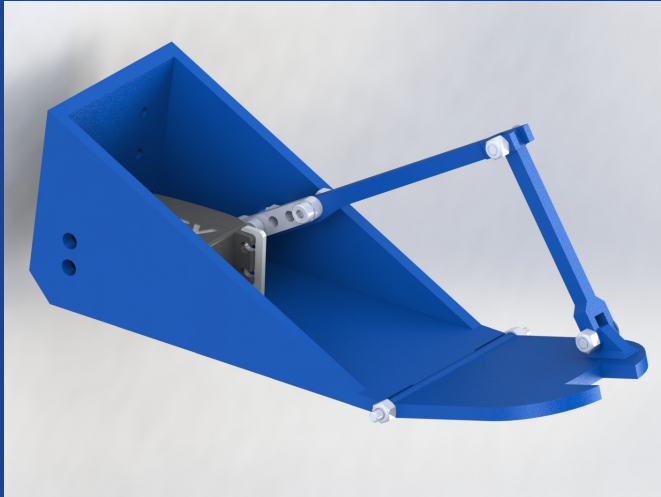
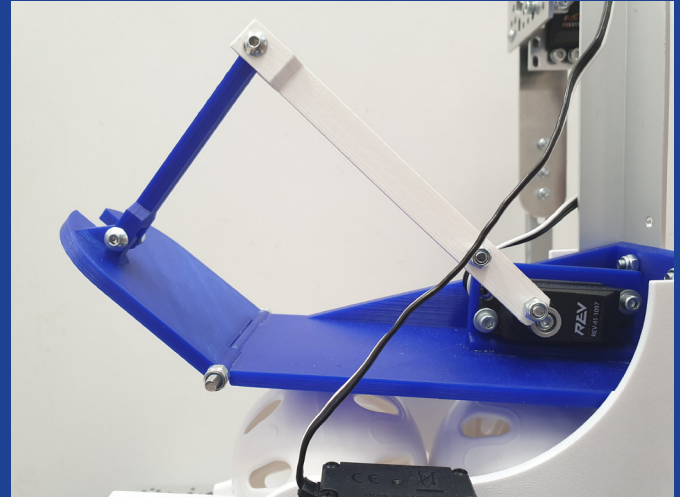
First Prototype made out of corner profiles

3.3. Storing Box

Because of our design choice, the Collector mechanism needs to convey the minerals in the Outtake. Therefore the synergy of these 2 systems is a crucial point that was accomplished by creating a near-perfect mesh between them.

For more efficient cycle times between the Crater and the Lander, there is a servo-controlled Sorting Arm on the right-hand side of the box, helping us passively sort the cubes from balls the moment we try to dump them into the Cargo Holds, from any orientation.

As a final touch, the entrance of the Storing Box has an integrated hinge, operated by a double linkage system for more efficient use of space and less rotational travel, making it fast and reliable, while making sure minerals don't fall while in motion.

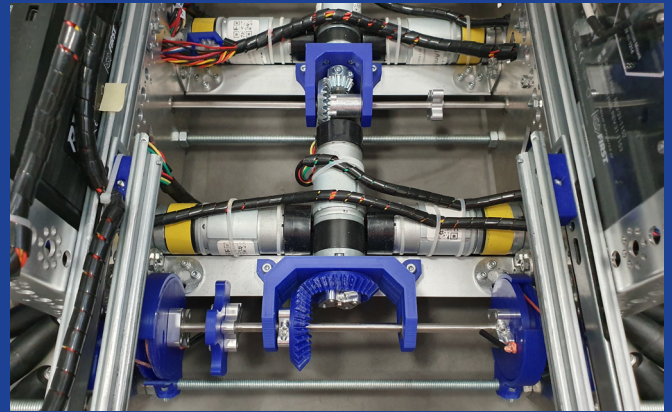
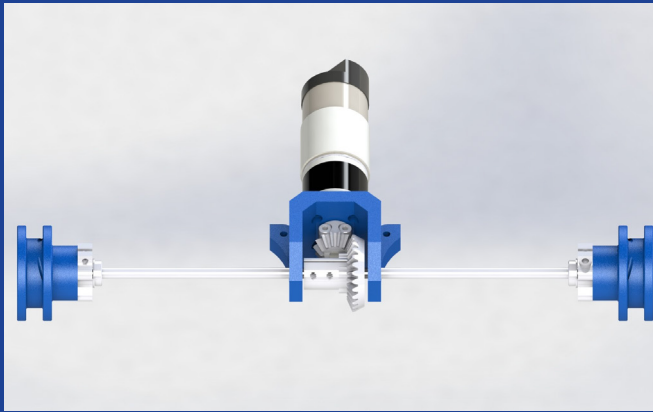
*Double Linkage System**Real life**Sorter Arm*

3.4. Extension System

To make the Scorpion reach the top of the lander, we scraped a few linear sliders from last years robot, but this quickly created issues since it would not extend as much as it was needed.

Instead of stacking multiple drawer sliders together, one of our sponsors brought us a new kind of slider that can be extended in both directions. Taking advantage of this characteristic allowed us to minimize weight and space usage by starting with the Scorpion extended downwards.

The Sliders are driven by 2 spools which are mounted on a stainless steel 6mm D-Shaft. This is powered by a Neverest 3.7:1 motor that is geared up to 7.4:1 using bevel gears, allowing us to change the axis of rotation to 90°, therefore improving our center of mass because of the motor placement between the drivetrain motors.



CAD vs Reality: Motor Transmission



Different types of sliders

4. Climb

4.1. Latching Mechanism

4.1.1 Introduction

In order to complete this year's End Game we had to think about a robust, reliable system that would be able to lift the robot swiftly, while providing repeatable unlatches in Autonomous and easy positioning in TeleOp.

The following designs were considered:

I. Hook

This involved a simple hook that would go into the Lander's handle.

Advantages:

- Simple to implement

Disadvantages:

- We needed to strafe upon landing in order to clear the handle
- It is fairly easy for the robot to fall off the lander

II. Harpoon

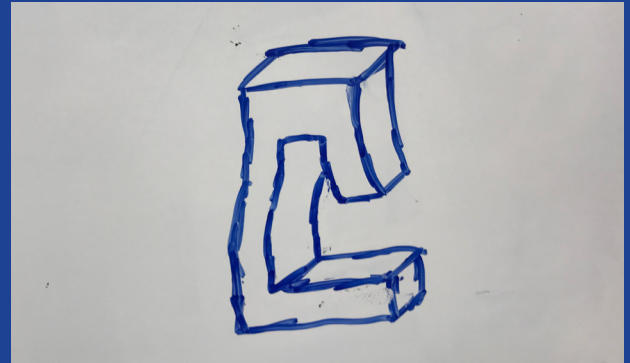
This option was based on two spring loaded flaps that would be pushed into the handle from below and snap into place.

Advantages:

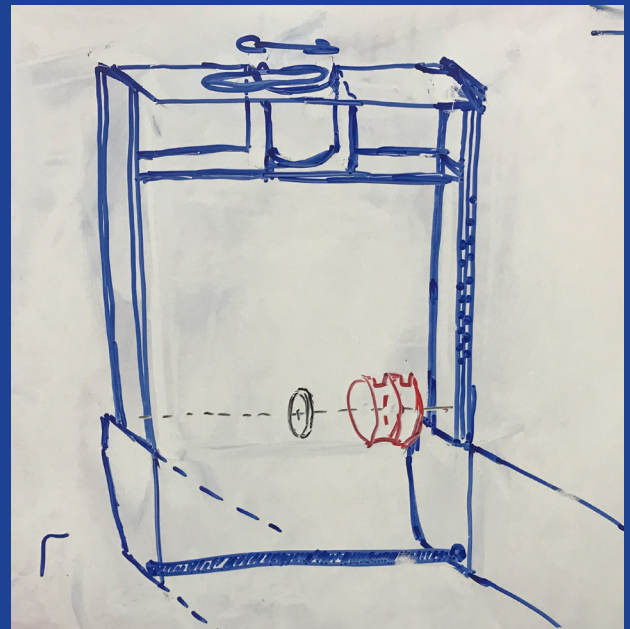
- Easy to latch and unlatch
- Impossible for the robot to fall, once hanged

Disadvantages:

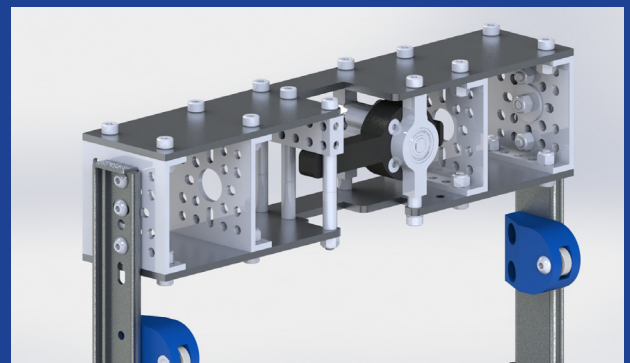
- If implemented poorly, it is less robust
- It needs more vertical movement to operate



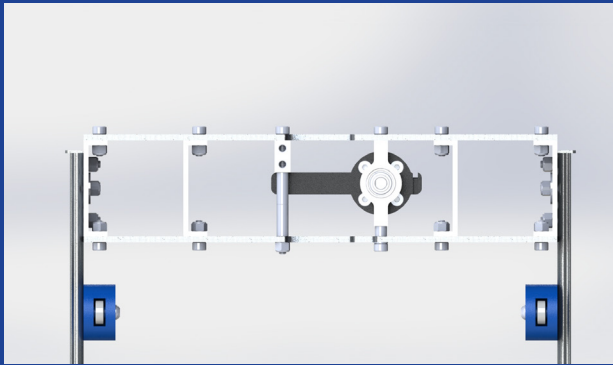
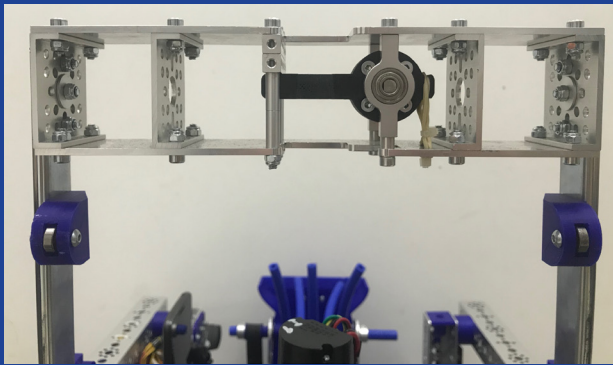
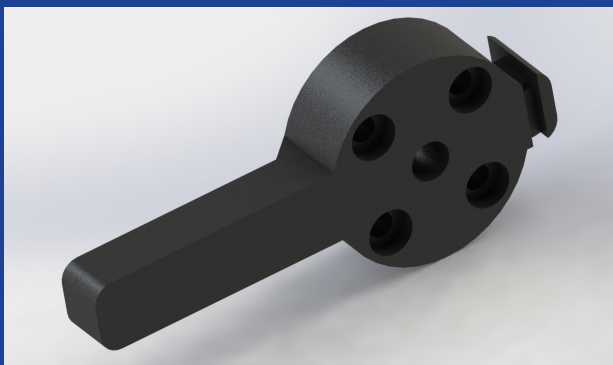
Hook Drawing



Harpoon Drawing



Upper Climb Render

*Upper Climb Render CAD vs Reality**Linear Slider**Polycarbonate Hook*

4.1.2 Conclusion

In the end, we decided to go with a simplified version with only one flap.

This hook rotates on an axle supported by two z969 bearings inside goBILDA pillow blocks and, when engaged, rests on a square beam. We used a rubber band to ensure that it snaps into place when released.

4.1.3 Spoiler Plates

This assembly was placed between two “spoiler plates” that we had CNC machined. In order to reach the handle we mounted the spoiler on a pair of 340 mm full extension drawer sliders.

4.1.4 Hook Design

Initially it was intended that the hook were machined from steel for its strength, however we switched to aluminum because of manufacturing limitations. Due to time constraints before the KRC, we ended printing it from polycarbonate and, since it held up with no problems, we kept making them this way.

In the second iteration we added countersunk holes for the mounting screws in order to shift the hook closer to the lander.

4.2.1. Introduction

I. Ratchet

- Straightforward.

- Clumsy.

- It is fragile, as it required a secondary servo as a means of disconnecting the ratchet and allowing the motor to spin in reverse.

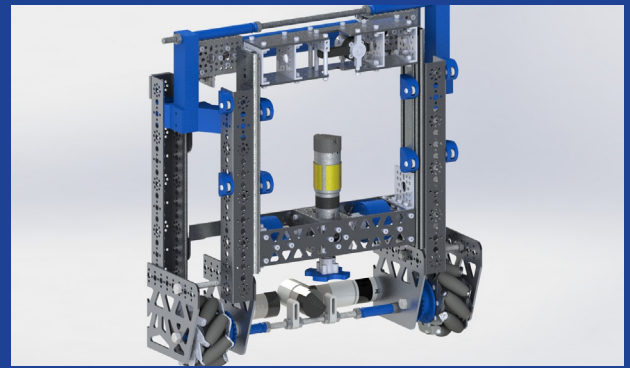
II. Pin break

This involved having a servo controlled, spring loaded, pin that would go into matching holes on a gear to lock its rotation. It was also contemplated about using some sort of break calipers, but this was never attempted.

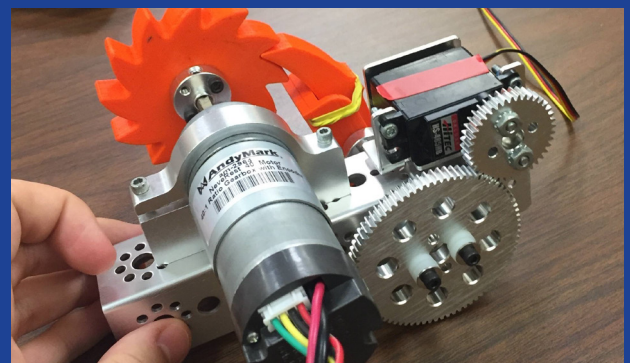
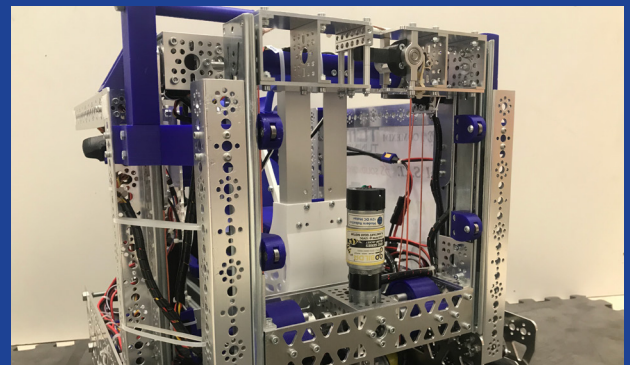
- Straightforward

- Finicky & Fragile

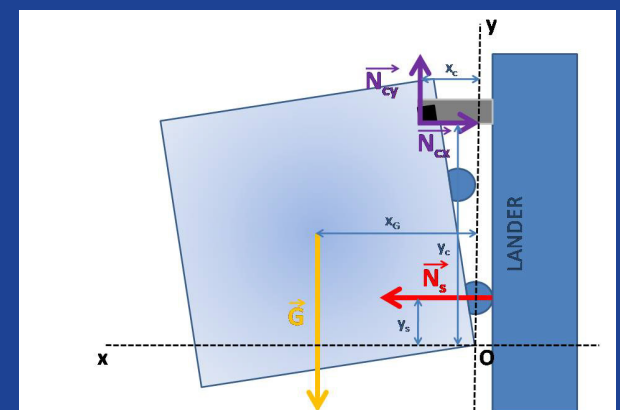
- This design also used a secondary servo for the pin



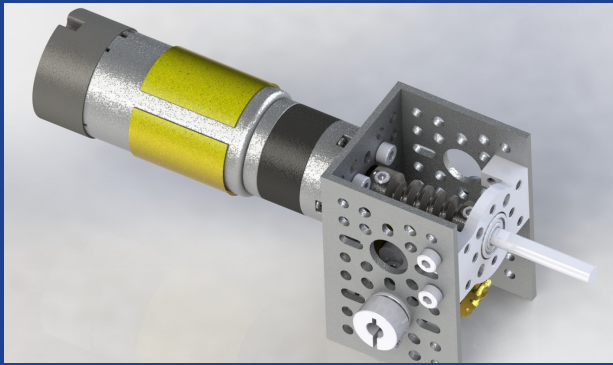
Climb Final Render CAD vs Reality



malum-panem's Tetrix compatible
ratchet (Reddit)



Forces applied on the robot while hanging



Worm Drive Assembly



Worm Gear



goBilda's Linear Actuator Kit

III. Worm drive

Using a worm drive solved the problem of locking the climb, as the output of the gearbox cannot drive the input.

Advantages:

- No back drive
- Compact

Disadvantages:

- High gear reduction; solved by using a motor with low gearing.

IV. Lead screw

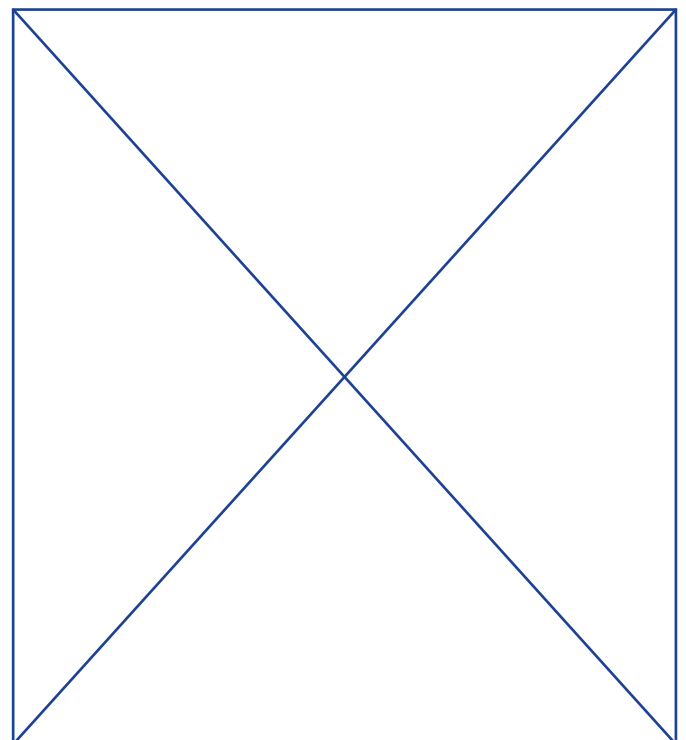
A fine pitch lead screw has the same effect as the worm gear in negating the back drive issue, while also providing the linear motion.

Advantages:

- No back drive
- Integrated linear motion

Disadvantages:

- Hard to adapt to our chassis design



4.2.2. Conclusion

We chose to go with goBILDA's singlethroated worm gear set, as it provided a strong foundation with great mounting options, and a speed reduction of 24 to 1. The chosen motor for this was a 3.7:1 Yellow Jacket Planetary Gear Motor with 5.4 kg*cm torque. This meant that, with 35 mm diameter spools, we could rise ~74 kg of robot, more than enough for FTC.

4.3. Thrust Bearings

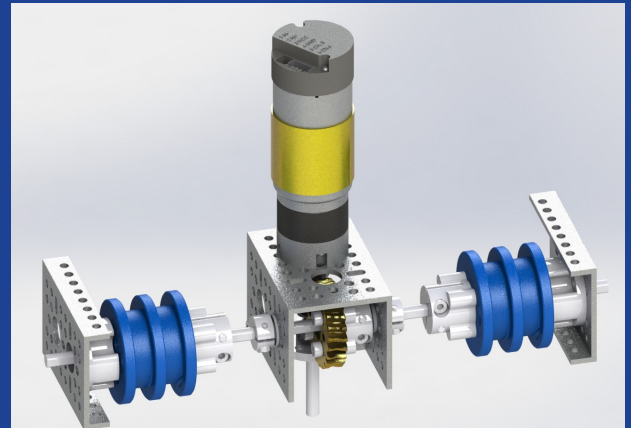
In order to ensure that the weight of the robot, transmitted through the wire, into the worm, would not go into the motor's gearbox, we added a thrust bearing that makes contact, through an adaptor, with the climb's structure. There is also a handle to manually spin the worm for positioning before matches.

4.4. Axle Bearings

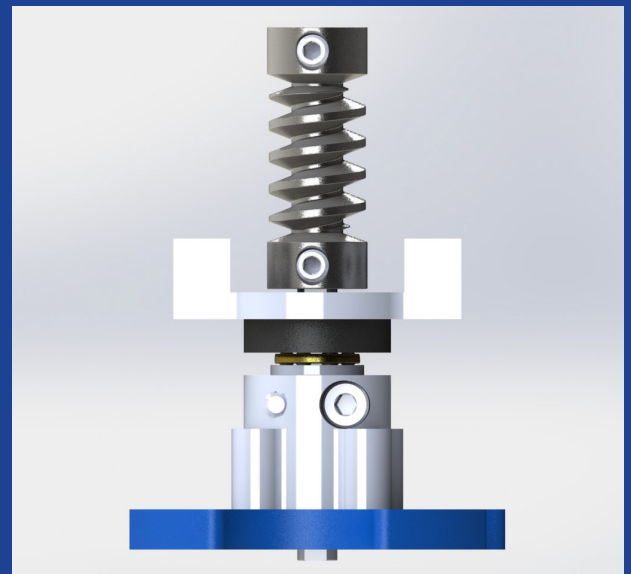
The main axle is supported by 6 ball bearings, with two double spools on each side, meaning two string for raising and two for lowering the climb.

4.5. Sliding Wheels

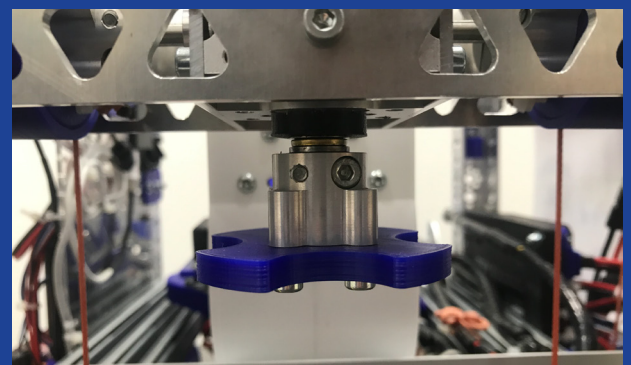
In the interest of best repeatability, we fitted 4 sliding wheels on the back of the robot. These help maintain parallelism with the Lander's side panel, while allowing some strafing when positioning.

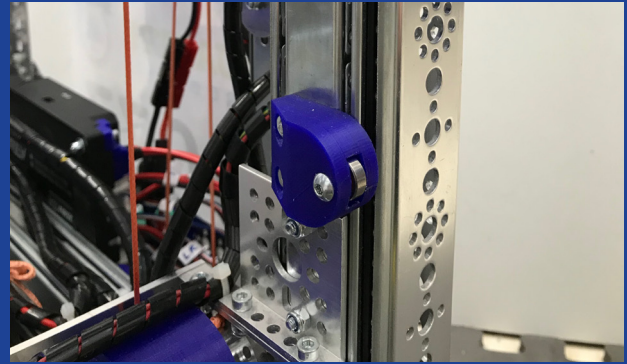
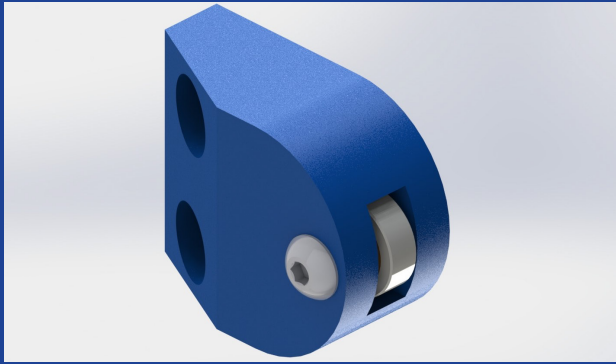


Climb Spools Axle



Thrust-Bearing Assembly CAD vs Reality



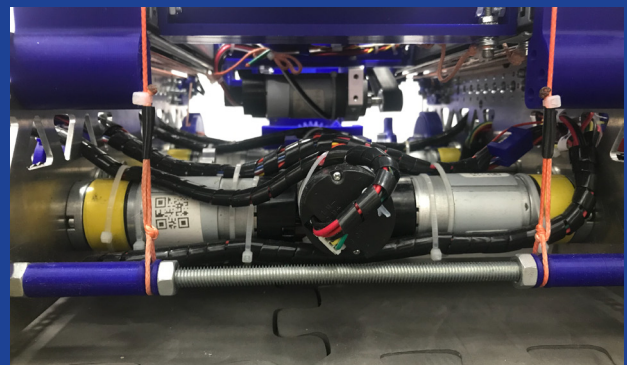
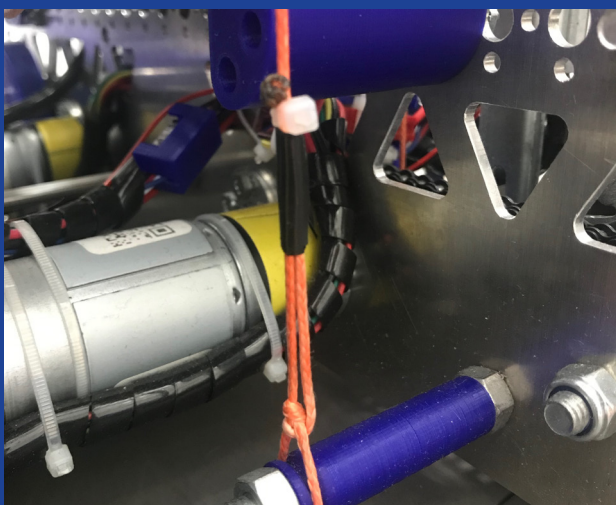
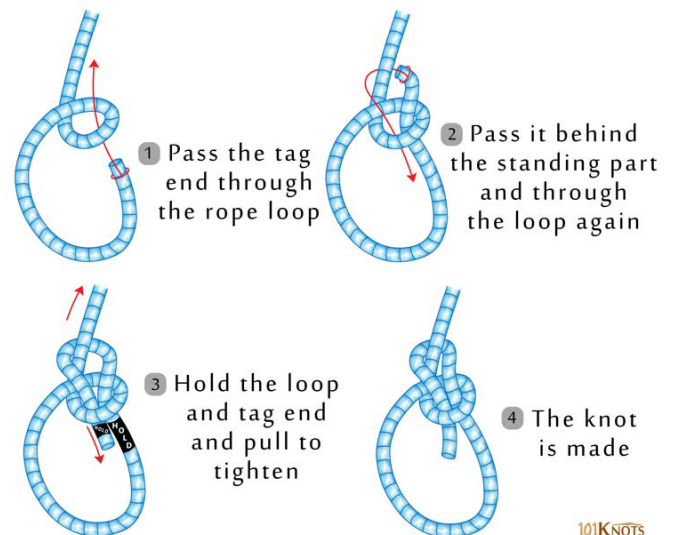


Sliding Wheel CAD vs Reality

4.6. String Management

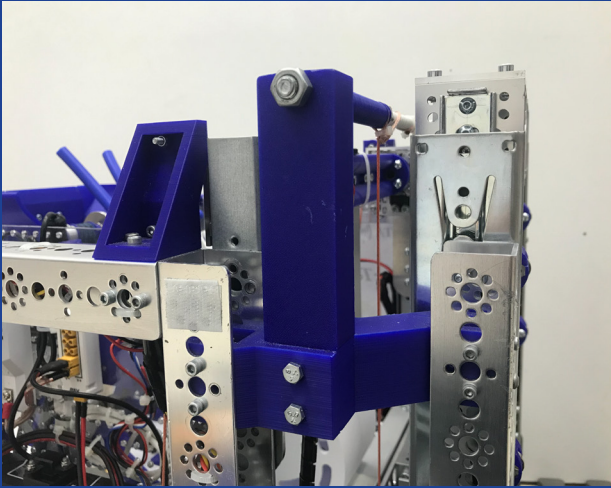
When the robot is latched to the Lander, the lower strings take the whole weight of the robot. As the wheels touch the ground the tension is transferred to the upper strings for the remainder of the unlatching process. This is reversed for latching in the End Game.

Bowline Knot Directions

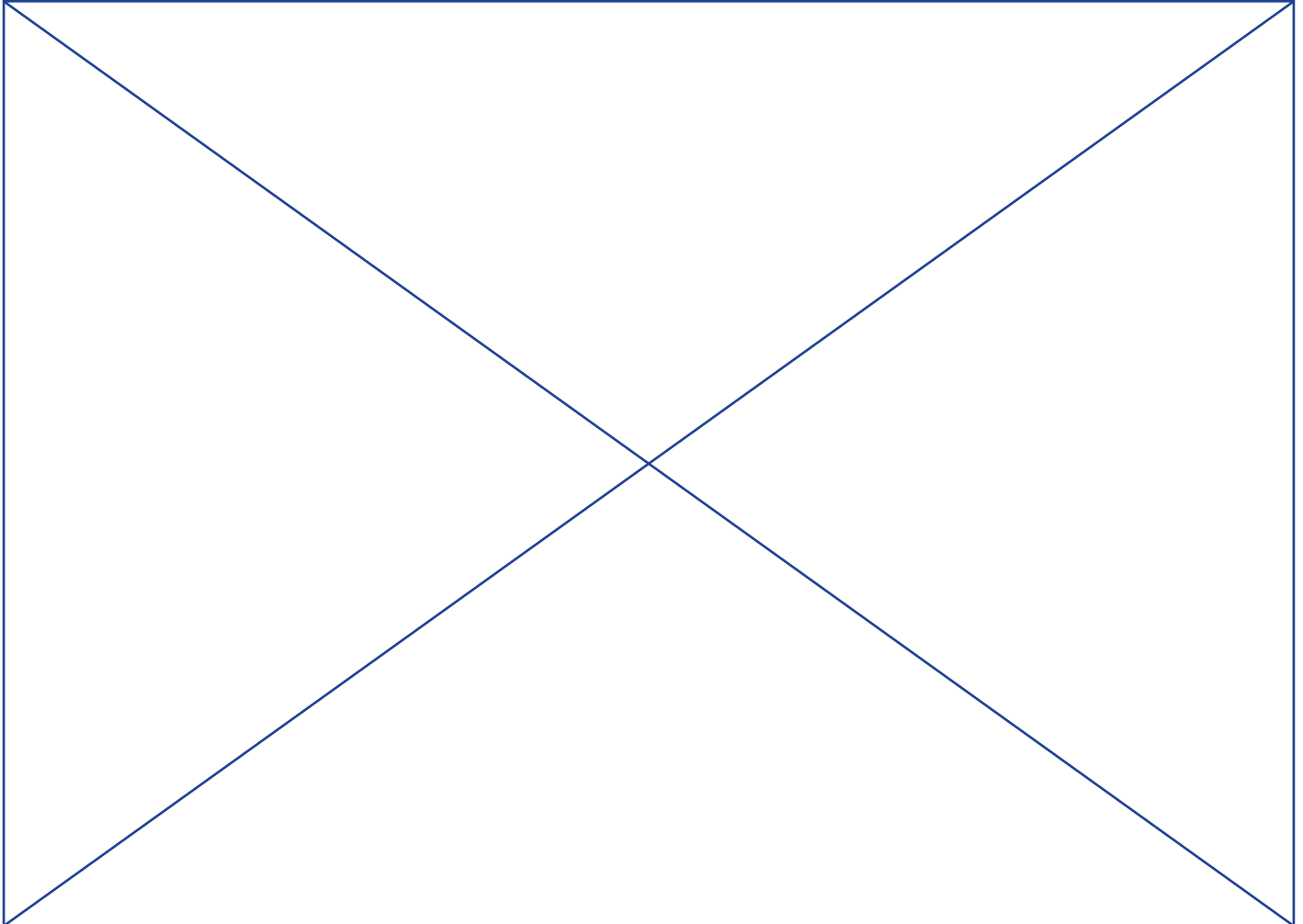


String Management

The strings are anchored to threaded rods spanning the width of the chassis, via 3D printed adapters with the help of a bowline knot. The lower one is directly screwed into the chassis plates, while the upper one is suspended above the TETRIX superstructure trough extenders that go into the 3D printed structural enhancers. The latter is not a problem as the upper strings hold at most the climb assembly and not the whole robot.



Structural Enhancer CAD vs Reality



5. Scientific analysis

5.1. Electrostatic discharge and FTC

During recent competitions, especially the Bucharest Qualifying Competition, we experienced ESD firsthand, with our robot disconnecting in key moments and even causing minor damage to the systems. This being said, we took action to research and combat this issue, for better results at our next competition.

5.1.1. Research

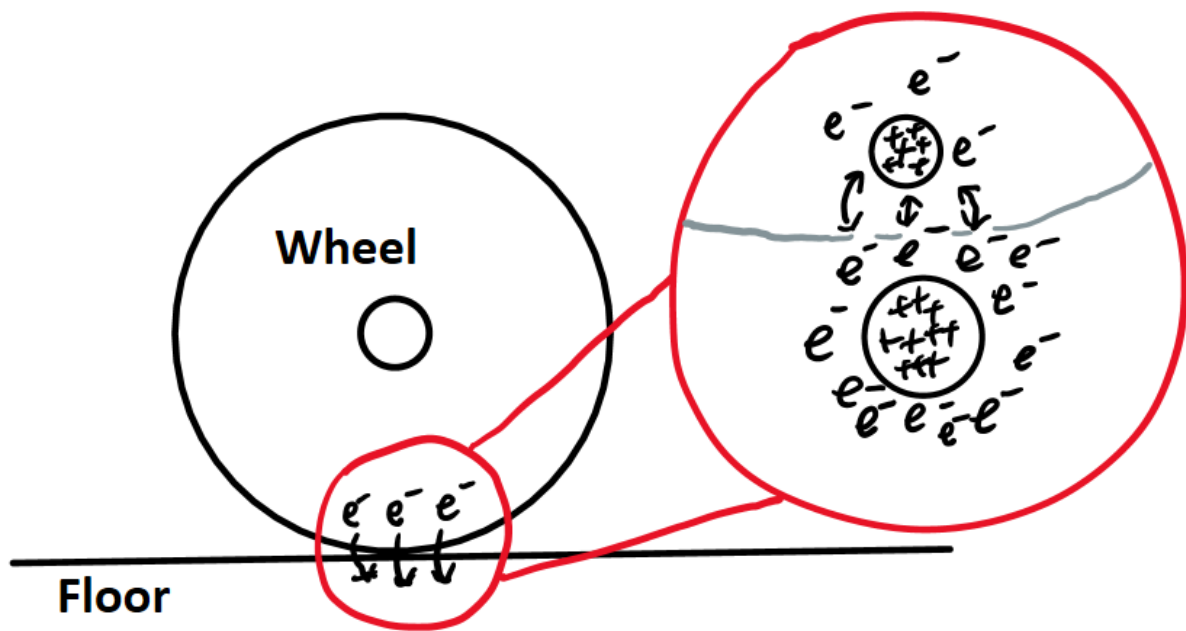
The following are passages from the white paper on the same topic, published by FIRST on September 18 of 2018, "An Analysis of ESD Mitigation for the FIRST Tech Challenge", by Eric Chen.

5.1.1.1. What is an Electrostatic Discharge Event?

An electrostatic discharge (ESD) event is when a highly charged object (like a robot) touches an uncharged or oppositely charged object and discharges to it. Because of the high voltages involved (up to tens of kilovolts), ESD events can produce extremely high electrical currents. Although ESD current spikes are extremely brief, they can easily damage or disrupt sensitive electrical devices.

5.1.1.2. How Robots Become Charged

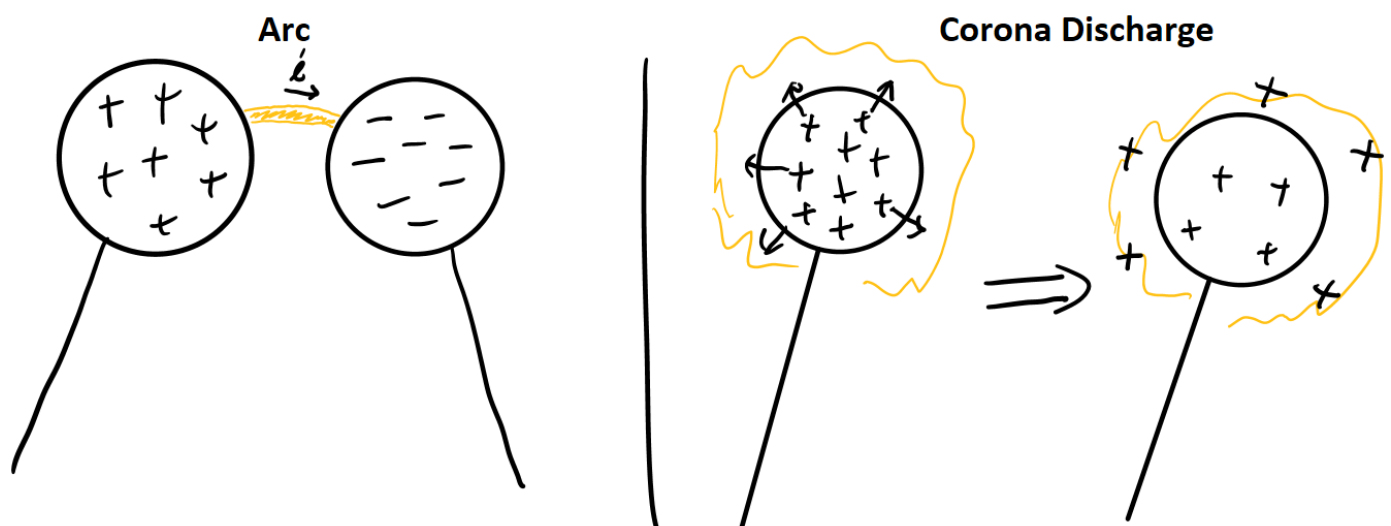
When two surfaces interact, there is generally a small amount of adhesion. This means that they share electrons and if they are made from different materials the electron sharing may be uneven. When the surfaces are taken apart, they can become charged. This is called the triboelectric effect. The triboelectric effect is more pronounced if the two surfaces slide past each other because they are not perfectly smooth and tiny imperfections cause vibrations. This causes the surfaces to make and break contact very quickly. It is important to note that triboelectric charging takes charge from one object and gives it to another. In the case of an FTC robot's wheels interacting with field tiles, positive charge is given to the wheels and negative charge is given to the tiles. The triboelectric effect has been found to be more pronounced in low relative humidity.

*Triboelectric Effect*

5.1.1.3. Discharging a Robot

There are two relevant ways to discharge something through the air. The first is arcing, which is when the air between two differently charged objects becomes ionized and allows current to flow from one to the other. The second is corona discharge, which involves charges on an object equalizing with ions in the air. Of these, corona discharge is more useful for mitigating static because it does not carry a hazardous amount of current.

A positively charged robot produces an electric field. Corona discharge works when a molecule ionizes in this field. The electron is pulled toward the robot and the positive ion is launched away. The electron hits other molecules causing them to ionize and eventually it runs into the robot, cancelling out a positive charge there. This process continues as a chain reaction. Because highly curved objects like sharp edges, points, and thin wires can concentrate electric fields, they tend to produce more corona discharge than smooth objects.

*Arcing vs. Corona Discharge*

5.1.1.4. Recommendations

I believe that the following solutions (in order of importance) should be considered for use during the 2018-2019 FTC season.

- Encourage teams to add ferrite chokes to signal wires- The combination of ferrite chokes and frame grounding proved to make the control system extremely robust in testing and it is very simple to add clip on chokes to wires.
- Ground the electrical system to the robot frame through a large resistor- Because it is difficult to perfectly isolate the electrical system, it is important to grounding the electrical system to the frame to prevents shocks from the frame to the electrical system. Testing showed that using a relatively small resistor could mitigate shocks on discharge. This resistor size should have a mandated minimum value of around 100 Ohms to limit current if a power wire is shorted to the frame and to prevent teams from using the frame to carry current. There need not be a maximum allowed resistor value. A reasonable starting value is 470 Ohms because it proved to work well in testing. This should be made clear to teams and an effort should be made to inform mentors who are not familiar with electrical design principles that grounding the frame does not pose a safety risk.
- Isolate electronics to prevent arcs- Isolating the electrical system from the frame can prevent arcing to sensitive components. Electrical isolation includes making sure that there is a large air gap (greater than 3/8" or 1 cm) between any exposed metal in the electrical system and any conductive frame member.
- Use anti-static spray on floor tiles- Heavy Duty Staticide substantially reduces or completely eliminates charge buildup and increases the rate of charge dissipation, even without static string or a ground plane. Heavy duty Staticide is designed to work on porous surfaces, like the FTC tiles while other formulations of Staticide are not. It is more durable and more effective.

5.1.2. What we did

As per the recommendations above, we purchased a Resistive Grounding Strap from REV Robotics. This also mandated the addition of a XT30 Power Distribution Block, since we were not allowed to exchange the XT30 connector, as stated by <RE14>I of the Game Manual Part 1. We also added a number of clip on ferrites to the USB, RS485, Servo, and other signal cables on the robot.



Grounding Strap



Box full of Ferrites

5.2. Work done by motors

We wanted to determinate the work done by some of motors to perform their tasks:

5.2.1. Climb

$W1$ = the work done by the climb in order to raise the robot to latching height

$G1$ = weight of the robot = $19 \text{ kg} \times 10 \text{ N/kg} = 190 \text{ N}$

$\Delta H1$ = the distance that the robot raises = 0.2525 m

$$W1 = \int_0^{\Delta H1} G1 dh = G1 \times \Delta H1 = 190 \text{ N} \times 0.2525 \text{ m} = 47.975 \text{ J}$$

5.2.2. Outtake

W = the work done by the lift system to raise the outtake system to release the minerals

$G2$ = weight of the lifting system and the 2 minerals = $(1.35 \text{ kg} + 0.05 \times 2 \text{ kg}) \times 10 \text{ N/kg} = 14.5 \text{ N}$

$\Delta H2$ = the difference of height at which the minerals are lifted = 0.345 m

$$W2 = \int_0^{\Delta H2} G2 dh = G2 \times \Delta H2 = 14.5 \text{ N} \times 0.345 \text{ m} = 5.0025 \text{ J}$$

$$v = \frac{\Delta H2}{\Delta t2} = \frac{0.345 \text{ m}}{0.7 \text{ s}} = 0.5 \text{ m/s}$$

5.3. Motor Study

With the help of Ms. Sacontala and using equipment from the school's physics lab, we conducted an experiment to determine the behavior of a DC motor under different loads.

5.3.1. Materials used

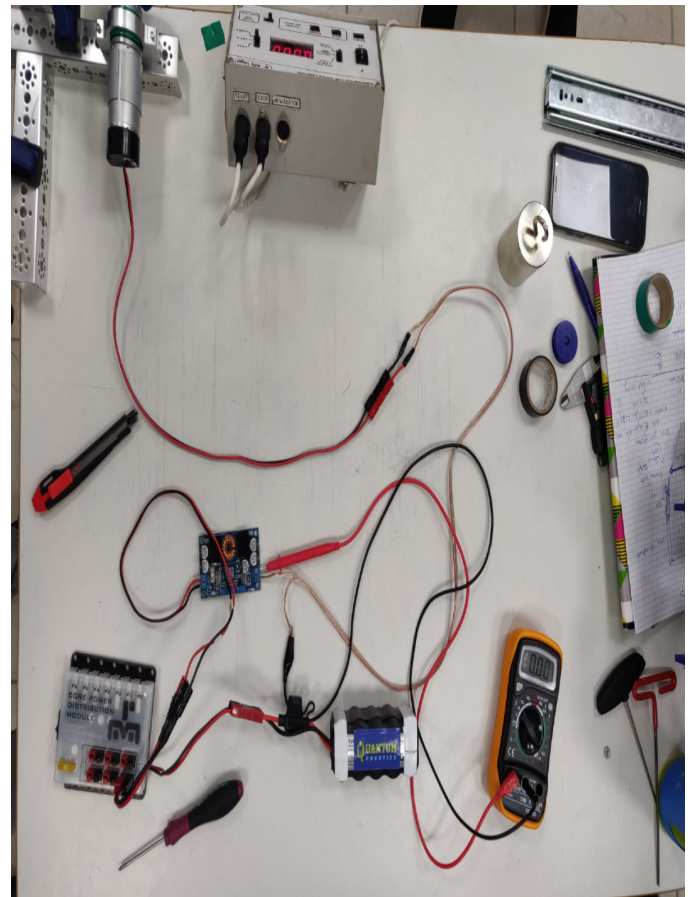
- 1 x AndyMark Neverest 20 Orbital Gear-motor
- 1 x 3D printed spool (25 mm radius) with goBilda clamping hub attached
- ~3 m of REV Robotics 1.2 mm UHMWPE cord
- 1 x 3D printed pulley with 608 bearing
- Structure made out of Tetrix
- Lab Weights
- 1 x Lab Stopwatch with two Optical Triggers
- 1 x Lab Pillar Base and clamps
- 1 x Modern Robotics Core Power Distribution Module
- 1 x LM2596 Buck-Boost Convertor • 2 x Multimeters • Various wires

5.3.2. Method

Since we used it extensively, for its reliability and efficiency, we decided to use a new, unused, NeveRest 20 Orbital Gearmotor for our tests. We built a simple test rig out of Tetrix and clamped it down to corner of a table with the help of two Irwin QuickGrips. The motor was mounted to the structure using a standard clamping motor mount and the pulley was fixed to the top of the structure on a M8 bolt. A stopper knot was tied at one end of The UHMWPE cord and a small loop was made at the other. The spool and the cord were then fastened to the DShaft via the hub.



Stopwatch Triggers

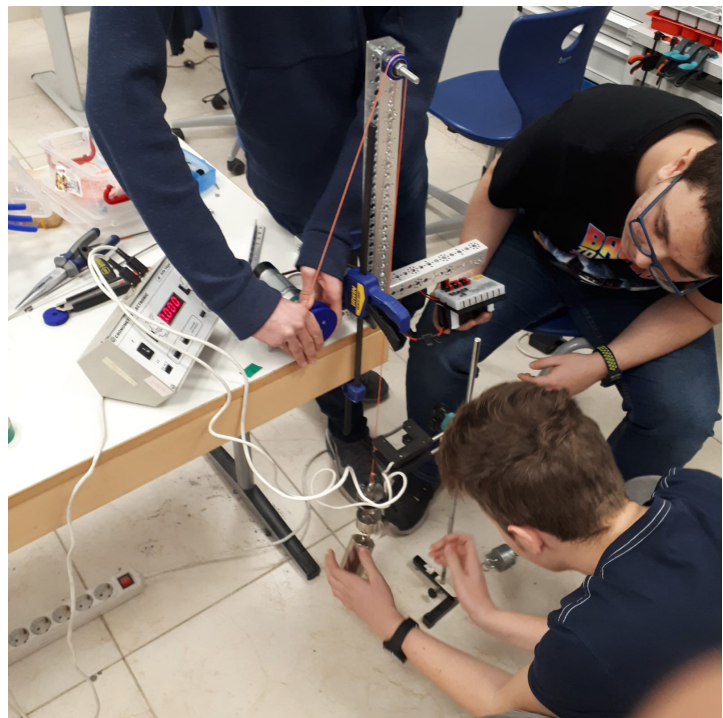


Power Setup

The Optical Triggers of the Digital Stopwatch were affixed to the top of the pillar with a gap of 35 mm between the start and the stop sensors. A small cardboard flag was taped to the first weight and positioned so that it would pass through the opening of the triggers. Other weights would be attached below this one to increase the load on the system. This worked fine for the first few tests but, when the chain of weights got too long, we switched to a small tool box with a metal rod as a flag.



Stopwatch Display



Experiment Setup

Initially we intended to use a Modern Robotics Core Power Distribution Module to directly power the motor and use its power button to control it, however, after a few tries, we found that the voltage would drop significantly, when load was applied to the motor. This prompted us to find a more constant voltage source. Our solution was using a LM2596 Step-up Step-down Converter board in tandem with the CPDM, to regulate the voltage passed through to the motor. We also added two multimeters, one in current and one in voltage mode, to the circuit to help us monitor the power usage.

The tests went as follows:

1. A number of weights were placed in the box. The total weight was noted.
2. The spool was hand tightened.
3. The Stopwatch was zeroed.
4. The CPDM was turned on.
5. The extreme values of the voltmeter and ammeter were note.
6. The CPDM was turned off immediately after the flag cleared the triggers.
7. The reading of the Stopwatch was noted

Nr	m (g)	Torque (Nm)	r (mm)	d (mm)	t (s)	Speed (RPM)	Uin (V)	Iin (A)
----	-------	-------------	--------	--------	-------	-------------	---------	---------

5.3.3. Data analysis

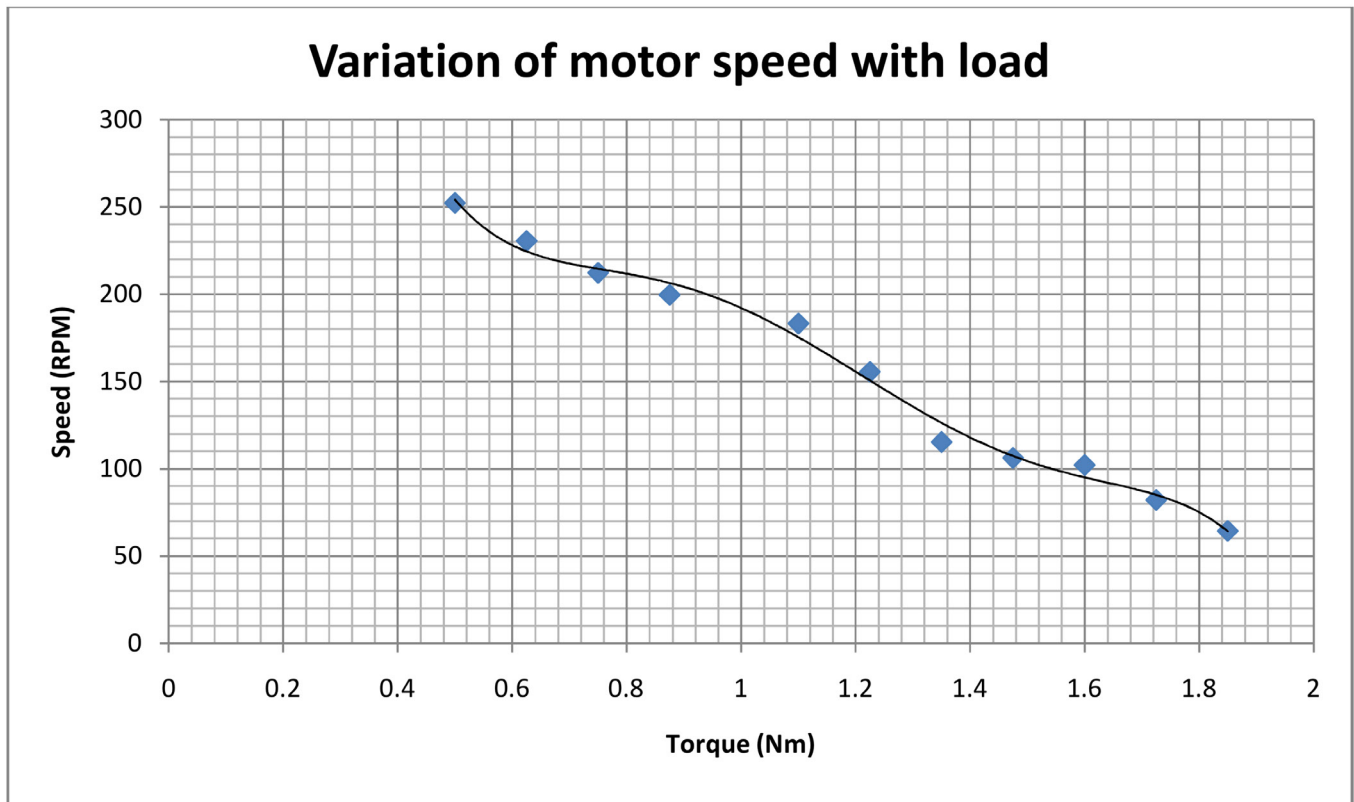
Torque is calculated as follows:

$$Torque = m \times g \times r$$

Motor output speed is calculated as bellow:

$$Speed = \frac{d}{2\pi r t}$$

Nr	m (g)	Torque (Nm)	r (mm)	d (mm)	t (s)	Speed (RPM)	Uin (V)	Iin (A)
1	2000	0.5	25	35	0.053	252.37	12	2.32
2	2500	0.625	25	35	0.053	230.61	12	2.63
3	3000	0.75	25	35	0.063	212.31	12	3.12
4	3500	0.875	25	35	0.067	199.63	12	5.24
5	4400	1.1	25	35	0.073	183.23	12	4.3
6	4900	1.225	25	35	0.086	155.53	12	4.9
7	5400	1.35	25	35	0.116	115.31	11	5
8	5900	1.475	25	35	0.126	106.15	11	5.6
9	6400	1.6	25	35	0.131	102.10	10.9	5.9
10	6900	1.725	25	35	0.163	82.06	10.86	6.5
11	7400	1.85	25	35	0.208	64.31	10.8	7



5.3.4. Error sources and Limitations

Even though we tried to be as rigorous as possible in our tests, there were some things that we missed or couldn't control.

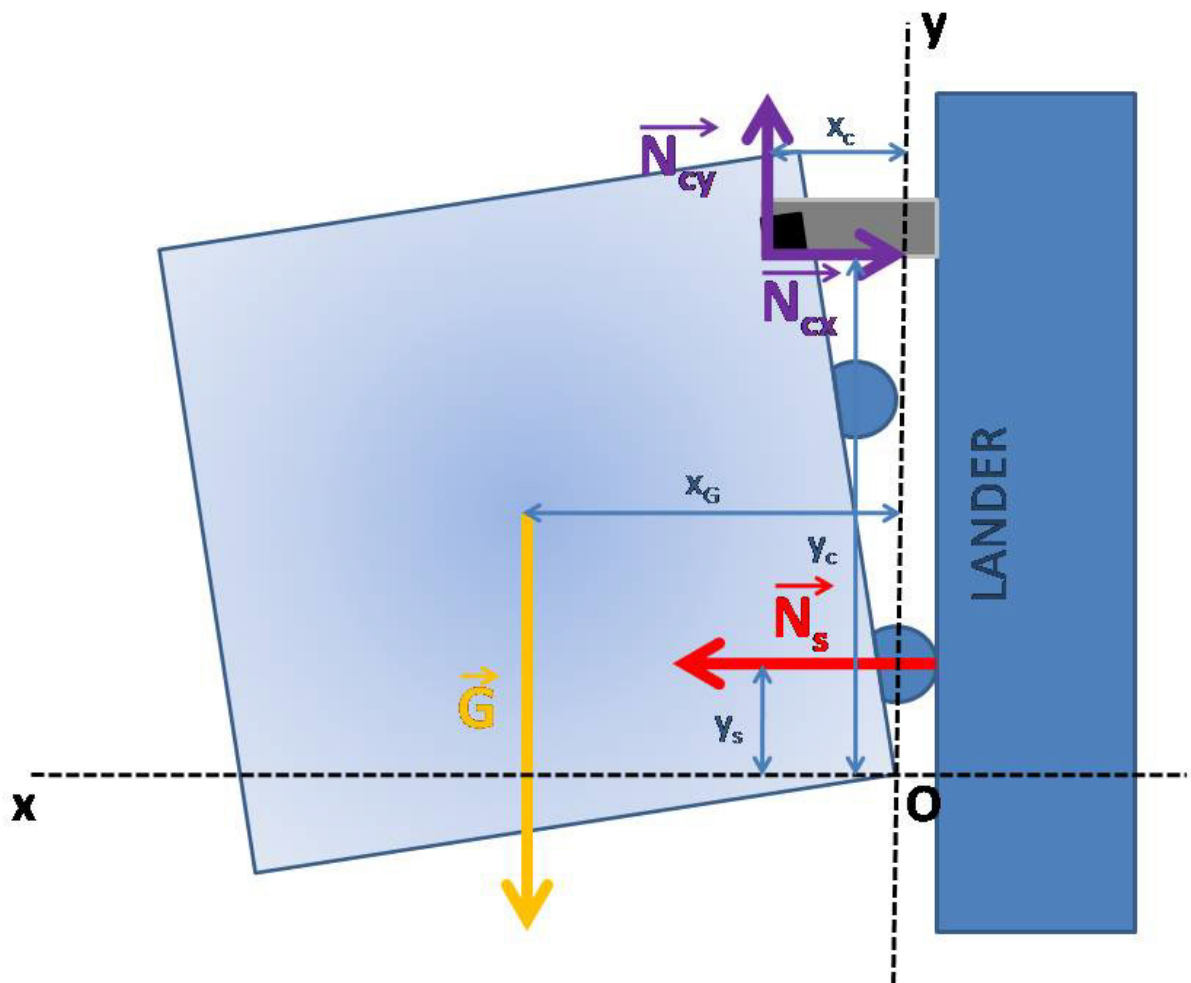
- Error in measuring the distance between the sensors of the triggers.
- Error in registering the values of the multimeters, as they had a low refresh/ sampling rate.
- Cord stacking on the spool, thus increasing the radius.
- Ignoring the mass of the cord
- Friction in the pulley
- Heating of the motor

5.3.5. Conclusions

The AndyMark NeveRest 20 Orbital Gearmotor is one of the best FTC legal motors and, because of that, is used extensively on our robot. This research helps us better understand how some of the systems on our robot work and assists in planning future.

This type of motor is currently used for all four motors of the drivetrain and on the Intake Sliders. Furthermore, this data can also be extrapolated for use with the NeveRest 3.7 Orbital Gearmotor by dividing the speed by $19.2 / 3.7 = 5.18$.

5.4. Climb Study



We want to determine how much tension is put on the climb system when the robot is hanged.

From the equation of rotational equilibrium we get:

$$G \times x_G + N_s \times y_s - N_{cy} \times x_c - N_{cx} \times y_c = 0$$

From the equation of translational equilibrium we get:

$$G - N_{CY} = 0$$

$$N_S - N_{CX} = 0$$

$$G \times x_G + N_{CX} \times y_S - G \times x_C - N_{CX} \times y_C = 0$$

$$G \times (x_G - x_C) + N_{CX} \times (y_S - y_C) = 0$$

$$N_{CX} \times (y_S - y_C) = G \times (x_C - x_G)$$

$$N_{CX} = G \times \frac{x_C - x_G}{y_S - y_C}$$

From measurements and approximations we can say that:

- The angle that the robot makes with the lander when latched is $\alpha = 6.5^\circ$
- From the CAD model we can measure and calculate:
 - $x_C = 52.93 \text{ mm}$
 - $x_G = 205.64 \text{ mm}$
 - $y_S = 153.28 \text{ mm}$
 - $y_C = 309.50 \text{ mm}$
- The weight of the robot is approximately $G = 19 \text{ kg} \times 10 \text{ N/kg} = 190 \text{ N}$

$$N_{CX} = 190 \text{ N} \times \frac{52.93 - 205.64}{153.28 - 309.50}$$

$$N_{CX} = 190 \text{ N} \times \frac{-152.71}{-156.22}$$

$$N_{CX} = 190 \text{ N} \times 0.9775$$

$$N_{CX} = 185.7310 \text{ N}$$

But

$$N_S - N_{CX} = 0 \Rightarrow N_S = 185.7310 \text{ N}$$

And

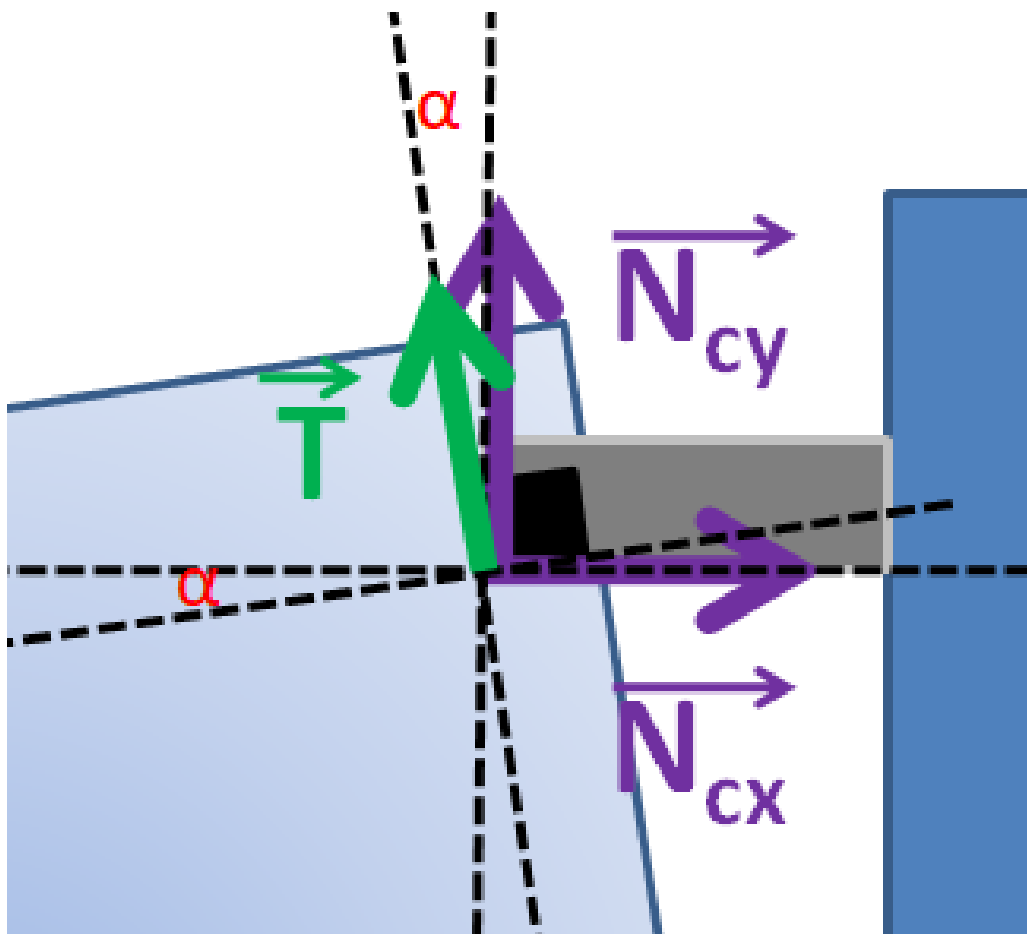
$$G \times x_G + N_S \times y_S - N_{CY} \times x_C - N_{CX} \times y_C = 0$$

$$G \times x_G + N_S \times y_S - N_{CX} \times y_C = N_{CY} \times x_C$$

$$N_{CY} = \frac{G \times x_G + N_S \times y_S - N_{CX} \times y_C}{x_C}$$

$$N_{CY} = \frac{190 \times 204.64 + 185.73 \times 153.28 - 185.73 \times 309.50}{52.93} \text{ N}$$

$$N_{CY} = \frac{38881.60 + 28282.96 - 57483.44}{52.93} \text{ N}$$



Now, the force transmitted as tension from the hook into the cord is:

$$T = N_{CY} \times \cos \alpha - N_{CX} \times \sin \alpha$$

$$T = 182.90 \times 0.9935 \text{ N} - 185.73 \times 0.1132 \text{ N}$$

$$T = 181.7112 \text{ N} - 21.0246 \text{ N}$$

$$T = 160.6866 \text{ N}$$

The goBilda 3.7:1 Yellow Jacket Planetary Gearmotor, geared down through the 24:1 worm gear has a stall torque of:

$$\text{StallTorque} = 5.4 \text{ kgcm} \times 10 \frac{\text{N}}{\text{kg}} \times 24 = 1296 \text{ Ncm} = 12.96 \text{ Nm}$$

The torque created by the tension in the cord applied through the 35 mm spool is:

$$\text{AppliedTorque} = T \times 35 \text{ mm} = 160.6866 \text{ N} \times 0.035 \text{ m} = 5.62 \text{ Nm}$$

As we can see, the StallTorque is about two times greater than the AppliedTorque, so the climb is able to raise the robot. In the real world, however, considerable amounts of friction are applied to the mechanism, especially at the meshing surfaces of the worm gear, thus the difference is not as substantial.

5.5. Materials and Material Properties

The meeting with Mr. Grigore Lucian, professor to the Faculty of Engineering “Titu Maiorescu” faculty determined us to learn about different material properties and how they affect the strength of that material. On the robot we use different types of materials from metal, aluminium, hard aluminium, plastic, cables. Each material has its properties and reacts according to the forces it is subjected to.

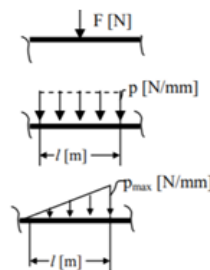
The teacher explained that there are different forces that lead to breaking, such as:

- the axial force N, which has the effect of stretching the fibers of the material
- the cutting force - which involves the clockwise rotation of the element on which it acts

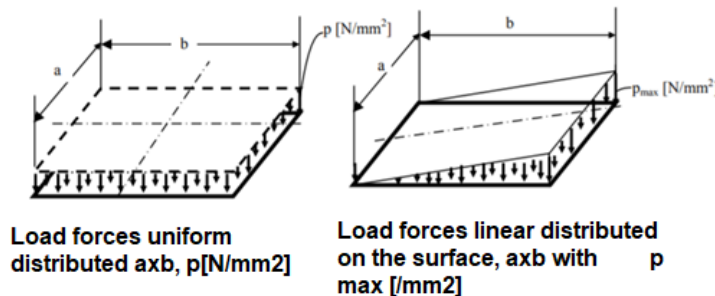
- Bending moment M_{iz} (in plane) is considered positive when it results in the stretching of the lower fibres and the compression of the upper ones

We looked at the strength curves of a generic material to look at the three different points of importance and how the forces work on the materials; when the material breaks, when the material bends beyond repair (cannot return to its original form), and when the material bends without breaking.

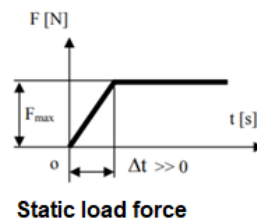
Also, the distribution of forces on the surface of the robot parts increases or decreases the resistance to shocks during gaming. An image of this is below.



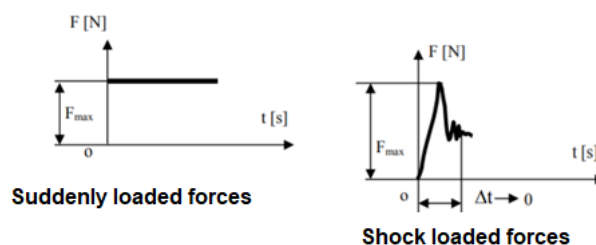
Distribution of the load forces on the length
 p [N/mm]



Depending on the way robot materials are used, dynamic forces and static forces can occur. Static forces are produced with a slow load with the load from 0 to the maximum value F_{max} . See the figure below:



Usually we meet dynamic forces which can appear suddenly or shock, and this can be variable and depend on the time.

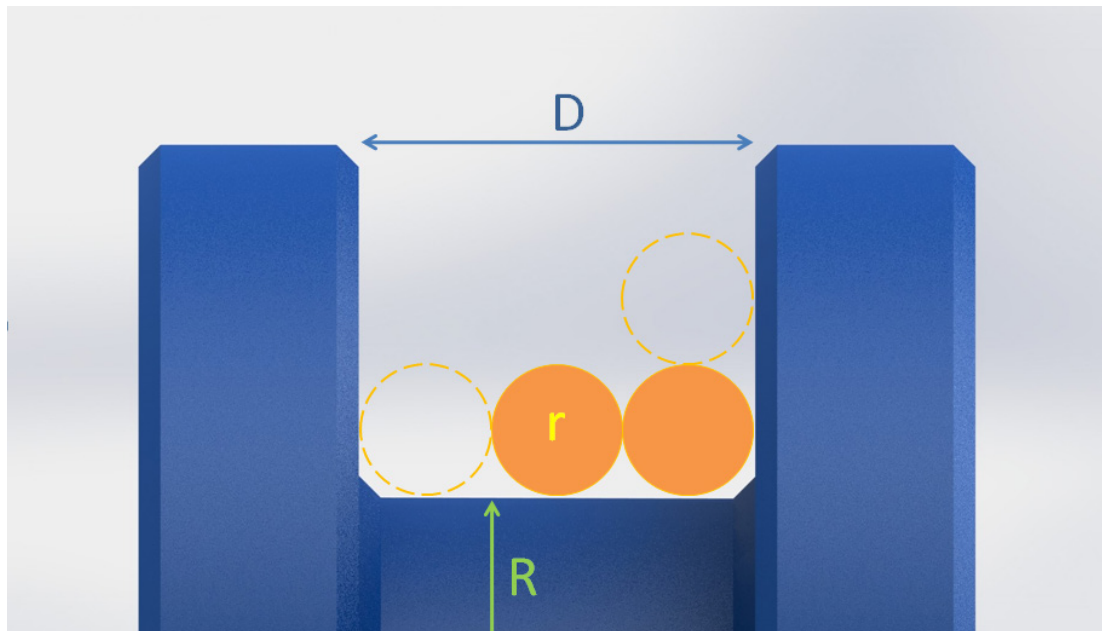


This explanation helps us to understand about CNC machines and Laser cutters that may be available to us and how different material properties affect how stiff, strong and rigid a material is.

We also discussed which strong and light materials he would recommend using and which is the proper manufacturing techniques to make parts out of sheets of raw materials machine to cut.

5.6. Spool Calculations

Since we have three different spool models on this year's robot we considered their design to be a high priority.



Let's assume that the radius of the spool is R , the radius of the string is r and the width of the spool is D . We approximate that the diameter of the REV 1.2 mm UHMWPE cord is 1.5 mm, because of manufacturing tolerances, so $r = 1.5/2 \text{ mm} = 0.75 \text{ mm}$.

Due to the design of the spools, the cord is anchored through a swept cut hole in the side. This ensures that the first layer of string is neatly coiled. The second layer, however, would not organize itself nicely. This being said, we want to avoid having more than one layer of cord. Also, for ease of stringing and tensioning, we like to also include about one turn of pre-tensioned string.

$$NrTurns = \frac{L}{2\pi R}$$

If we consider the path length of the string to be L , we need to calculate the numbers of turns that the cord will coil around the spool:

This means that

$$D \geq NrTurns \times 2 \times r + 1 = \frac{2Lr}{2\pi R} + 1 = \frac{Lr}{\pi R} + 1$$

Now if we consider ω to be the rotational speed of the motor at the implied torque, the time Δt it takes for a full unroll of the spool is linked to the $NrTurns$ and the radius R , as such:

$$\omega \times \Delta t = 2\pi \times NrTurns = \frac{L}{R}$$

$$R = \frac{L}{\omega \times \Delta t}$$

By using the last formula you first determine the radius of the spool in relation to the required string length L and the characteristics of the motion, ω and Δt .

Now, the value of D can be calculated by rounding up the value of

$$\frac{Lr}{\pi R}$$

We used the method described above with great success in the planning and design of our robot.

2) Programming

1. Arhitecture

Our codebase is designed to be modular and reusable. Every component is appropriately encapsulated with suitable abstractions. This makes the creation of OpMode easier without the brittleness of putting every method into a single superclass.

1.1. Hardware Abstraction Layer

To help facilitate our modular design, each robot subsystem (e.g., the drivetrain) has its own class. This class abstracts the “low-level” (in our case) I/O operations (e.g., setting motor power, reading encoders) and presents a logical interface to interact with the subsystem.

1.1.1. Subsystem Example

To see this in action, let’s examine the *Outtake* class which controls the outtake system of the robot. First off, it begins with a section of constants:

```
public class Outtake implements Subsystem {
    public static final boolean IS_DISABLED = false;
    public static final double TRANSFER_DOOR_POSITION = 0.08;
```

These constants are easily changed; such that changes in the physical robot can be quickly reproduced in code. Next, there’s a section of variables and a constructor to properly initialize them:

```
public enum ScorpionMode {
    DOWN,
    MIDDLE,
    UP
}

public ScorpionMode scorpionMode = ScorpionMode.DOWN;

private DcMotorEx liftMotor;
private Servo leftScorpion;
private Servo rightScorpion;
private double liftPower = 0;
// redundant instance variables omitted...

public Outtake(HardwareMap hardwareMap, Robot robot) {
    liftMotor = hardwareMap.get(DcMotorEx.class, "liftMotor");
    liftMotor.setDirection(DcMotor.Direction.REVERSE);
    liftMotor.setZeroPowerBehavior(DcMotor.ZeroPowerBehavior.BRAKE);

    leftScorpion = hardwareMap.get(Servo.class, "leftScorpion");
    rightScorpion = hardwareMap.get(Servo.class, "rightScorpion");

    // redundant initialization logic
}
```

This is mostly boilerplate initialization logic, although there are a few things of note. First, all subsystems are designed to work asynchronously. To implement this, every subsystem has an **update()** method (more below) and a mode enum that describes the current operating mode/state (almost like a finite state machine). This design choice allows for code reuse across both iterative and sequential OpModes.

Next there are several methods for interacting with the subsystem. In our implementation, most of the methods only update the desired state and defer execution to **update()**.

```
public void setLiftPower(double liftPower) {
    this.liftPower = liftPower;
}

private boolean isLiftUp() {
    return liftSwitch.getState();
}
```

Now the majority of the work is done within the **update()** method. As with all subsystems, this is called repeatedly by the Robot object, that coordinates the calls for all the **update()** methods.

```
@Override
public void update() {
    if (IS_DISABLED)
        return;

    if ((liftPower > 0 && !(isLiftUp()))
        || (liftPower < 0 && Math.abs(getLiftEncoder()) > 20))
        liftMotor.setPower(liftPower);
    else
        liftMotor.setPower(0.2);

    switch (scorpionMode) {
        case DOWN:
            leftScorpion.setPosition(0.935);
            rightScorpion.setPosition(0.065);
            break;
        case MIDDLE:
            leftScorpion.setPosition(0.34);
            rightScorpion.setPosition(0.66);
            break;
        case UP:
            leftScorpion.setPosition(0.165);
            rightScorpion.setPosition(0.835);
            break;
    }
}
```

Nearly ever **update()** method has a **switch** statement to handle the different states/modes. This is often followed by logic that executes in every mode.

2. Autonomy Period

2.1. Summary

- A **105 point auto** on the lander position facing the crater, and an **80 point auto** on the lander position facing the depot.
- Uses **TensorFlow** to **identify** and knock off the gold mineral off the sampling field. This has been **100% consistent** in matches.
- Lowers down from the lander using the encoder on the motor for accuracy.
- Using the drive motor encoders and the REV Expansion Hub IMU, the robot follows a preplanned trajectory, correcting for errors with two PID controllers.
- Drops the Team Marker in the depot using the Intake system.
- The robot turns towards the appropriate crater and parks.

2.2. Sensors used

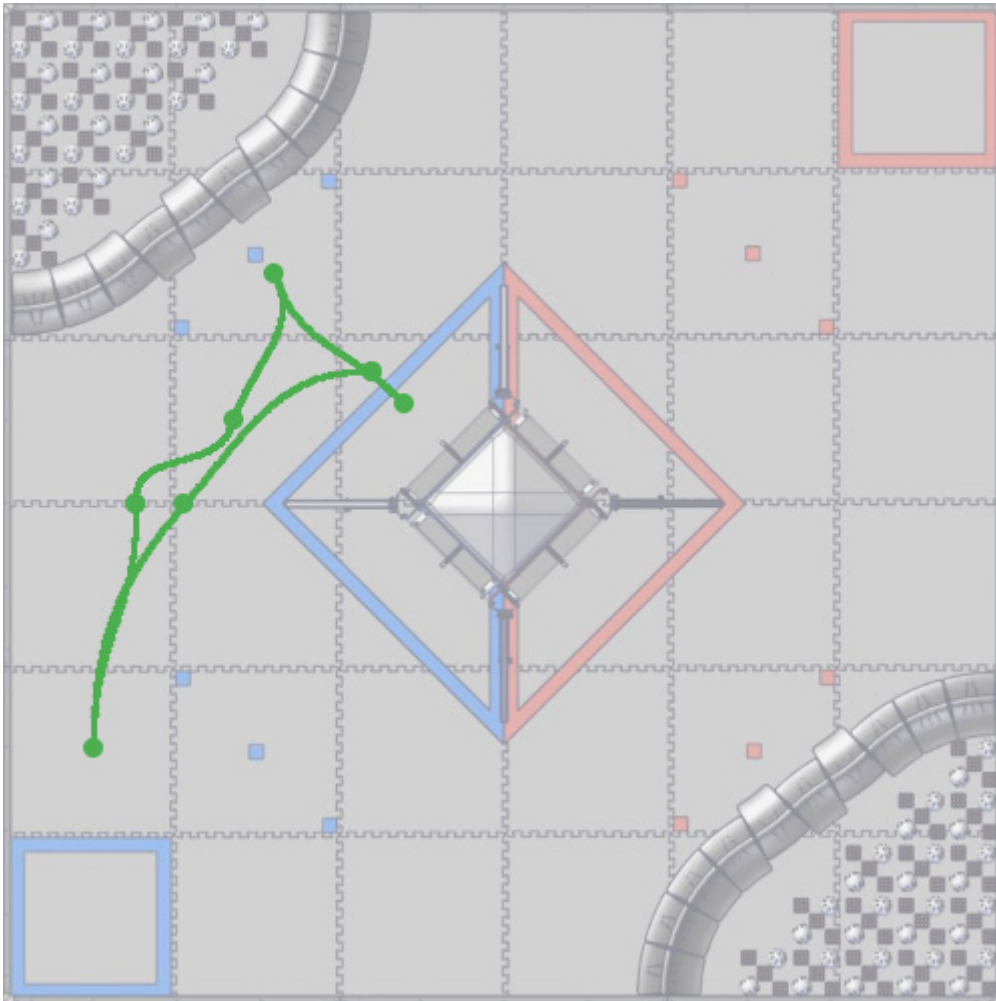
- Bosch BNO055 IMU — The internal IMU inside of a REV hub is used to accurately measure the robot's heading. This heading is critical to maintaining a dead reckoning estimate of the robot's pose in the autonomous routine and applying appropriate corrections to keep a desired heading over time.
- Motor Encoders — All four motors on the drivetrain have encoders that keep track of the motors' rotations. This data is combined with the heading to fully estimate the robot's pose (i.e., its XY-position and heading). These same encoders are also used internally by the REV hub for closed-loop velocity control. Additionally, the encoder on the climb motor is used to maintain the lift's position with PID.
- Logitech HD Pro C920 Webcam — The camera is used for determining the position of the gold mineral using TensorFlow.
- Limit switches — The limit switches are used for the automatization of the outtake system.

2.3. Strategy

- As our robot extends its intake fast, we try to make our autonomy leverage that as much as possible.

2.4. Autonomous Diagrams

2.4.1. Autonomous 1 (80 - 105 points)



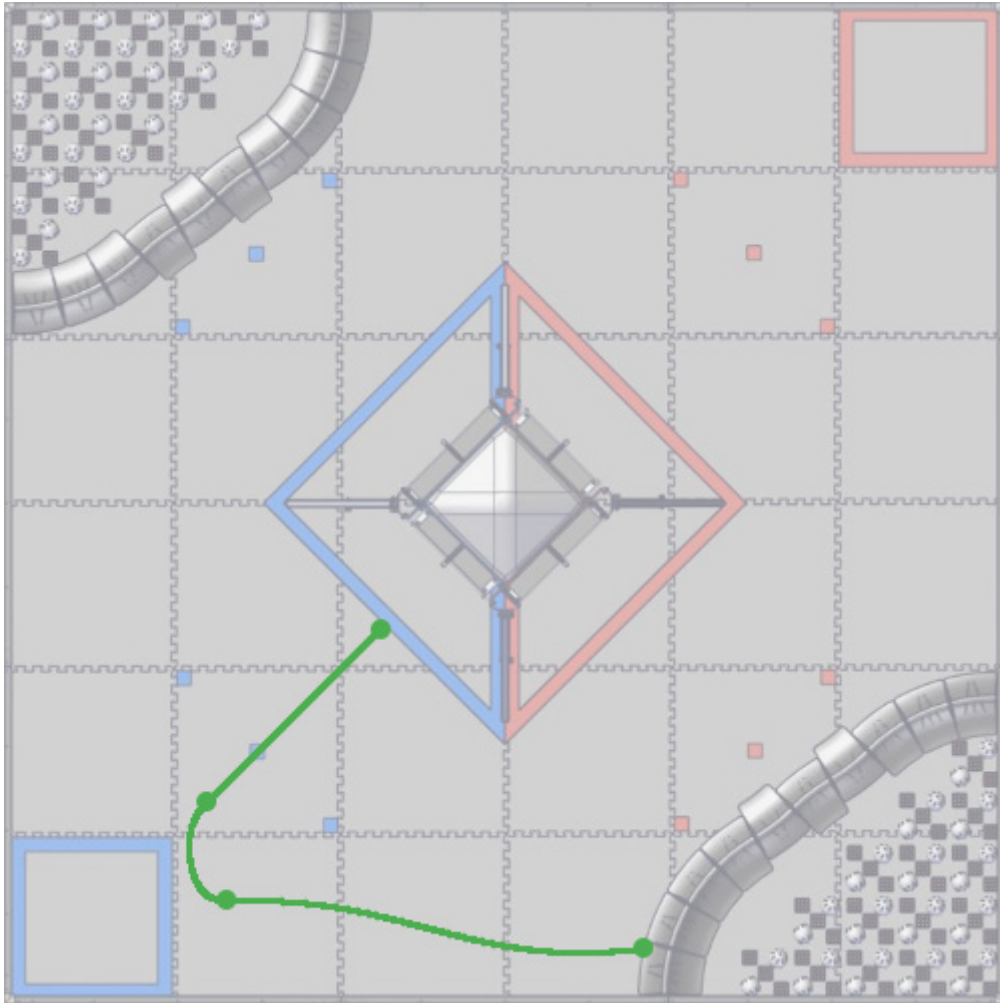
2.4.1.1. Scoring

- Climbs down the lander (30)
- Knocks off the gold mineral off our sampling field (25)
- Leaves team marker in depot (15)
- Knocks off the gold mineral off our allies sampling field, depending on our ally (25)
- Parks in the crater using the intake (10)

2.4.1.2. Sensor Inputs

- Uses **TensorFlow** to identify the gold mineral on the sampling field
- Using **Motor Encoders** and the **IMU** we calculate the position of the robot on the field and follow a preplanned trajectory

2.4.2. Autonomous 2 (80 points)



2.4.2.1. Scoring

- Climbs down the lander (30)
- Knocks off the gold mineral off our sampling field (25)
- Leaves team marker in depot (15)
- Parks in the crater using the intake (10)

2.4.2.2. Sensor Inputs

- Uses **TensorFlow** to identify the gold mineral on the sampling field
- Using **Motor Encoders** and the **IMU** we calculate the position of the robot on the field and follow a preplanned trajectory

3. Navigation

Navigation, the robot's ability to localize itself and follow paths, is paramount to success in autonomous.

3.1. Coordinate System

A coordinate system is essential to precisely specifying the robot's position on the field and the various movements it makes. For our coordinate frame, we chose the center of the field as the origin with the positive X-axis extending towards the audience and the positive Z-axis pointing up to the sky. With these axes defined, we then chose the positive Y-axis to point towards the red side to ensure right-handedness.

3.2. Localization

Localization is the robot's ability to effectively estimate its position over time. Currently, the software relies primarily on dead reckoning with encoder and IMU sensor data.

Since we have a mecanum drive, the kinematics are a little more complicated. The equation below allows us to turn encoder data into estimated velocity data:

$$\frac{r}{4} \begin{bmatrix} 1 & 1 & 1 & 1 \\ -1 & 1 & -1 & 1 \\ -1/K & -1/K & 1/K & 1/K \end{bmatrix} \Omega = V$$

where Ω is a column matrix of wheel rotations (i.e., encoder reads), r is the wheel radius, V is $[V_x, V_y, \omega]$, and K is wheelbase-related constant.

The velocity estimate (V) is multiplied by the time delta to obtain the pose estimate delta and the xy-components of this are added to the previous pose estimate. Finally, the estimated heading is set to the heading reported by the IMU.

3.3. Spline Paths

Traditionally, the main path constructs used in FTC are straight lines (any purely translational movement) and point turns. Although these work well, the separation of translational and rotational motion wastes time. To help resolve this, we make use of curved splines.

More specifically, we use cubic Hermitian splines. Each spline is constructed from a series of waypoints that include an (x, y) position and a heading (essentially a pose). Then for each adjacent pair of waypoints, we interpolate a polynomial of the following form (within a modified basis to handle two dimensions — more details below):

$$y = ax^3 + bx^2 + cx + d$$

The constraints of the system form a linear system in a , b , c , and d that can be solved to yield the appropriate polynomial for the waypoint pair. These polynomials can then be stitched together into a smooth piecewise curve with C_1 continuity.

3.3.1. Parametrization Details

You may have noticed that the equation stated previously isn't very well-suited to describing a parametric curve in two dimensions. To transform this equation into a more amenable form, two primary steps are necessary: First, parametrize the curve into the form $x(t)$, and secondly, shift the coordinate frame/basis to simplify the interpolation procedure.

To parametrize the polynomial, we simply take $t = x/k$ where k is the Euclidean distance between the waypoints (also called knots). This yields the following parametric form:

$$\mathbf{x}(t) = \langle kt, a(kt)^3 + b(kt)^2 + c(kt) + d \rangle$$

Now, let's translate the coordinate frame to the first knot and rotate it so the x-axis contains both knot points. Adjusting constants as necessary, the equation becomes the following:

$$\begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} kt \\ a(kt)^3 + b(kt)^2 + c(kt) \end{bmatrix} + \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$$

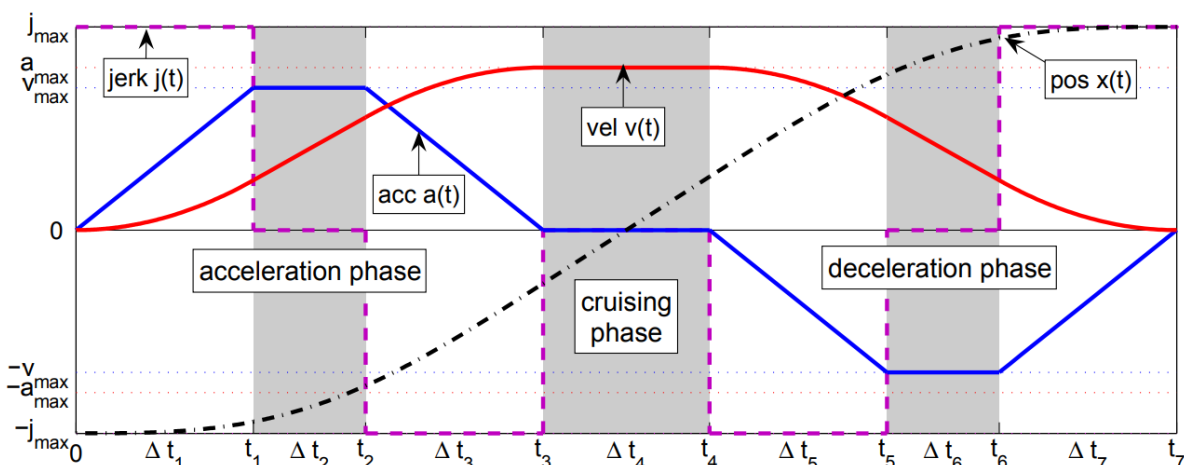
where $\tan \theta = \frac{y_1 - y_0}{x_1 - x_0}$ (x_0, y_0) is the first knot, and (x_1, y_1) is the second knot.

These transformations simplify the interpolation procedure at the expense of a slightly more complex parametrization.

3.4. Motion Control

3.4.1. Motion Profiling

Almost all of the robot's movements are motion profiled to smooth them out and improve accuracy. The simplest form of motion profiling is trapezoidal. In this case, acceleration is capped (constant), making a trapezoidal velocity graph (first stage: constant acceleration, second stage: constant velocity, third stage: constant deceleration). Instead of instantaneous accelerating to the maximum velocity, we gradually ramp up to avoid mechanical strain, improve accuracy, and, in the case of the drivetrain, prevent wheel slippage. Our motion profiling goes one step further: instead of capping acceleration, jerk (the derivative of acceleration) is capped. This results in a smooth, S-curve velocity graph.



3.4.2. Trajectory Generation

With a little work, these one-dimensional profiles can be applied to arbitrary parametric curves (e.g., splines). To begin, let $x(s)$ be the parametric curve as a function of arc length and $s(t)$ be the motion profile as a function of displacement over time. These two functions can be composed to form the final trajectory $x(t)$. To compute the velocity, let's differentiate:

$$\begin{aligned}\mathbf{x}'(t) &= [\mathbf{x}(s(t))]' \\ &= \mathbf{x}'(s(t))s'(t)\end{aligned}$$

Differentiating again for acceleration:

$$\begin{aligned}\mathbf{x}''(t) &= [\mathbf{x}'(s(t))s'(t)]' \\ &= \mathbf{x}''(s(t))[s'(t)]^2 + \mathbf{x}'(s(t))s''(t)\end{aligned}$$

3.4.3. Feedforward Control

In order to follow the S-curve motion profiles, we use feedforward control (open loop control operating with knowledge of the underlying kinematics). The controller takes the velocity and acceleration setpoints at each time and uses feedforward velocity and acceleration coefficients, respectively, to determine the final voltage applied to the motors. This relies on the fact that the voltage-balance equation for DC motors ($V = k\omega + IR$) can be reorganized into the form $V = K_v \cdot v + K_a \cdot a$ where V is the applied voltage (effectively equivalent to power in this context), v is the velocity from the profile, a is the acceleration from the profile, and K_v and K_a are the corresponding feedforward coefficients.

To achieve optimal performance, it is essential that these coefficients are tuned properly. For K_v , we measure the motor powers and real-world speeds with a slow acceleration. This effectively reduces the voltage-balance equation from earlier to $V = K_v \cdot v$ since a is effectively zero. Therefore, we can do a linear regression on the recorded power-velocity pairs to determine K_v . Once K_v is tuned, we use binary search to find K_a .

3.4.4. Feedback Control

Whenever necessary, we use PID (Proportional Integral Derivative) controllers for effective closed-loop control. Closed-loop control is still very important in motion profiled actuators (e.g., the drivetrain); feedforward and feedback control work in tandem to provide high accuracy motion. PID calculates a correctional control signal based on the error signal using the following formula:

$$\mathbf{u}(t) = K_p \mathbf{e}(t) + K_i \int_0^t \mathbf{e}(\tau) d\tau + K_d \frac{d}{dt} \mathbf{e}(t)$$

The fundamental operation of our PID controller is very similar to most other teams, although we have a few special features for additional flexibility and stability. To mitigate integral windup, the internal sum (i.e., integral) exponentially decays. It also supports arbitrary “circular” input signals (e.g., angles; anything where the signal wraps around and angle renormalization (θ is always in $[0, 2\pi)$)).

3. Driver Controlled Period

3.1. Strategy

During TeleOP, our intake system extends around one and a half meters. The robot stops in front of the crater, extends the intake system to collect minerals, and then retracts it to prepare for putting them in the lander. Then the robot moves near the lander and deposits.

Because of this, our robot is more efficient if it works in the area near the crater. This allows us to have better cycle times, while not blocking access to the crater to the other team.

3.2. Driver Controlled Enhancements

Our TeleOP uses a combination of motor encoders and limit switches to limit the movement of the systems up to their mechanical limit, alleviating a lot of the work off the shoulders of our drivers. Depending on the situation, our main driver controls the intake extend system or the climb system, and our second driver depending on the positions of the outtake or the intake system, has different actions happen. This leads to a much easier and streamlined operation, where only 2-3 button presses are needed for operating all the systems.

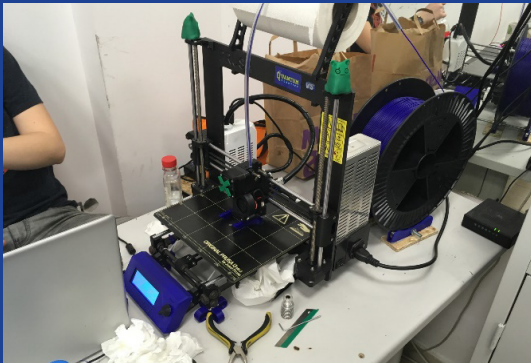
3.3. Controller Mapping

3.3.1. Gamepad 1 - Driver

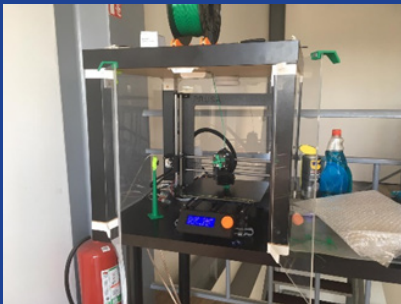


3.3.1. Gamepad 2 - Operator

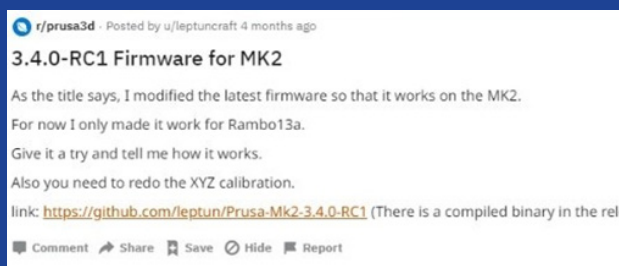




Our first 3D printer



Our second 3D printer



A Reddit post detailing our firmware port for the MK2

3) 3D design

3.1. 3D Printer

When we first joined the FIRST® Tech Challenge program, we received a room in the school only for our team .

Along with it also came the first 3D printer from our high school. It is a Prusa i3 MK2S which was used before we received it and it was in an acceptable condition.

Experience comes through experimentation, so we started learning and tweaking the various printer settings in our software. After playing around with the printer, some of our team members really liked the technology and its possibilities, so they decided over the summer holiday to purchase and assemble a second 3D printer for personal and team use.

During the holidays, we kept learning more and more about the hardware itself, but also about the firmware. We also adapted the software from newer machines to our old printer, managing to get some helpful new features that weren't officially supported on this printer model.

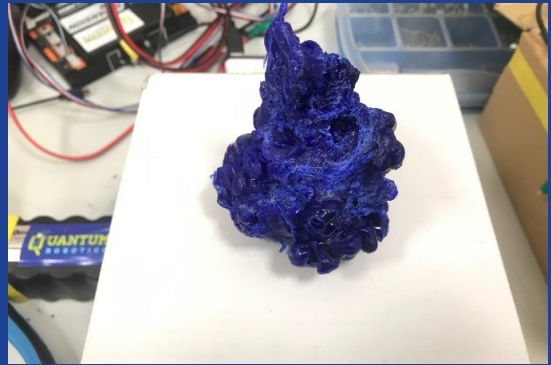
Next, we tested and used the firmware for enough time in order to make sure it was working properly and diminish the bugs that we found through our rigorous testing methods involving real-world prints and code analysis tools. We posted our changes to the official subreddit of our printer model in order to contribute in our own way to the amazing and helpful Prusa Community.

Some of the problems that we encountered during experimentation with our printer helped us learn the difficulties and the limits of designing and manufacturing parts. Several difficulties that we encountered include:

- Having to repair the damaged print bed that we got from the former owners, having the extruder leaking and crashing into the printing surface because of an assembly mistake, causing us a lot of headaches and damaging the frame and some of the moving parts.
- Mounting the cable bundles using clamps with screws instead of zip ties to reduce the risk of damaging wires through daily usage.
- Leaving the printer unmonitored overnight with the extruder crashing and melting itself, extruding a huge blob of plastic.
- Having countless failed prints because of wrong software settings or forgetting to check the resulting manufacturing file generated by the software.

The filament that we used on the robot initially is called “ColorFabb PLA Economy Dark Blue”. It is a great material for printing robot parts that need to be stressed a lot, but still be able to stay intact with minimal bending. Until we switched to this plastic material, we used some generic PLA from a local vendor.

Looking back, that filament was awful resulting in barely functional mechanisms or parts that failed after a short amount of time. On our robot, we also have some parts made out of ABS because of its lower density and its property of being able to be post processed easily.



The result of a failed overnight print



Broken parts made from bad filament



Our ColorFabb PLA Economy Dark Blue filament

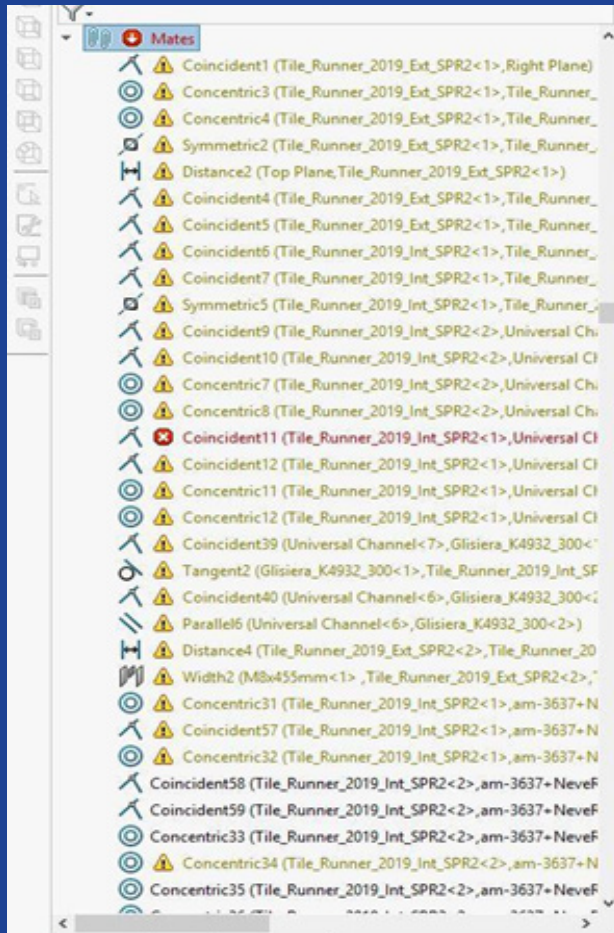
3.2. Solidworks

For designing and simulating our robot, we started using SOLIDWORKS 2018 due to its extensive feature set, ease of use, configurability, and robustness compared to other solutions. After contacting Dassault Systems, the parent company of SOLIDWORKS, we received 15 license keys for our team. We were very glad to migrate to it from our previous CAD solution, Google's SketchUp, which had its limitations shown during our previous FTC season.

One of our main use cases for SolidWorks is creating parts and assemblies for our robot, but also creating bills of materials, stress testing and simulation. With the help of the GrabCAD SOLIDWORKS plugin, we are also making it easier for other team members to collaborate, with its cloud sync and robot revision control systems.

Some benefits that we gained as a result of our migration from SketchUp include easier and better team collaboration and organization, part configurability, compatibility between programs, equations, and variables, allowing us to create dynamic parts that extend and move with ease, improved management of large assemblies and topology administration.

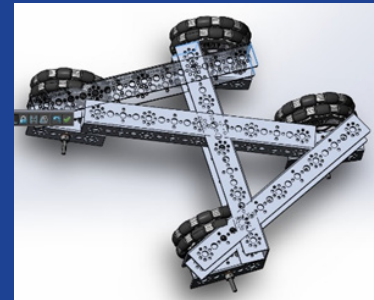
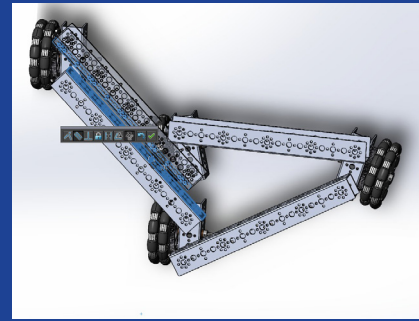
Even with its great features, not everything is perfect and so is SOLIDWORKS.



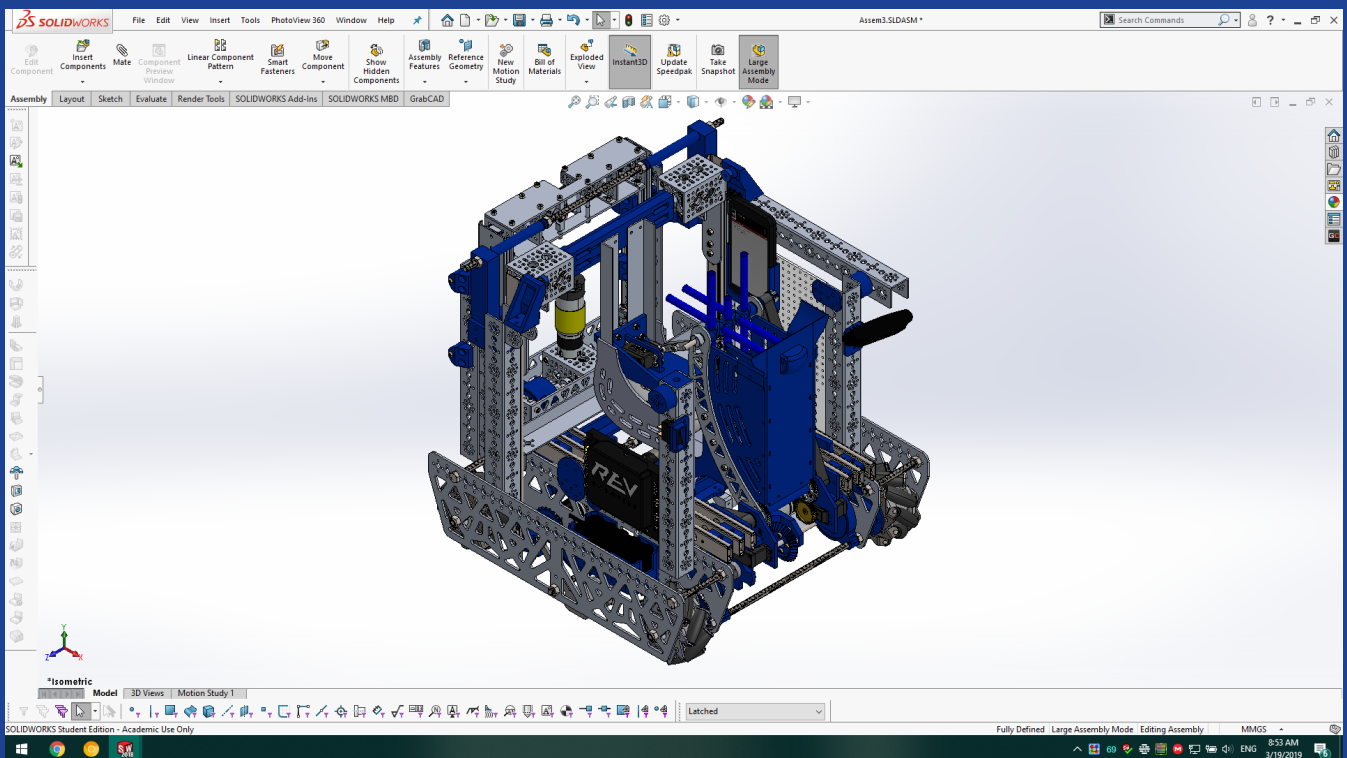
A problematic Feature Manager tree

Over time, as the parts and assemblies that we were designing became bigger and larger, we started encountering strange stability and mechanics problems.

Among these, some of the more notable ones include having the assembly throw an “Over defined” or “No solution” found error, which we can fix by deleting some relationships with problems, and then undoing the change, or strange crashes when closing, solved by setting the assembly into “Large assembly mode” and making all the parts lightweight in the Feature Manager tree, and in some rare cases, the assembly losing the ability to be saved due to it being corrupt, solved by reordering items in the Feature Manager tree and changing the properties of problematic mirror features.



Problematic renders caused by “Under defined” assemblies



Screenshot from CAD

3.3. GrabCAD

Another improvement over the last season is the addition of GrabCAD into our workflow. This helped us with team collaboration and organizations, as we no longer needed to run around and announce that we were going to work on a file, just to find out that somebody else modified that file and having somebody redo all the modifications one person did in the other persons part or assembly, as the changes cannot be merged.

One feature that we found quite handy in GrabCAD is its ability to create what are called “Partner Spaces” which allow us to share our work as we are doing it with our sponsors, collaborators, and supervisors, without the need for them to download compatible versions of the software, or converting it to 2D images that cannot be interacted with.

A third useful feature of GrabCAD is its plugin for SolidWorks that allows us to lock files automatically, announcing everybody that we are working on that particular file, preventing feature merge conflicts and minimizing the downtime. However, the plugin was not updated since SolidWorks 2017 so after some tinkering, we found out that by creating a virtual machine, installing SolidWorks 2017 in it and copying the plugin files manually to our installs of SolidWorks 2018 we were able to get it working.

3.4. Trello

In order to have a coordinated workflow we use Trello. It is a platform designed for project management and task scheduling. In it we create “Cards” and write information in them. We put this cards in the following lists:

- Several Sprints (revisions of the robot)
- Weekly Sprint: Things we have to do in that specific week
- In Progress: What is currently worked on
- Printer Queues: They are used for managing 3d printing time
- Several History lists: The place where card end up after being completed

For each Card we can also assign people to work on them. This is useful since everyone assigned receives notifications on their phone and email regarding card updates, deadlines or changes to the task. Another thing we can do is assign labels. We use those to assign an amount of “agili”, priority and printing material, which are shown with colors in a Card.

In cards we can also add pictures, texts, checklists and comments. These are designed to make the work of team members easier by making the work interactive.

3.5. Online models

Permanent link for robot model:

<https://autode.sk/2ExSqH2>



Vuforia

1. Install Vuforia View from the App Store or Google Play scanning the QR code below
2. Open Vuforia View on your device
3. Select scan in the lower part of your screen
4. Scan the VuMark (next page) and play around!





4) YRobot

4.1. Chassis

This part of the notebook focuses on the story of the YRobot, a robot designed by all the new members of the team as a introduction to robotics and Rover Ruckus challenges and for testing new systems/ robot components and ideas.

At first, we brainstormed for chassis ideas, and we eventually settled on a design based on the “Curiosity” rover sent to Mars by NASA because it offered a great degree of mobility, being able to go into the crater to pick up the minerals.

However, after attempting to build many intake systems, we realized that there was not a lot of usable space left due to how much the chassis occupied.

So, after another brainstorming session, we settled on a holonomic drive-based system, for mobility purposes.

We started assembling it, going through multiple iterations using different sized TETRIX© channels and we eventually settled on a design that would accommodate our intake system while fitting in the required dimensions.

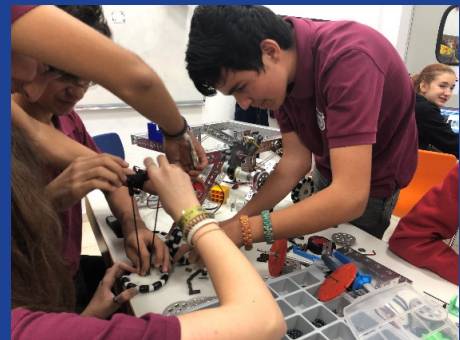
We unfortunately realized there was a flaw with the weight distribution across our robot, due to the intake system being mounted on the far side of the chassis, so we needed to add counterweights in order to prevent the robot from tipping over.



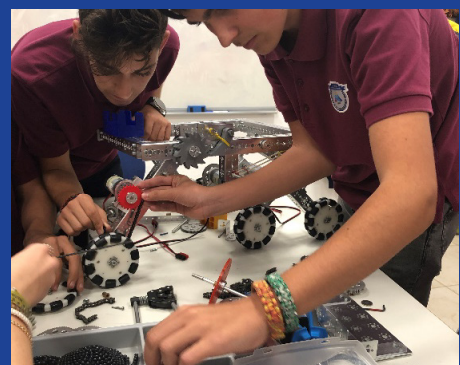
Visoiu working on one of the versions



Debating robot models



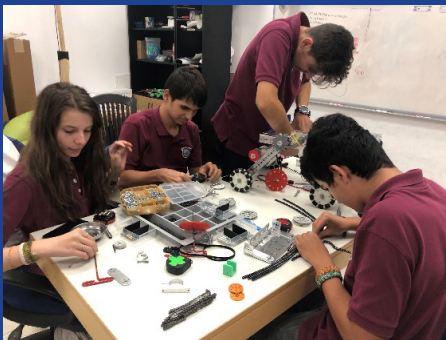
Assembling the wheels



Assembling the chassis



Assembling our first modular robot



Trying a new model



New mechanism



Studying the sliders

4.2. Intake

After a lot of tries, we decided that the best solution for our spacing problem was integrating the both intake and outtake systems in only one.

Starting from this idea, we changed everything and that means even the position and the number of the sliders. However, we now have two sliders in vertical position attached at the highest point of the robot.

Storing the minerals after collecting them was also a problem for us because we did not succeed with TETRIX®, that is why we made symmetric

We eventually narrowed the problem down to our models using inches while we would input some measurements in both inches and centimeters.

We then got the parts on the printer and assembled the box. Due to two earlier failed experiments on how to extend the slider, we ruled out linear sliders and we settled on using string and pulley systems.

Instead of mounting the motor and the string wheel on the robot chassis, as that would require more complicated maneuvering, as we found out during prototyping, we tried mounting a channel between the two sliders to mount the motor to the slider assembly.

After mounting and unmounting the sliders a dozen times, while messing with the hole alignments as the sliders are not TETRIX friendly, we finally found a way to mount the motor. As a trial, we started assembling everything, from the pulleys to a little arm that would hold the string over the slider so that it won't catch during the retraction to the motor and the string wheel.

4.3. Outtake

The outtake is basically the intake flipped over, using the same mechanism.

So, our outtake is extensible, with the help of a string that is placed on a TETRIX and connected to a two-wheel pulley, and at the end of the system is another TETRIX, placed on a slider to keep everything together.

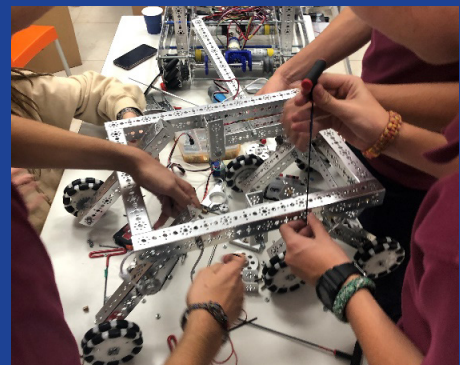
The pulley is connected to a 40 mm motor, that makes the hole system work. When we power on the robot, the outtake is supposed to extend the slider and put the cubes and the balls inside the lander.



Explaining the model to Alex



Mounting the motors



Cable management



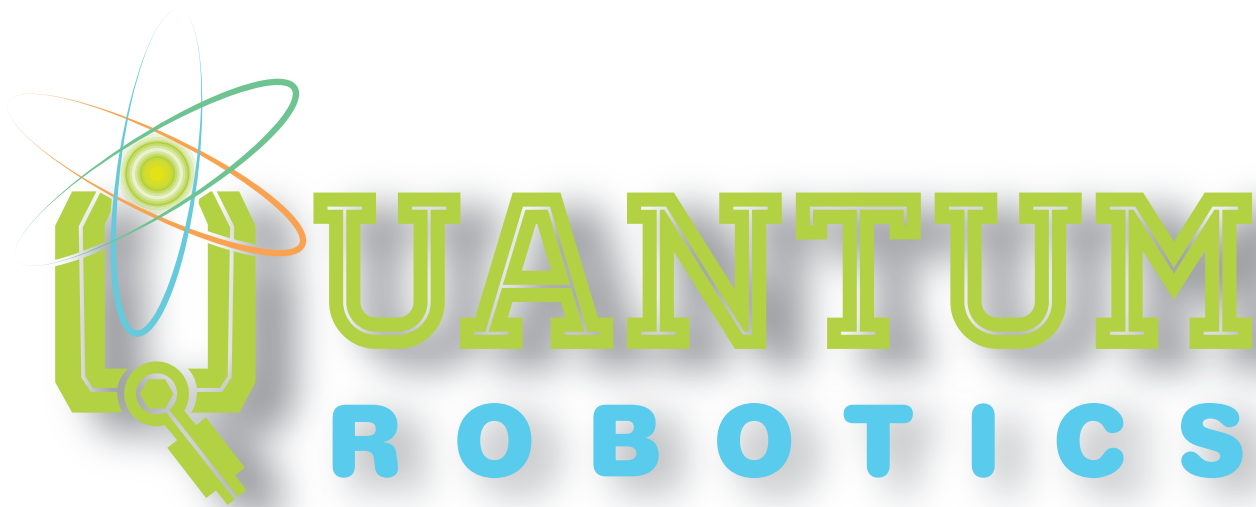
Climb prototype

FIRST **CHAMPIONSHIP**



April 24-27, 2019

Detroit, MI



Daily Entries

2018-2019

Week 23**Tuesday**

4 - 10 June 2018

5th**Goals****Reflections**

- | | |
|---|---|
| <ul style="list-style-type: none"> • get to know each other • introduce the new members in our family | <ul style="list-style-type: none"> • realized the importance of the relationship between the members |
|---|---|

Summary

Today we had our first meeting with the new team members. All of us could see how nervous, but at the same time excited we all were. All the old members realized how important it was that the people they recruited were suited to be a part of the Quantum Family. The meeting started in the lab – the place where the magic happens was presented. Ema made a table where we began noting the attendance.

We talked about robotics and what made us decide to take this path. We talked about our passions and our goals, we laughed about our failures, but most importantly we started feeling more united. Andrei P. and Ema gave us an inspiring speech and showed us pictures and little videos from the past year. It made everybody incredibly excited about what the new year would bring.

Next, Emre Sertel, our mentor, called all of us in his informatics lab, where he presented himself and told us how happy he was to welcome new members in the family.

The atmosphere overall was full of excitement and energy, it helped us shape our common goal for this season – to reach as further than last year, and to bring home a medal. We left home excited to meet in the following days!



Photos from the first meeting of the season after the latest interviews. We talked about the departments within Quantum Robotics and impressions on this year's theme for FTC.

Attendance**Time: 13³⁰ - 15⁰⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Tudor, Victor, Visoiu, Vladut, Voinea

Week 23**Friday**

4 - 10 June 2018

8th**Goals**

- Research on the notebook design
- Summer plans


Reflections

- Realized the importance of written plans

Summary


Today the PR department decided that a meeting was needed to talk about the up coming plans for the holiday and do a little research about the format we were going to use for this year's notebook. The meeting started on a relaxed note seeing as we were at the end of the school year and most of our classes ended, as well as having the majority of our averages closed. We met in the school cafeteria, seeing as the lab was occupied by a few members who were working on a personal project. Ema presented us different notebooks she found inspiring and we further discussed our ideas on how it should look, and what best represents who we are as a team, as well as highlights our hard work.

Each of us had the chance to express our opinion, as well as comment what we didn't find appealing about the other proposals. Next up, we discussed the plans we had for the summer and how we could get involved. Firstly, we decided that we would translate the technical notebook offered by First Tech, from English to Romanian, in order to make it easier for the teams in our country to understand it, the rules and its values. We also talked about meetings that we might have, and the goal for this year's season. When we were done we the robotics part, we shared our plans for the summer and bonded over our common interests. It was a helpful and fun meeting for everyone!



Brooklynn
Builder
Programmer
Driver

My name is Brooklynn. I'm an 8th grader at Buckhorn Middle School. This is my second year with FIRST Tech challenge and the Browncoats. I was on a FIRST Lego League team for 2 years before I joined the Browncoats. If you want to know who I am, I'm that quiet person who lurks in the shadows and can only be seen when wanted to be seen. I like to do robotics, read books, draw, and ... read more books.

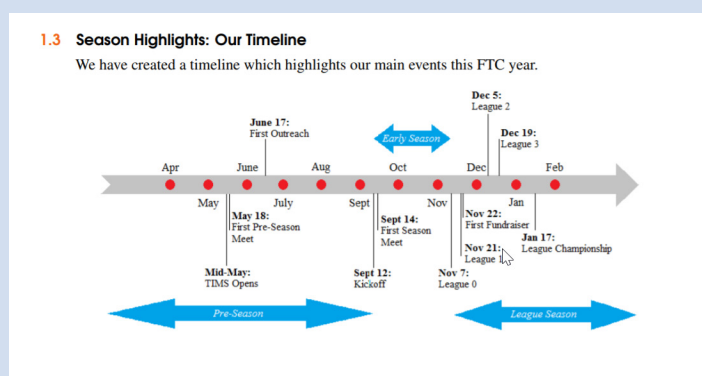


Jalynn
Engineering
Notebook
Team
Reporter

My name is Jalynn, and I'm a homeschooled sophomore. I did FIRST Lego League in fifth grade and instantly fell in love with robotics, but scheduling problems prevented me from joining another team until now. I am willing to help in any area needed on the Browncoats. I'm interested in Engineering Notebook, building, and possibly programming. During my free time I like reading, writing, listening to music, and talking (or hanging out) with my friends.

Team Biography Team - 4 FTC 7842 Browncoats

Team 7842 Browncoats Team section example for Pr team



Team 9774 Nano Ninjas Timeline Graph as example of graphics for Quantum Robotics' engineering notebook

Attendance**Time: 15³⁰ - 17⁰⁰**

Andrei, Denisa, Ema

Week 38**Thursday**

17 - 23 September 2018

20th**Goals**

- Take a decision about the notebook
- Taking decisions about up-coming plans

Reflections

- The importance of taking into account different opinions
- Realized the importance of taking a break when you are too tired

Summary

As it was a regular Thursday, we had our normal meeting with the whole team! We ordered pizza and started working. We talked about our up-coming plans, and made some decisions about the activities we want to get involved in.

We also discussed some logical issues about the Tech Fest we are going to participate in the following days. The young team tried to understand some robotics concepts better. It was a more relaxed meeting than usual, even though we did do our usual work.

We think that maybe next time we'll have more work.

Today the PR department had a special meeting dedicated to the format of the notebook. We made research online and asked for the opinion of the other members who wanted to get involved.

Also, our mentor, Emre Sertel, gave us some advice, taking into account what he saw when we participated to the First Tech in Detroit in spring. Taking into consideration all that we saw and heard, we decided on the (almost) final format of the notebook, divided by chapters and subsections.

Considering the experience we had from last year, we also decided what application we were going to use to design and write it.

Last year we wrote our notebook in Microsoft Word but one of the reasons we didn't start yet on this year's notebook is that we didn't want to have to move the text around after a while in another app, and we definitely didn't want to have issues with the design of the notebook. Working in Word was really tiring since text boxes kept jumping pages and it was getting really annoying to lose stuff around. This year our two options were Adobe InDesign and Power Point. Due to the fact that InDesign wasn't as accessible as Power Point to all of the editor we ended up with choosing to work with the Microsoft App.

With the time left we worked on the balance from tetrix. It was a productive meeting!

Attendance**Time: 11³⁰ - 18⁰⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Tudor, Victor, Visoiu, Vladut, Voinea

Week 42**Monday**

15 - 21 October 2018

15th**Goals**

- Start our new Halloween project
- Brainstorming for Hacking Health

Reflections

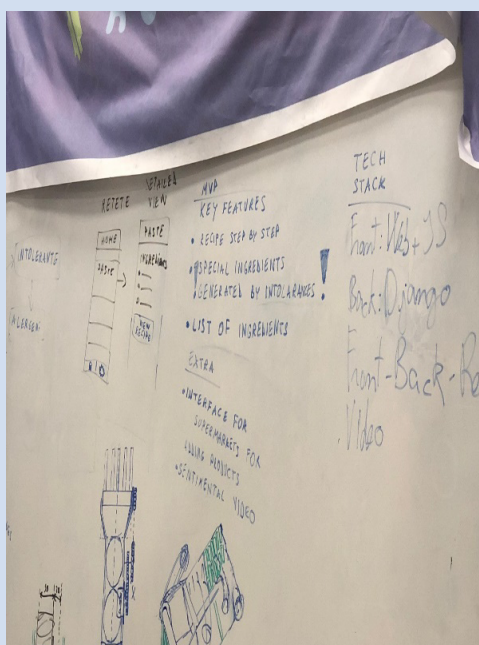
- Posters approval takes a while
- Never do testing on food

Summary

Today we had a meeting with our colleague for Hacking Health and we tried to brainstorm some ideas for the competition. We tried to form an idea and organize a little based on what we wished to do just so we would know where to start on the competition day. We decided on making an app that would help people with allergies and intolerance find special ingredients and also recipes based on their needs.

Besides thinking a little about intake system, the PR team also worked on starting our Halloween project. We printed the posters for the school and then we went over to the school management in order to get their approval for the posters. Only after going through several directors and signatures we were able to put up the posters on each floor and officially start our project. Since the aim of this activity was to have it not only within school but also as an outreach method we also posted it on both Instagram and Facebook.

We learned today that we should never do experiments on food after a failed attempt of opening a bag got messy.



Hacking Health plan for the the contest app.



Halloween poster for fundraising.

Attendance

Alex, Andrei, Ema, Radu, Sanzi, Victor, Voine

Time: 11³⁰ - 20⁰⁰

Week 42**Thursday**

15 - 21 October 2018

18th**Goals****Reflections**

- Change the wheels of the YRobot

- Importance of teamwork

Summary

Seeing as it was Thursday, we had our normal weekly meeting with the whole team.

It was a very productive day in which everybody worked a lot. The young part of the team worked on their YRobot, more specifically they rebuilt the wheels of the robot. It was a more challenging task than it seemed, but they managed to accomplish it through perseverance and team work.

At the end, they were very proud and happy about what they did! While the others accomplished their own goals and targets, the PR department held a meeting where they discussed future outreach plans and up-coming important dates.

We also further worked on the notebook and modified what we didn't like in the design.

After all the hard work, we decided to reward ourselves with some pizza. We bonded over the challenges we overcame and laughed about the funny moments!

Attendance**Time: 11³⁰ - 18⁰⁰**

Alex, Andrei, Ema, Radu, Sanzi, Victor, Voinea

Week 45**Thursday**

5 - 11 November 2018

8th**Goals**

- Improve team dynamics and connections
- Understand the sponsors process better
- Further develop intake system for YRobot

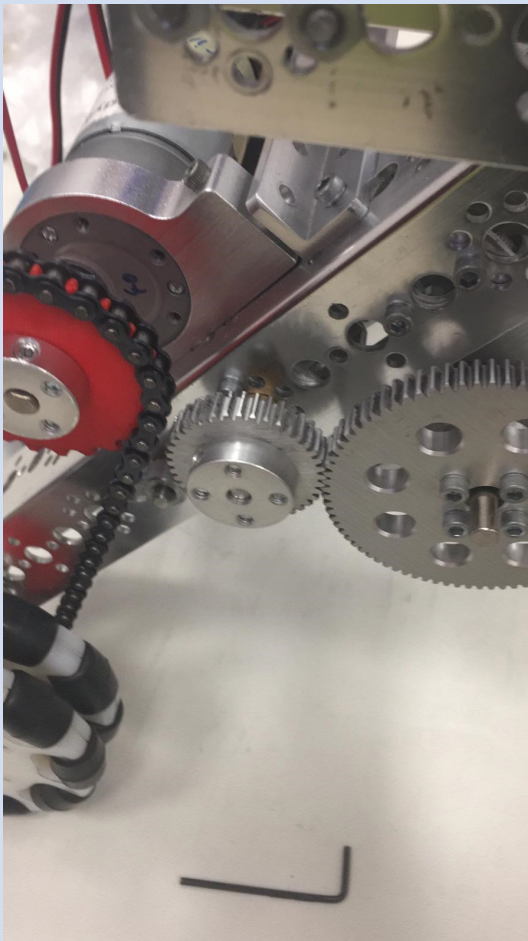
Reflections

- Improved team communication
- Saw a new approach towards sponsors
- Started taking safety rules more seriously

Summary

Since today was Thursday, we had our weekly meeting but we also had a meeting at the same time so we ended up splitting the team in two, each group with their own task.

In our lab, Tudor P., Mihnea, Mircea, Eliza, Cezar, Tudor C., Luca, Voinea and Marin. worked on the YRobot, more specifically the intake system required to pick up the from the field. It was an enlightening meeting for the young group, as they realized the importance of applying safety rules, after Tudor P. hurt himself by accidentally sticking his hand between two gears.



While working on the robot, Tudor Popescu accidentally hurt on of his fingers. He was testing the chains when this happened and it was an wake up call for all new members on the topic of safety in the lab.

Attendance**Time: 11³⁰ - 18⁰⁰**

Tudor P., Mihnea, Mircea, Eliza, Cezar, Tudor C., Luca, Voinea, Marin

Week 46**Thursday**

12 - 18 November 2018

15th**Goals****Reflections**

- Start printing documents
- Join all ideas for the robot
- Close team applications & edit digital documents

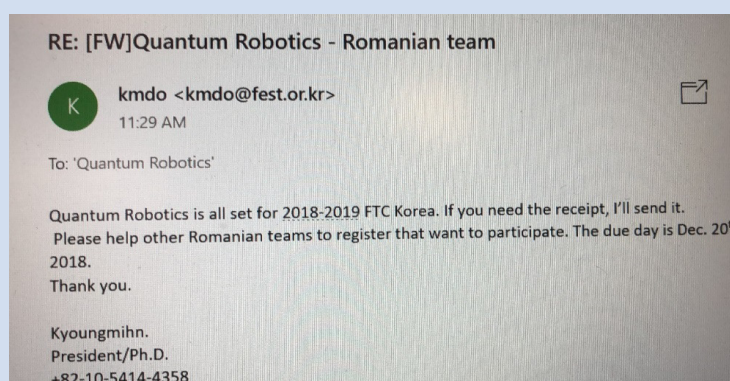
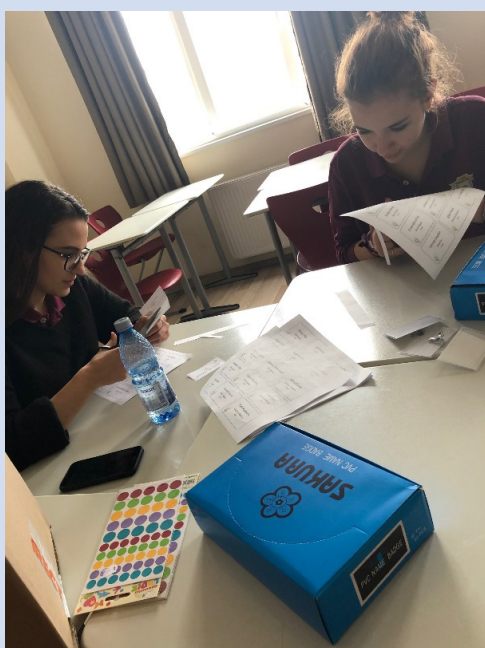
- Robot work 2 days before a competition is risky
- Further digital changes should be avoided

Summary

Today our main focus was the demo. Today we also received confirmation from the Korean Robotics Competition organizers about our enrollment for January's competition.

Today all the people on hardware sat together and tried to find a final design for the robot since the time left is so little. Meanwhile, Sanzi, Radu, Visoiu and Cezar tried to find a solution for programming but they had some difficulties since they didn't know the final mechanisms of the robot.

On one side, Ema, Andrei and Denisa worked a lot on finalizing as many digital documents as possible and also started printing the papers for the badges for all participants that were already involved. They started working on all the lists since they needed to have: Participants and spectators list for the school security Pizza lists for ordering the pizza on Friday. After printing both game manuals and all other needed documents for robot and field inspections they also printed the pages for the badges. When they started working on cutting all the badges and setting them up they realized that it was a really good choice to start working ahead since it was taking a lot of time.



The reply from the korean organisers about our enrollment for the competition (up).

Ema and Denisa started working on the badges for Friday (on the left).

Attendance**Time: 13³⁰ - 20⁰⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Tudor, Victor, Visoiu, Voinea, Marin, Caracuda, Mircea

Week 46**Friday**

12 - 18 November 2018

16th**Goals****Reflections**

- | | |
|---|--|
| <ul style="list-style-type: none"> • Finalize robot construction and programming • Organize the demo room • Advertise the demo | <ul style="list-style-type: none"> • Robot needs to be ready earlier at your own demo • Volunteer's tasks should be better defined • Advertising sooner |
|---|--|

Summary

Today was a very busy day. Through the day we had several moments during which we had split in several groups.

In the morning, Andrei and Ema were invited to Radio Guerilla to do a short advertising of our demo. Working again with Sorin Badea was a real pleasure. During the same time, at our lab, Sanzi, Radu, Victor, Alex, Voinea, Popica and Denisa started working on the robot and on the final touches for the to-do list and electronic documents.

Even though we had so little time left till the demo, we were really determined to test many ideas for the robot.

In the afternoon Eliza, Tudor, Visoiu, Mihai and Cezar joined the rest of the team. Tudor, Ema, Denisa and Andrei started working on printing the last documents and then they started disabling the field so it could be moved to the sports hall for the demo.

The rest of the members and volunteers continued working one group on finishing the robot and another on doing the programming.

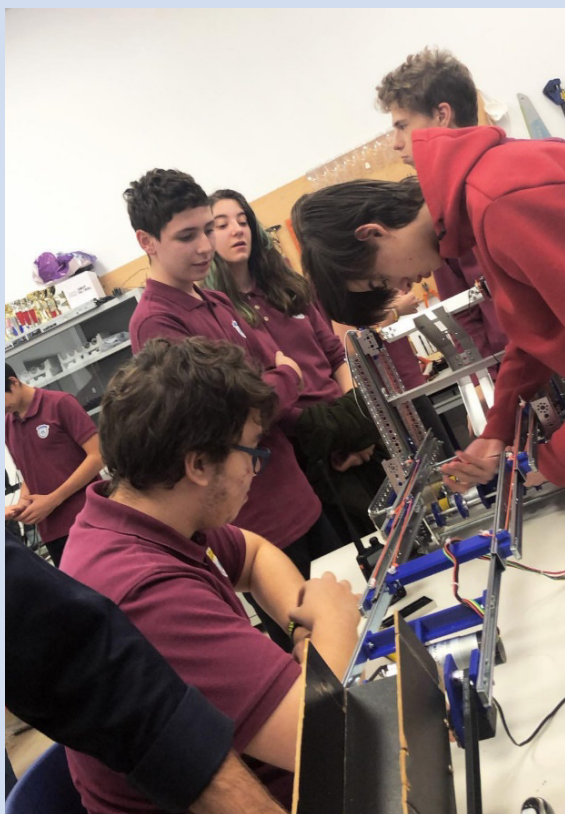
While working on the robot we realized we had a few problems with the extension of the robot into the crater since our wires were not long enough.

In the evening, we started taking out tables and chairs from the nearby classrooms, preparing to put them in the sports hall as it was being cleared. Since in order to test the robot we needed to have a field, everyone took a break from what they were doing and we started arranging the sports hall.

We tried to divide into pairs each doing a task but since our roles weren't so well defined it was pretty hard at the beginning with coordination. In the end, after all tables and fields were in place we started working on the video and sound preparations while others were working on the last touches for the robot.

It was a very long day but in the end we were happy to see that we were able to put everything into place and we also managed to finish implementing some last things on the robot since our goal was to test various mechanisms at our demo.

Summary



Picture 1



Picture 2



Picture 3



Picture 4

In picture 1 we have the team who works on the robot. The intake system is almost ready and now they are working on connections and programming.

In picture 2 we have Andrei, Denisa and Ema working on sending confirmation emails and finishing the food order for the demo.

In picture 3 and picture 4 the sports hall is being prepared for the demo and the fields are being set up along with the systems.

Attendance

Time: 9⁰⁰ - 1⁰⁰ (next day)

Andrei, Ema, Victor, Alex, Radu, Sanzi, Popica, Denisa, Eliza, Tudor, Visoiu, Cezar, Mihai

Week 49**Thursday****3 - 9 Decembrie 2018****6th****Goals**

- Send mail for Christmas Projects
- Work on the CAD and robot design
- Take team photos (part 2)

Reflections

- Having CAD before starting the physical robot blocks a lot of work time
- Big events take a lot of time and planning

Summary

It was a tiring day for everybody, seeing as we had a lot of exams before the meeting. But getting together and bonding made us feel better. The PR department sent emails regarding possible holiday events, and worked further on the notebook. Ema and Denisa worked a lot on finding the best solutions for the winter outreach events and sent as many emails and ideas as possible in order to open as many collaborations as possible. They also took some time to take 5 more team member pictures since not everyone was able to bring their T-shirts with them.

At the same time, the rest of the time worked on the CAD design, realizing the importance of having it done, before making physical changes to the robot. They discussed possible designs and ideas, and debated the best solutions. Today we worked a lot on finalizing the 3d model of our QRobot. Voinea did most of the modeling while Andrei, Victor and Alex helped him. Meanwhile, some of the younger members worked on the Yrobot.

The hole team started to make a bill of materials so we could order the parts from GoBilda. We stayed really late to finish but unfortunately the card payment got denied because the order was to large.



In the first photo we have Tudor and Luca getting ready to take the team photos for the notebook. In the second photo we have Eliza, Tudor, Luca, Mihai and Mireca working.

Attendance**Time: 13³⁰ - 21³⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Tudor, Victor, Visoiu, Vladut, Voinea, Mihai, Mircea

Week 49**Friday****3 - 9 December 2018****7th****Goals**

- Edit and do some catch up for the notebook
- Continue doing the CAD
- Add intake on Yrobot
- Order parts

Reflections

- The summary from each day should be as complete as possible
- Bank problems do appear
- CAD is useful on YRobot

Summary

Today's meeting started a little later than usually on Fridays. Alex, Andrei, Ema, Radu and Victor came in at 9³⁰ and started by setting goals for the day.

On the PR side, the goals were to edit as many past days as possible and also add any additional text from the other team members.

Victor, Alex and Voinea wanted to continue working on the robot in CAD since they want to start building it but they first need to see that everything they planned out will work out.

Radu worked today on catching up with all the news from FIRST and other teams. Later on, he joined Victor and Alex and watched some sum-ups from USA qualifiers.

Cezar and Visoiu changes some things on the chassis of the YRobot because they needed to add the intake system. After working for a while they realized that working in CAD first would be really helpful and they decided that starting from the next meeting they will work on doing so.



Voinea, Alex and Victor working on CAD and doing research from american qualifiers



Visoiu working on the YRobot

Attendance

Alex, Andrei, Cezar, Ema, Radu, Victor, Visoiu,, Voinea

Time: 13³⁰ - 21³⁰

Week 50**Monday**

10 - 16 December 2018

10th**Goals****Reflections**

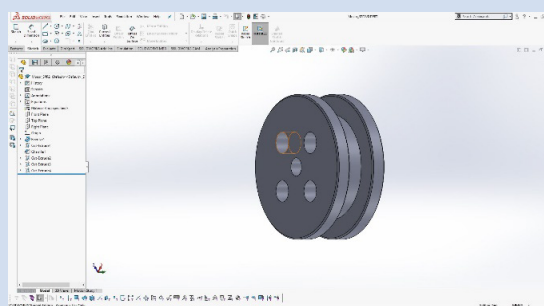
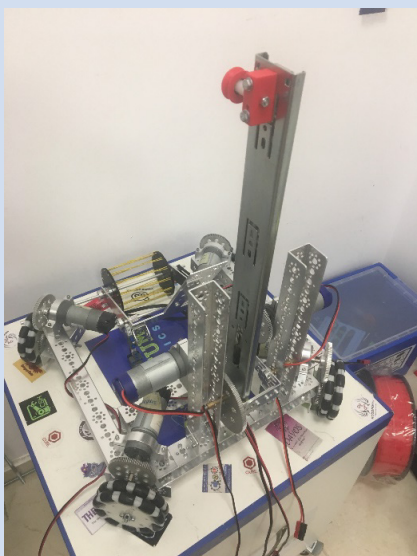
- Advance CAD and YRobot

- More time needed on 3D

Summary

Today Visoiu changed slider mounting direction so that it is easier to mount the intake/outtake assembly and to control the extension of it. We also made the second rotating motor redundant, as the weight of the whole system could be supported by only one motor. Additionally we tested the extension of the entire intake/outtake system.

Today Ema worked on adding and deleting some questions from the daily entry Google form while the rest of the team members present worked on further robot research and 3D Design edits for the spoils.



*Up we have the spoil 3D Design.
On the left we have the the YRobot on which
Visoiu worked today.*

Attendance**Time: 13³⁰ - 21³⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Tudor, Victor, Visoiu, Vladut, Voinea

Week 50**Tuesday**

10 - 16 December 2018

11th**Goals**

- Teach 3D to members
- Draw drilling references onto the slider

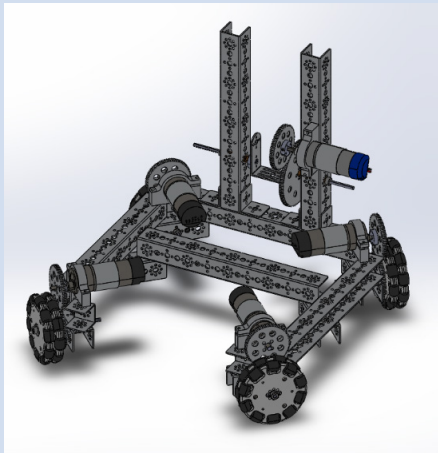
Reflections

- Did everything that we planned
- Teaching takes time

Summary

Changed slider rotation for better support of the intake system. Redesigned slider rotation mechanism to something with better support. Marked slider for drilling to better align with our support.

Today, Voinea introduced Luca and Eliza to SolidWorks. They learned how to make a Sketch, use Extrude and many other features.



In the first photo we have the 3D Design of the YRobot on witch Voinea and Cezar worked and in the second photo we have Voinea teaching Cezar some things about 3D Design.

Attendance

Andrei, Eliza, Luca, Visoiu, Voinea

Time: 14³⁰ - 17³⁰

Week 50**Wednesday**

10 - 16 December 2018

12th**Goals****Reflections**

- Drill holes into the slider
- Brainstorming for Korea
- Brainstorming for notebook

- Achieved almost everything that was planned
- Will repair holes next time

Summary

Today Visoiu marked and drilled holes into the slider. Drilled one hole off-center so we now need to expand that hole into a slot.

Today Ema, Andrei, Alex and Victor stayed really late trying to figure out a solution for several problems concerning the team, some about the Korean contest in January and some about the design and writing of the engineering part of the notebook. Today was a really exhausting day and they were also stressed because there was a big test coming.



Alex and Victor taking a break after a hard day.

Attendance**Time: 14³⁰ - 21⁰⁰**

Alex, Andrei, Ema, Victor, Visoiu, Voinea

Week 50**Friday**

10 - 16 December 2018

14th**Goals**

- Design and build slider extension and retraction mechanism

Reflections

- Did everything that we planned but we need more info to decide

Summary

Today Cezar, Eliza, Luca, Tudor and Visoiu worked on the intake system, especially on the retraction and the extension of the sliders that we use. We designed and tested the slider mechanisms. We also had Alex help us with some explanations and advices for the mechanism and afterwards we asked him and Victor to “cut open” the other robot for scrap parts for our robot.

Meanwhile, today Alex, Victor and Voinea worked on the 3D Design for the robot. Andrei and Ema worked today on sending some more emails for before the holidays.



Alex helping Eliza, Visoiu, Cezar, Luca and Tudor with the sliders and giving additional info.

Attendance**Time: 14⁰⁰ - 17⁰⁰**

Alex, Cezar, Eliza, Ema, Luca, Tudor, Victor, Visoiu, Voinea

Week 51**Monday**

17 - 23 December 2018

17th**Goals**

- Working on 3D design
- Working on notebook

Reflections

- There isn't enough room for 2 minerals in collector

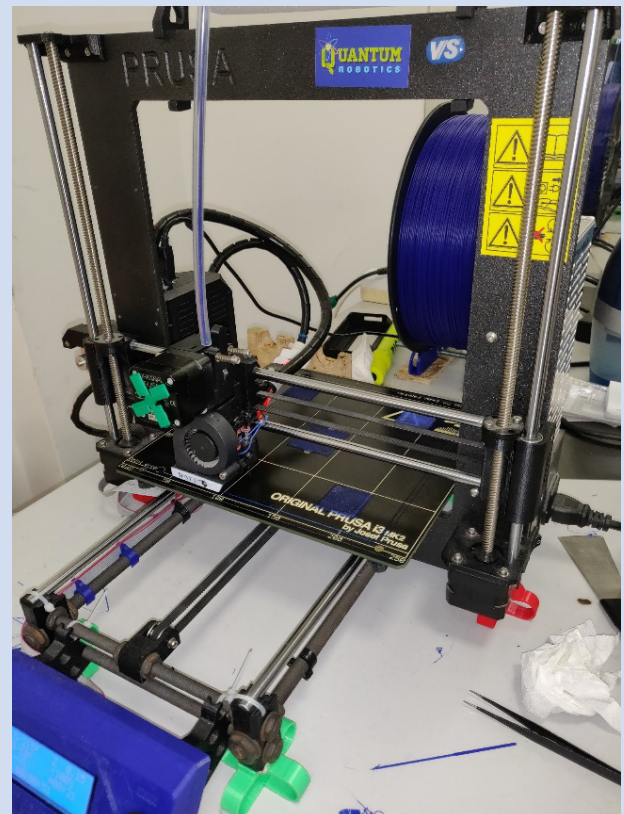
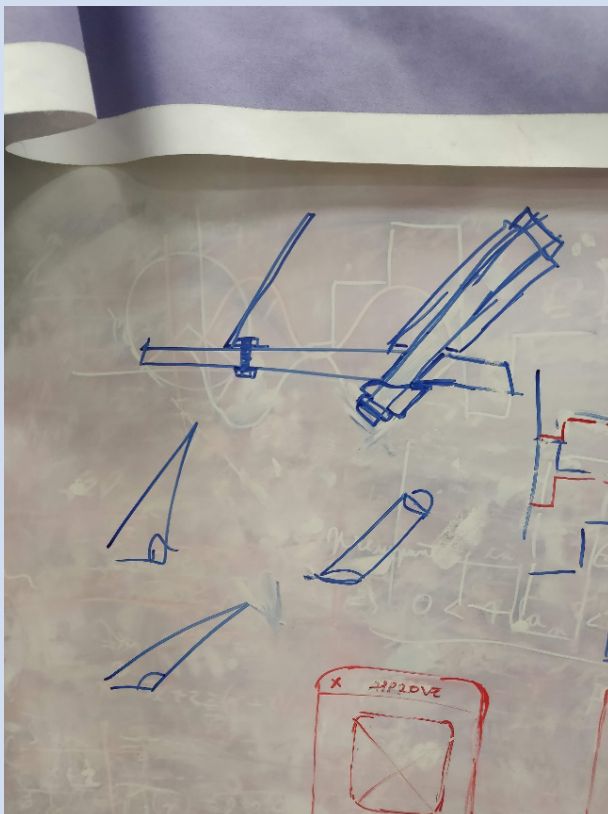
Summary

Today, Voinea, Victor, Alex and Andrei worked on the CAD of the robot.

We started by drawing a sketch on the whiteboard and then modeling an end stop for the outtake. After some fixes on the spacing, we realized that the mineral collector was initially designed without thinking about the end stop and now we couldn't fit 2 silver balls in the robot, so we had to rethink our intake.

Unfortunately, it was getting really late and we had to solve our solution the next day. Meanwhile, Ema kept working on the notebook. She is still working on getting all the personal descriptions and gathering and ordering daily entries.

We also had some problems with the printer because the bed level was not even. We fixed it by adding a 0.2 mm spacer in one of the corners and then recalibrating the printer.



The robot sketches from the white board and the 3D printer in use after adding the spacer.

Attendance

Alex, Andrei, Ema, Victor, Voinea

Time: 13³⁰ - 22⁰⁰

Week 51**Thursday**

17 - 23 December 2018

20th**Goals**

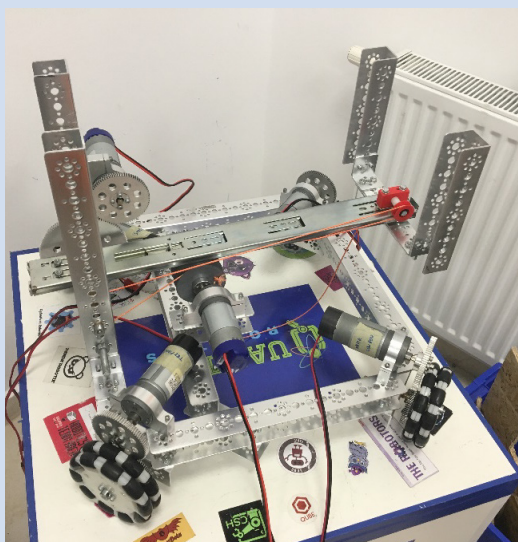
- Build intake system

Reflections

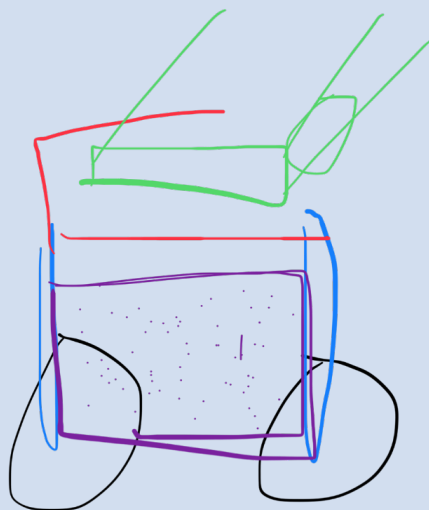
- Did everything that we planned

Summary

Designed and built the new intake system. Redesigned and reprinted the old intake wheels with more teeth in a more sensible configuration (did 6 major versions, each from scratch).



The YRobot in the final shape.



Eliza's drawing on the phone of the idea.

Attendance**Time: 9²⁰ - 16⁵⁰**

Alex, Andrei, Cezar, Eliza, Radu, Tudor, Victor, Visoiu, Voinea

Week 51**Sunday**

17 - 23 December 2018

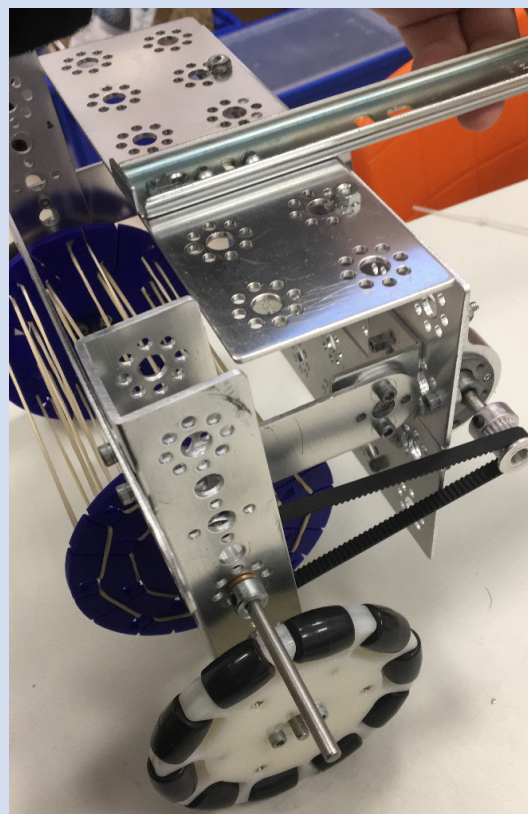
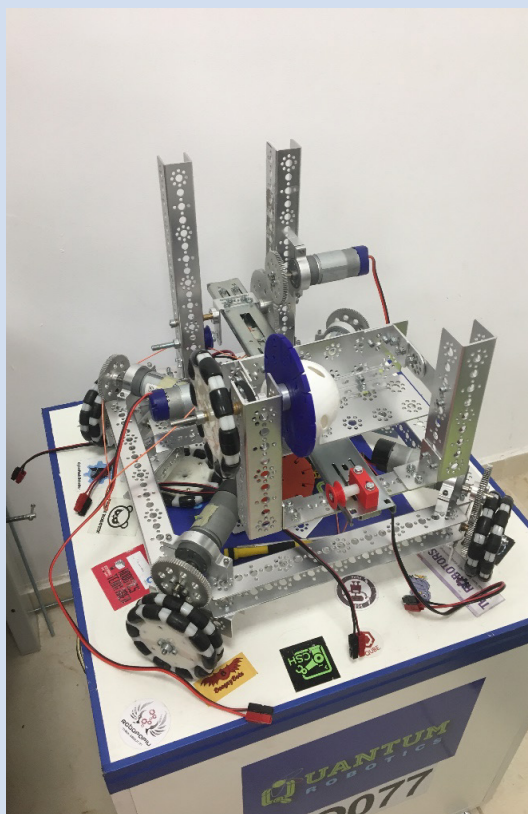
23rd**Goals****Reflections**

- Finish intake, start software part.

- It works and it is almost ready!

Summary

Almost finished the intake system, after mounting it upside down. Tested the TeleOP mode and the control formulas for the motors.



The robot after finishing evryting and testing the TeleOP and the intake final intake system.

Attendance**Time: 10⁰⁰ - 17⁰⁰**

Alex, Andrei, Radu, Victor, Visoiu, Voinea

Week 52

24 - 30 December 2018

Sunday

30th

Goals

- Ordering from GoBilda

Reflections

- We were very late with the order and we will be on a tight schedule when the parts arrive

Summary

Today we finally finalized the order from GoBilda. After being delayed for 3 whole weeks, we managed to talk to our school managers and we explained the situation. They understood and we started adding products to the cart. Unfortunately, you can't add parts in the cart from a table so we had to add them one by one.

Item ID	Description	Quantity	Price	Total
1	10K 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
2	100K 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
3	1M 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
4	100K 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
5	10K 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
6	100K 1/4W 5% Carbon Film Resistor	100	\$0.01	\$1.00
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The order list from GoBilda that we realised today we are extremely late with.

Attendance

Andrei, Victor, Voinea

Time: 12⁰⁰ - 18⁰⁰

Week 1**Saturday****31 - 6 January 2019****5th****Goals****Reflections**

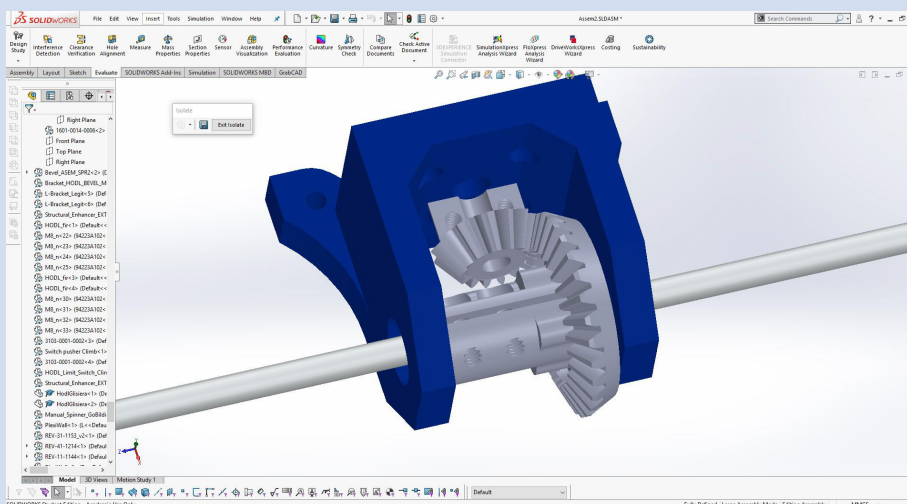
- Calculate mass

- We need to work on mass saving

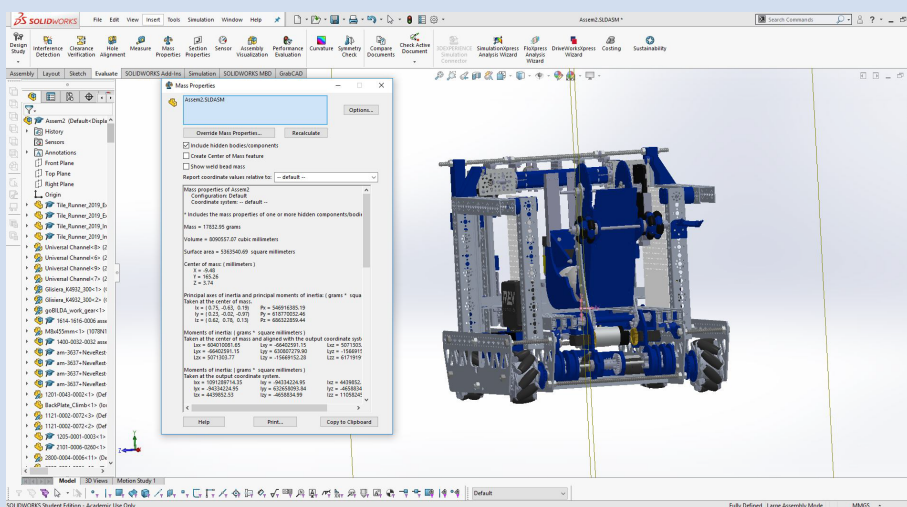
Summary

Today everyone came back from vacation and we were back in business! While Ema worked on the notebook while the hardware and 3D teams were working together to update the old parts with the ones from the GoBilda order. We replaced parts such as the beveled gears and added a few more screws to the assembly.

To be sure the robot will fit in the weight limit, we began adding masses to the parts of the assembly and by the end of the day we had an approximation: 17.8 kg (without cables). This means we had very little extra mass remaining. We think that we need to think a lot about our options with the weight of the robot. We are not sure what we are going to do for the final solution of the robot but most probably we will have to think a lot about our options and combine them for a lighter robot that would still do all the tasks.



This is a screen shot from the CAD with the climbing system that will allow the climbing system to deattach from the lander through the top of the hanger.



This is a screen shot from the CAD with the whole robot, with the climbing system already on.

Attendance**Time: 11⁰⁰ - 21⁰⁰**

Alex, Andrei, Ema, Radu, Victor, Voinea

Week 2

Tuesday

7 - 13 January 2019

8th

Goals

- Purchase team T-shirts

Reflections

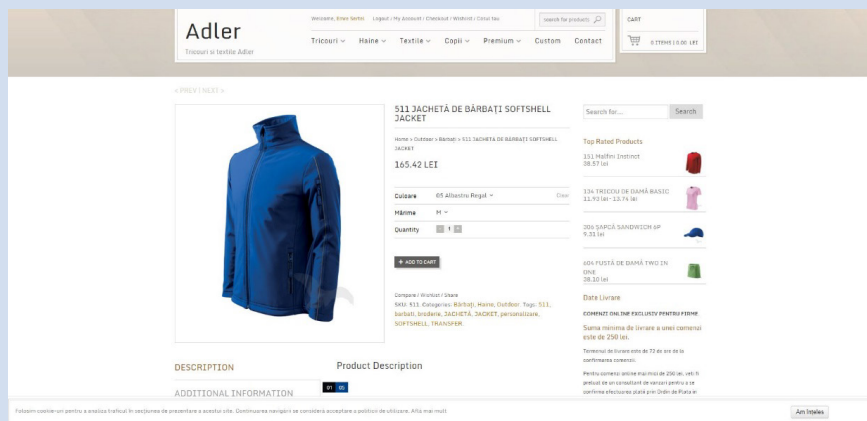
- We need backup funds for T-shirts

Summary

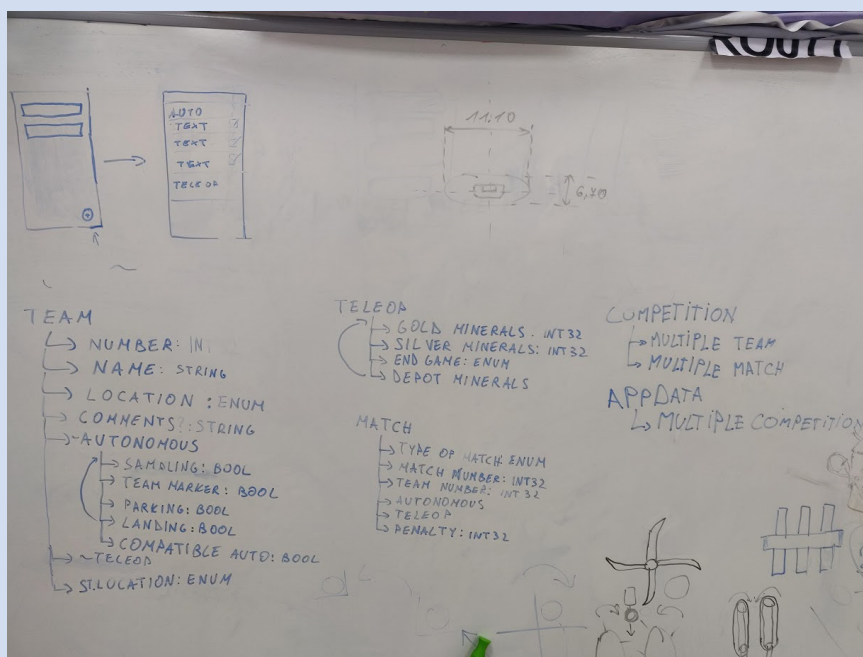
Today we ordered the team clothing for Korea. We made it mandatory for every member to get a T-Shirt and optional for a soft shell jacket or hoodie. All clothes were ordered in Royal Blue color from Adler. In total, we spent 2000 lei (around 500\$).

We also had a talk about team tasks at the competition. We decided to make 3 teams: The robot team (with driver and emergency engineer), Pit team (PR and a person responsible with the batteries) and scouting team (to collect information about other teams).

To make scouting easier, we decided to make a scouting application for our phones. The programmers made a sketch of the database behind the app. Next we will continue working on a scouting method and hope our T-shirts come in time.



This is one of the team uniform articles we've bought today. It is a soft-shell in royal blue.



This is a map of the way we want the scouting app to be for the contest in Korea. In the end we would like the app to have to possibility to collect all data from each member that and the add it in a single data-base but for now, simply collecting the data and keeping it is enough.

Attendance

Time: 11⁰⁰ - 21⁰⁰

Alex, Andrei, Cezar, Eliza, Ema, Radu, Sanzi, Tudor, Victor, Vladut, Voinea

Week 2**Wednesday**

7 - 13 January 2019

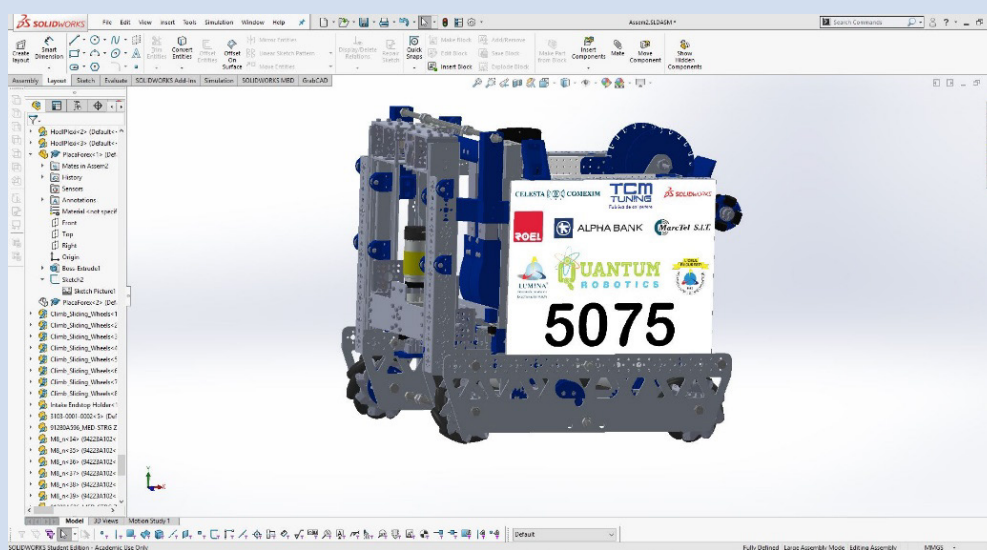
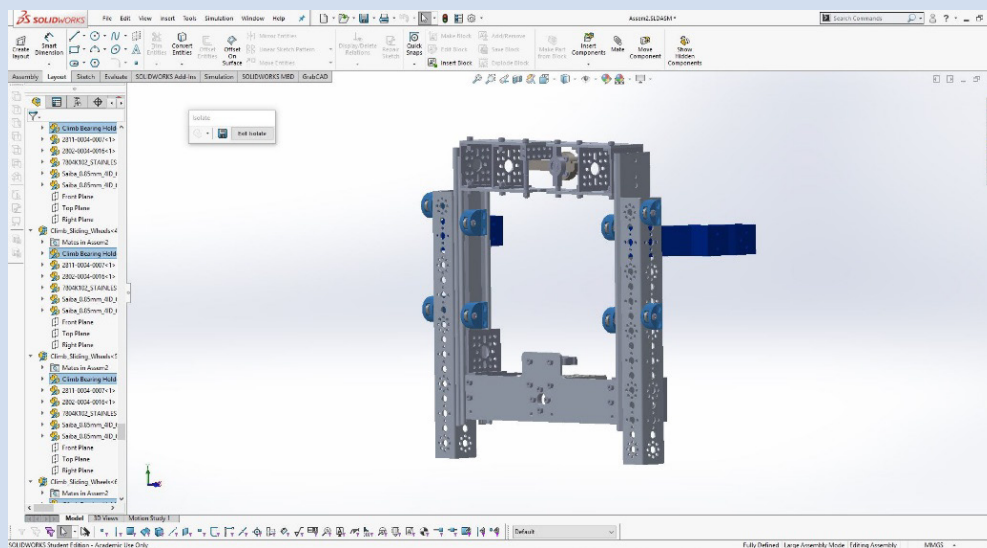
9th**Goals****Reflections**

- Design rollers
- Design robot panel

- Panel collides with battery holder we need to find a solution

Summary

Today we started designing the robot side panels. We chose 5mm Forex as our panels as they are easily available for purchase and easy to cut. After a initial 3D design where we decided on the dimensions, Andrei designed the placement of the logos in Adobe InDesign. After he was done, we added the photo to our 3D model. Victor and Alex designed the rollers that the robot will use when climbing back on the lander. They were made to reduce friction between the robot and the lander's plexiglass wall. We will think about solution and also talk about them tomorrow when we hope to find a suitable one.



The two photos are screen shots from the 3D Design. The second one has only the hanging system. The third photo has the whole robot in it's final state, with the Forex and sponsors.

Attendance**Time: 11⁰⁰ - 20⁰⁰**

Alex, Andrei, Victor, Voinea

Week 2**Thursday**

7 - 13 January 2019

10th**Goals****Reflections**

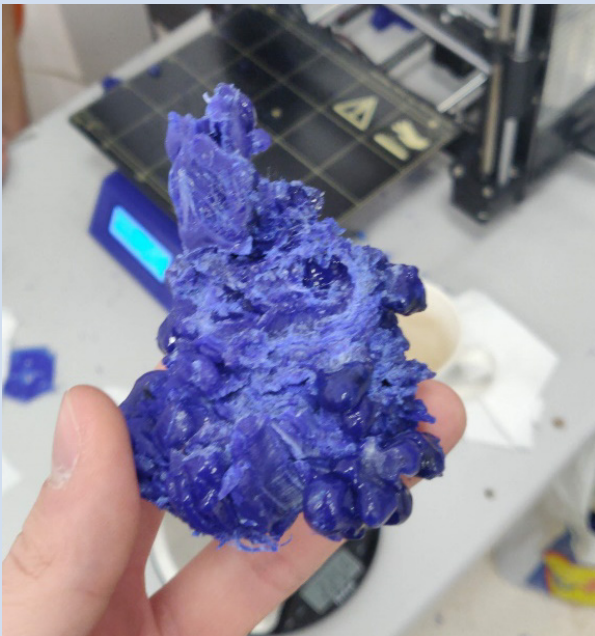
- Fix printer

- Printer needs more maintenance

Summary

We started the day poorly, as the 3d printer was very damaged when we arrived to school. The print that we left for the night before came off the printing bed and material started to build up at the nozzle. PLA went all over the internals of the printer and the whole hot end was damaged beyond repair. Because we were in a hurry to fix the printer, we quickly ordered the broken parts from PRUSA.

Later that day, we went to FabLab, a firm that sells Plexiglas and Forex, and inquired about purchasing those materials. We were told that we need to send them an email with all the details. Because it was quite late already, we went home.



This is one of the mistakes made overnight because the printer broke again and the piece we were trying to print got destroyed by the material stuck on the nozzle.

Attendance**Time: 11⁰⁰ - 19⁰⁰**

Alex, Andrei, Radu, Victor, Voinea

Week 2**Friday**

7 - 13 January 2019

11th**Goals****Reflections**

- Getting our CNC parts

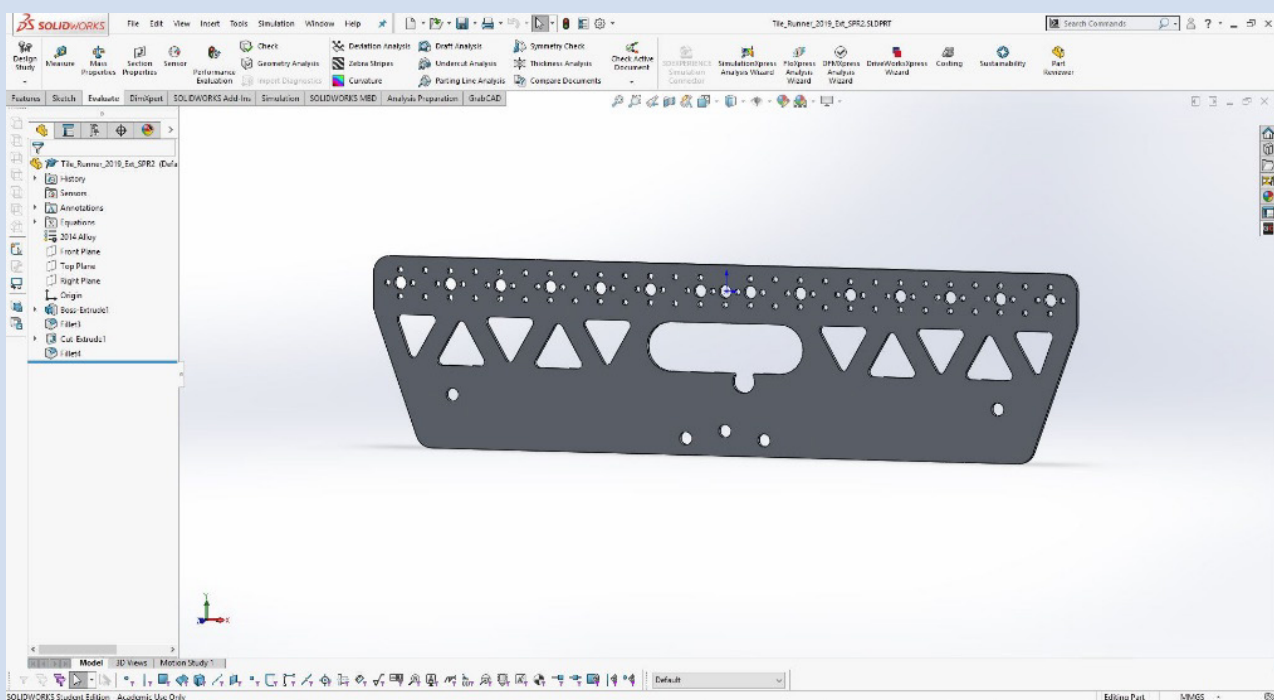
- We need backup plans

Summary

We started the day by sending the mail to FabLab with the required DXF files. After that we worked on a flag holder for the robot. Our design was made out of 2 different parts so we could adjust if the flag is longer/shorter than expected.

We also got a call from Elettra, the firm that was supposed to help us with the CNC parts. They told us that they will be very busy the following weeks and they will not be able to manufacture our parts. We were devastated by these news as we have a very tight schedule. We quickly called our friends from QUBE that gave a phone number for the company they work with for CNC parts. After getting in contact with IPAD, we sent them a mail with our requirements. We also had some small redesigns of the main chassis as we were fearing it but give up under the stress.

Also, today the team leader of Caragiale High School came over to our lab and we lent them 4 omni wheels for their robot.



The 3D Design for the one of the Chassis parts that unfortunately wasn't made with a CNC at first so it ended up badly executed by hand at one of our sponsor's lab.

Attendance**Time: 11⁰⁰ - 21⁰⁰**

Alex, Andrei, Radu, Victor, Voinea

Week 2**Saturday**

7 - 13 January 2019

12th**Goals**

- Drill holes in sliders
- Improve Yrobot Intake Design

Reflections

- Better time management required;
- We need to learn to work under pressure

Summary

Today we went to our sponsor, TCM Tuning to drill some holes in our sliders. Unfortunately, our linear drill is not precise enough for this so we had to rely on TCM. We arrived at 4PM and the building closed at 5PM so we were under pressure to finish in time. Because we were in a hurry, we drilled a few holes with 3.5 mm drill bit instead of the 4 mm one but we decided we will fix the holes when we get back to our lab. After half an hour of work we realized we were not going to finish in time but we were lucky that the people there understood our problem and waited for us until 7PM. In the end we were really lucky to have TCM's support and we were able to finish what we had to do and drill all the holes.

We started by making a Tetrix prototype for our first ideas. By testing the design we realized some features didn't work well. After rethinking it, we managed to build a working prototype, but it's still not complete. Also, Cezar and Luca had to drill holes into the sliders to enlarge the space between them.



Photo with Andrei and Victor enlarging some holes while Alex, Radu and Voinea are looking.

Attendance**Time: 11⁰⁰ - 21⁰⁰**

Alex, Andrei, Cezar, Eliza, Luca, Popica, Radu, Sanzi, Sanzi, Victor, Voinea

Week 5**Friday**

25 January 2019 - 3 February 2019

1st**Goals**

- Identifying a solution for accurately return a coordinate location of our robot on the field.

Reflections

- We need to design a wheel mount to use omni wheels as independent encoder wheels.
- We identified that the mechanism yields 306 counts per revolution, which will allow movements that have error of less than 0.25 inches.

Summary

After returning from Korea, the first thing we wanted to change to our robot was the autonomous period code. In Korea, we had persistent issues with the encoder data coming from the motors. The errors would lead to our robot missing the deposit, misplacing the team marker and hitting the edge of the field scratching the plexiglass surface. The code didn't have any issues.

We had different theories from where the errors would come from. One of the more prominent theories being that the mecanum wheels would slide and won't rotate so the encoder would not register all the movement.

We searched in the FTC community for a solution to this problem. One of them was to mount odometry wheels.

We would need to register the movement in all directions to get the perfect tracking of the robot. The plan is to put one encoder wheel on each side of the robot excluding the front due to the lack of space.

To avoid the friction created Omni wheels would be the one to solve the issue. There are many types of Omni wheels, but we settled on buying smaller ones.

The reason for that was for reducing the speed and have more rotation per inch. For the encoder, we decided to use the given encoder from the recently purchased TETRIX kit.

Implementing the odometry wheels to the code is not that hard. The problem is with the hardware which requires creating in CAD a special mount for the encoder and wheels.



E4P encoder



TETRIX encoder coming with the kit



Omni wheel we decided to order

Next Step: Finalizing the system, buy the pieces, print the 3D pieces

Attendance

Time: 10⁰⁰ - 22⁰⁰

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea

Week 6**Monday**

4 February – 10 February 2019

4th**Goals**

- Continue researching and identifying ways for implementing the odometry encoder wheels.

Reflections

- Buy the omni wheels and test the solution
- Solving the difficulties with the lack of the slots implies that we can get back to modeling the encoder wheels case.

Summary

Today we found out that the Omni wheels that can be found on the internet all have a normal shaft hub. It is made from aluminum and would not pass through our encoder. So, changing to a D-Shaft hub made from PLA would help us be more precise with the encoder and reduce the weight. We spent a large amount of time on designing a perfect model for the odometry. But no use.

There were a lot of flaws going from functionality to size and weight. Going through a lot of deep thinking, helped us realize that the wheels would need rubber bands to push them on the tiles. We want to ensure that the robot program gets the information from the encoder as accurate as possible.

When trying to find what slots would be used for the encoder wheels we found out there were only one left. There should be at least two more for them to work. The first thing that came up was adding a relay to the system. But when searching the game manual, we found out that the relays were prohibited from use.

Next, was trying to replicate a relay by using a servo that would press a button to switch the contacts. In order to avoid weighing down the robot and occupying as small space as possible, the servo chosen was a Micro Servo. End stops were added to act as buttons since there were a lot of them in our storage.

After we settled on materials to use the last thing, we needed to was preparing a model that would be holding all the components.

The horn of the servo was too small. Therefore, the next idea was creating a connection between the horn and the end stops using a linkage. We added two more end stops so the wires would have enough number of pins for connections. The system has two states:

- when all the buttons are pressed (two of the end stops would be active)
- when none of them are pushed (the other two would activate).

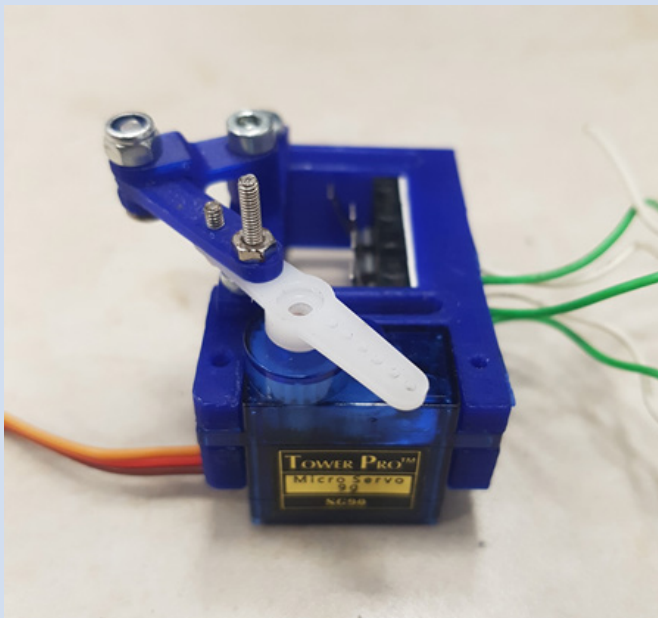
After a while, the model was ready to be printed. The first attempt of printing ended up in a fail because the mount was printed in the wrong orientation. In 3 and a half hours the model was ready to be removed from the heated bed. Victor soldered the wires and mounted the servo.

Solving the difficulties with the lack of the slots implies that we can get back to modeling the encoder wheels case. We added to our sketch a place assigned to securing the rubber bands and a cap screwed to the principal part to mount the encoder quickly or make changes to it.

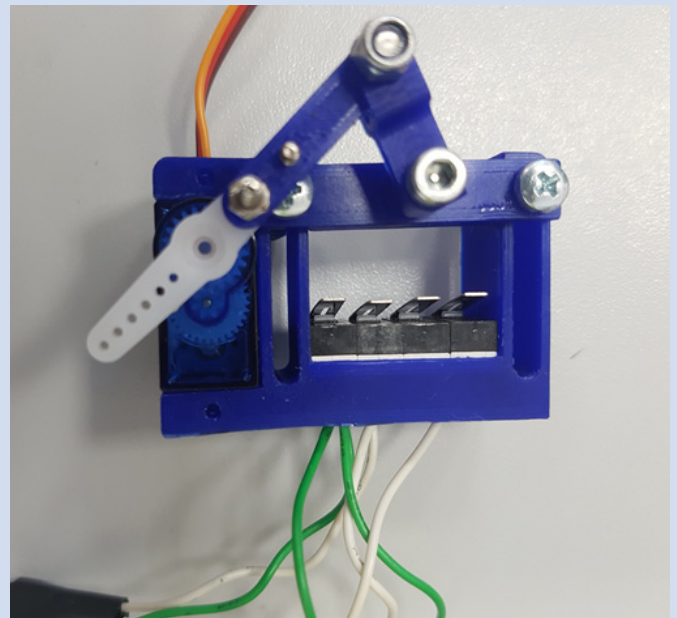
The printer got prepared before handling the 3 encoder cases, by cleaning the bed and preheating it. We mounted the “relay” and connected the wires to it. Tested the “relay” with a multimeter and the results were promising. Before leaving the lab we assembled one encoder wheel.

<RE17> Additional Electronics – Electronic devices that are not specifically addressed in the preceding rules are not allowed. A partial list of electronics that are not allowed includes: Arduino boards, Raspberry Pi, relays, and custom circuits.

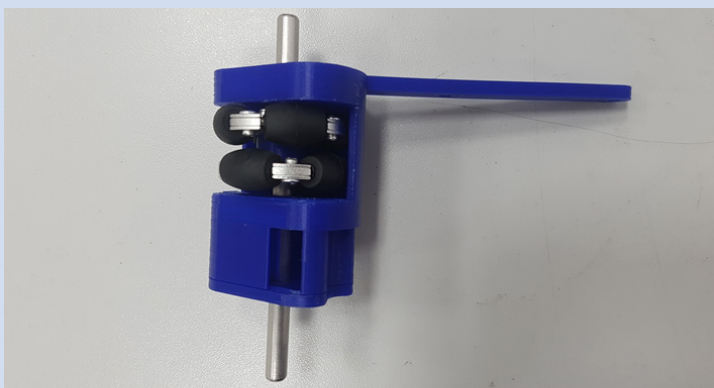
Fragment from the game manual



Custom made “relay”



Side view of the custom made “relay”



The odometry encoder wheel system

Next Step: Fixing the system on the robot and testing

Attendance

Time: 10⁰⁰ - 22⁰⁰

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea

Week 7**Thursday**

11 February – 17 February 2019

14th**Goals**

- Testing on the field the solutions of odometry
- Testing the custom switch created by Victor and avoid the future risk

Reflections

- Overloading the robot with new tasks is a new challenge. We should be prepared and sure that our new solution solves the positioning of the robot during the game

Summary

We tested this mechanism on a test holonomic drive. The final encoder counts were higher than expected because the encoder returns 4 counts per encoder tick, so we have 1440 counts per revolution, which translate to 306 counts per inch.

This is more accuracy that expected but we identified a new risk that can appear during the game.

The lack of slots forced us to design a switch system which is moved by a servomotor. Switching the power between motors/encoders can create a huge risk during the game. If we cannot action back the servomotor we risk staying with the robot on the field. This we cannot afford.

Also, we were with the robot to the maximum weight and we cannot load with new pieces.

Alex and Radu, came with the idea to improve the programming using the PID function. Using the PID function in the programming help us to avoid errors on the field because this corrects the motor errors depending on how far are on the targets.

This new idea gives us a new challenge, after we studied almost 3 weeks implementing the odometry.

Next step: Create a program to return the coordinate location of the robot based on programming PID function.

Attendance**Time: 10⁰⁰ - 22⁰⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea

Week 8**Saturday**

18 February - 24 February

23rd**Goals**

- Design and test the autonomy programming based on PID functions

Reflections

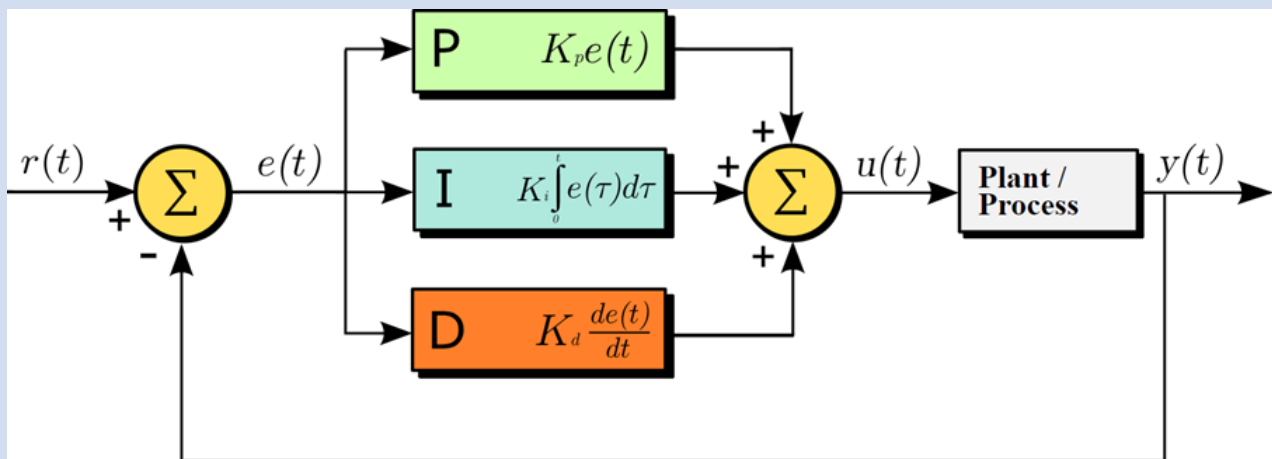
- Studying and Implementing the new programming functions in order to eliminate error of the motors

Summary

We have 2 more weeks up to Regionals and we should finalize the programming and start training. Radu, head of programming, studied the PID function and he informed the technical team.

PID (proportional–integral–derivative controller) is a control loop feedback mechanism widely used in industrial control systems and a variety of other applications requiring continuously modulated control. A PID controller continuously calculates an error value $e(t)$ as the difference between a desired setpoint (SP) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively), hence the name.

In practical terms it automatically applies accurate and responsive correction to a control function. An everyday example is the cruise control on a car, where such as ascending a hill would lower speed if only constant engine power is applied. The controller's PID algorithm restores the measured speed to the desired speed with minimal delay and overshoot, by increasing the power output of the engine.



A block diagram of a PID controller in a feedback loop. $r(t)$ is the desired process value or setpoint (SP), and $y(t)$ is the measured process value (PV)

In this model:

Term P is proportional to the current value of the SP – PV error $e(t)$.

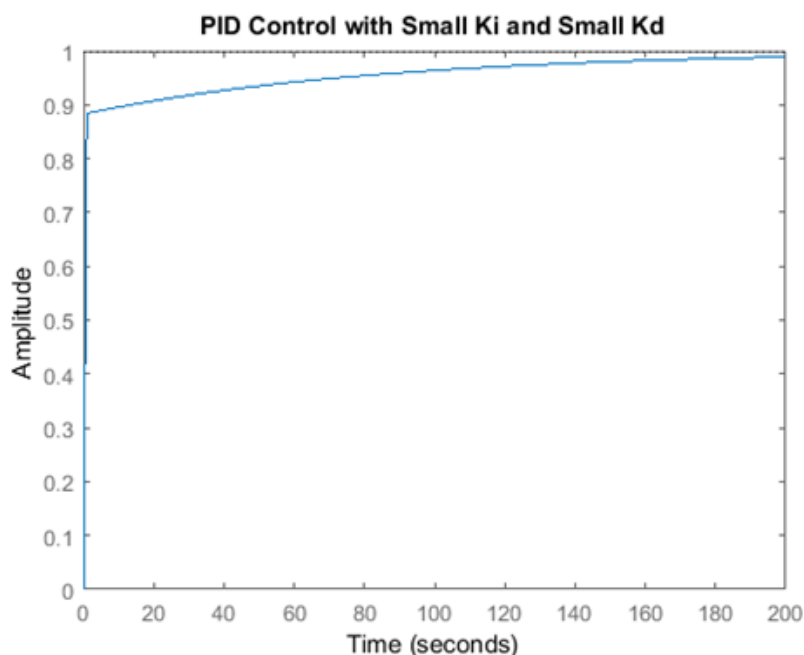
Term I accounts for past values of the SP – PV error and integrates them over time to produce the I term.

Term D is a best estimate of the future trend of the SP – PV error, based on its current rate of change. It is sometimes called “anticipatory control”, as it is effectively seeking to reduce the effect of the SP – PV error by exerting a control influence generated by the rate of error change.

This fact can be verified by experimenting with different values of . Specifically, you can employ the Control System Designer by entering the command `controlSystemDesigner(P_motor)` or by going to the APPS tab and clicking on the app icon under Control System Design and Analysis and then opening a closed-loop step response plot from the New Plot tab of the Control System Designer window as shown below.

We added an integral term in order to eliminate the steady-state error to a step reference and a derivative term for often reduce the overshoot. We tried PID controller with small and . Modifying the m-file so that the lines defining your control are as follows. Running this new m-file gives the plot shown below.

```
Kp = 75; Ki = 1; Kd = 1;  
C = pid(Kp,Ki,Kd);  
sys_cl = feedback(C*P_motor,1);  
step(sys_cl,[0:1:200])  
title('PID Control with Small Ki and Small Kd')
```

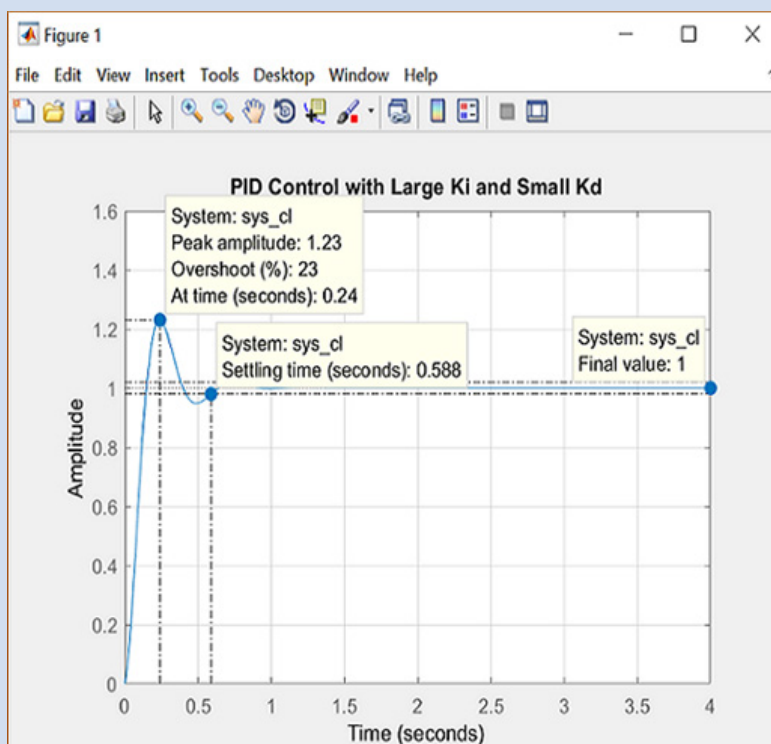


Inspection of the above indicates that the steady-state error does indeed go to zero for a step input. However, the time it takes to reach steady-state is far larger than the required settling time of 2 seconds.

Tuning the gains

In this case, the long tail on the step response graph is due to the fact that the integral gain is small and, therefore, it takes a long time for the integral action to build up and eliminate the steady-state error. This process can be sped up by increasing the value of K_i . Go back to your m-file and change K_i to 200 as in the following. Rerun the file and you should get the plot shown below. Again the annotations are added by right-clicking on the figure and choosing Characteristics from the resulting menu.

```
Kp = 100; Ki = 200; Kd = 1;  
C = pid(Kp,Ki,Kd);  
sys_cl = feedback(C*P_motor,1);  
step(sys_cl, 0:0.01:4)  
grid title('PID Control with Large Ki and Small Kd')
```

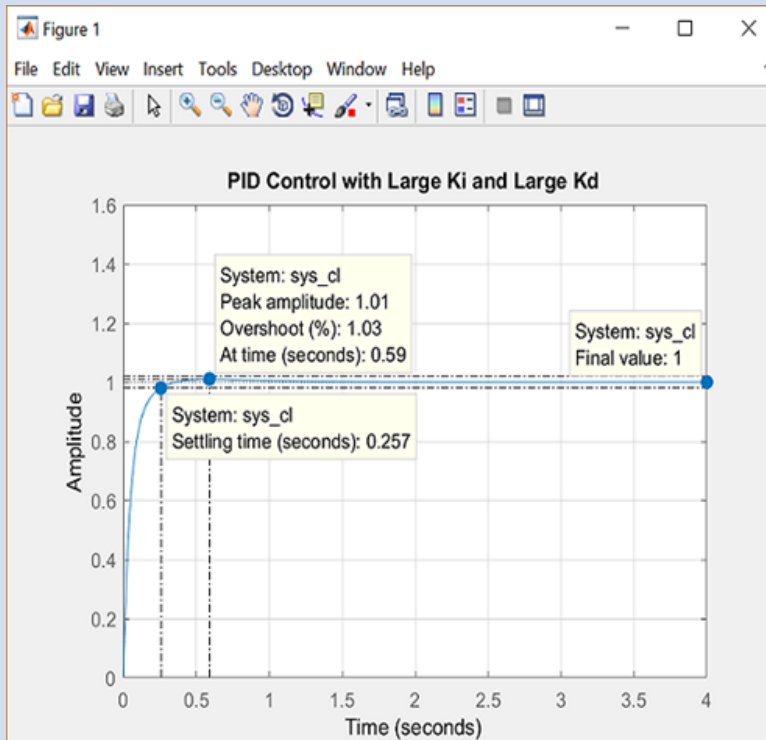


As expected, the steady-state error is now eliminated much more quickly than before. However, the large K_i has greatly increased the overshoot. Let's increase K_d in an attempt to reduce the overshoot. Go back to the m-file and change K_d to 10 as shown in the following. Rerun your m-file and the plot shown below should be generated.

```

Kp = 100; Ki = 200; Kd = 10;
C = pid(Kp,Ki,Kd);
sys_cl = feedback(C*P_motor,1);
step(sys_cl, 0:0.01:4)
grid title('PID Control with Large Ki and Large Kd')

```



As we had hoped, the increased K_i reduced the resulting overshoot. Now we know that if we use a PID controller with $K_p = 100$, $K_i = 200$, and $K_d = 10$, all of our design requirements will be satisfied.

Conclusion: We finalized the analysis and now we can have more accuracy in calculation of time from lander to first cube, than to depot area and back to lander.

Next Step: Finalizing the testing and implementing the code



Attendance

Time: 10⁰⁰ - 22⁰⁰

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea

Week 9**Saturday**

25 February – 3 March 2019

2nd**Goals**

- Testing the robot in autonomy and driving mode

Reflections

- Next week is the Regional competition and we need to test the robot on the field. We have the chance to participate to Gh. Lazar Highschool Demo.

Summary

Our focus this week is to verify all systems if these works properly. Simulating the competition is the best way to test the robot.

What we learn about our robot during Demo:

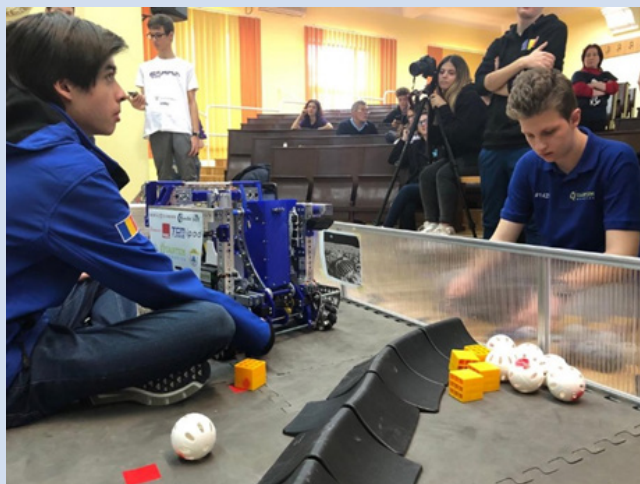
- some cubes are going to fall inside the robot, and we don't have possibility to take out
- we need to improve the autonomy in case some robots are in our way to score
- we need to communicate more with our alliance in order make the game strategy and to score more
- we succeeded 13 cycles, but we can do more
- we need 10 sec to climb

Conclusion:

We need more training to improve the driving.



Fixing the lander



Loading app for robot

Attendance**Time: 10⁰⁰ - 22⁰⁰**

Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea

Week 10**Wednesday**

3 March - 10 March 2019

5th**Goals**

- Finalizing work with notebook before Regional contest
- Finalizing promotional materials
- Simulating the interview

Reflections

- All the team members have work to do and we share the work for each member technic/non-technic. We consider working to the notebook in InDesign is the best design solution.

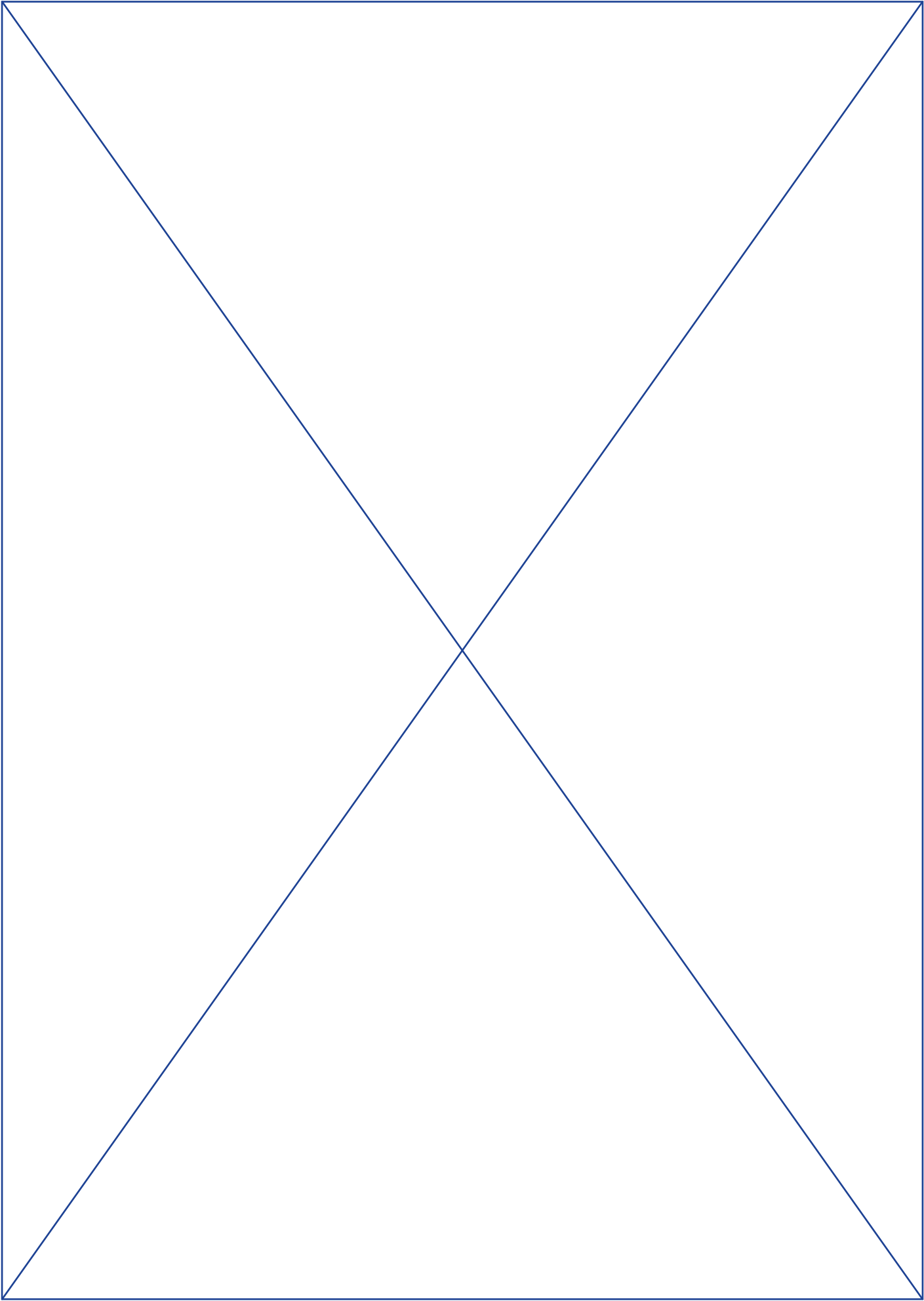
Summary

After we came back from Korea, we star working to the notebook in order to transfer the text and pictures from PowerPoint in InDesign program. Working in PowerPoint is easier, but our notebook became very consistent and ppt is limited. We consider working in InDesign is proper and we can have the format and design to the highest quality for next season, too.

Tuesday, we had the chance to rehearse for the interview and prepare the members who never took part in one. New members were very scared about the interview. Together with Mr. Emre – our mentor, Mr. Ferhat – Imagine's mentor and Mr. Fatih – Informatics teacher, we simulated the FTC contest interview, possible questions, team presentation, and technical solutions.

*Interview simulation***Attendance****Time: 10⁰⁰ - 22⁰⁰**

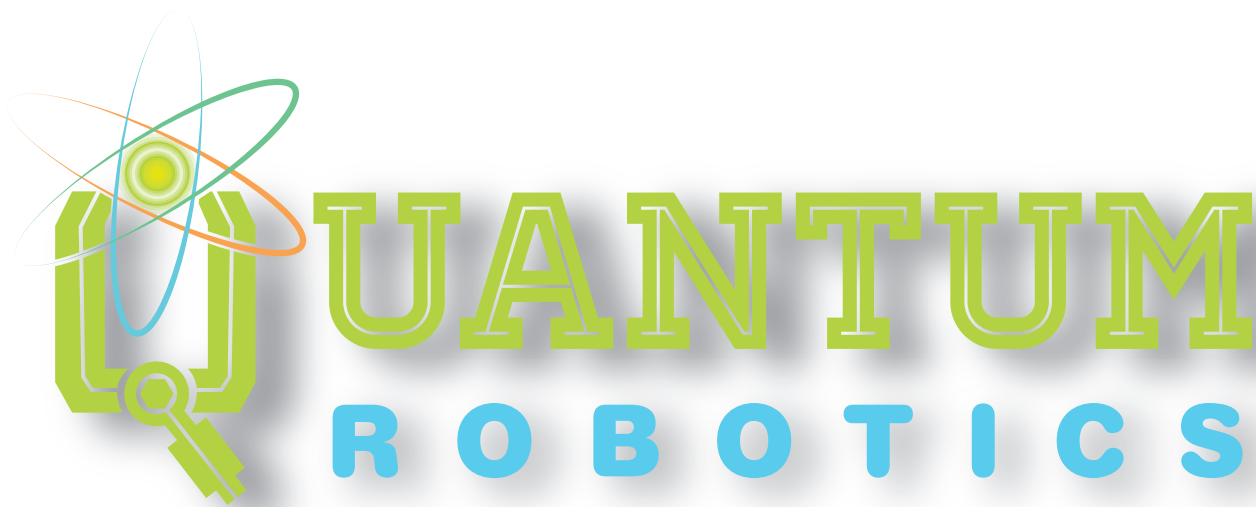
Alex, Andrei, Cezar, Denisa, Eliza, Ema, Luca, Popica, Radu, Sanzi, Teo, Tudor, Victor, Visoiu, Voinea



FIRST **CHAMPIONSHIP**



April 24-27, 2019
Detroit, MI

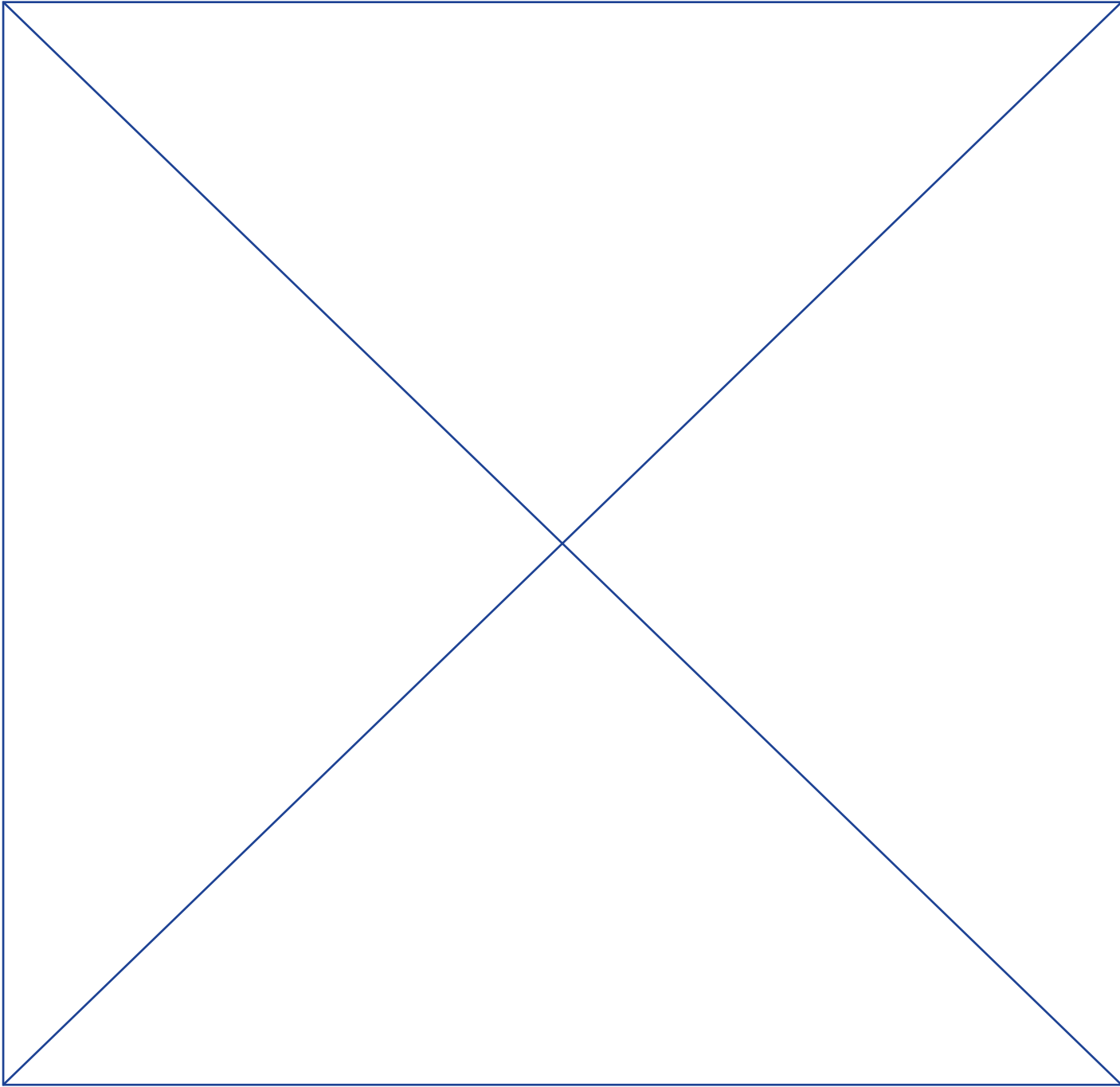


Annex

2018-2019

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Annex 1

27th February 2019

To whom it might concern:

Gentlefolk,

I met the Quantum Robotics team in April 2018 during their arrival in Detroit for the **FTC World Championship**. I was impressed by the teams' enthusiasm and I hope the robotics work will continue as a part of *education by doing!*

As you may know, the FIRST Tech Challenge competition help individuals develop the knowledge for STEM and how to work as a team! As people from "Natie prin educatie" states, the work (on STEM / robotics) is much better than wasting time (such as drug related). **A key part is to learn not only from your (team) mistakes but also from other's mistakes! It's not easy but possible!**

I'm very glad the Quantum Robotics students and their teachers (engineers included) **are taking time to learn and continuously improve themselves**. Learning is hard but STEM education is critical for this! Many years ago, I've learned math and physics for the engineering admission tests by teaching math and physics as a private tutor as a student, and later as an engineer!

Part of this learning process is the **sponsor financing**. The sponsor should foster this win-win situation:

- Students win by continuous education in STEM / robotics (learn by doing)
- Sponsor win by good PR.

As in any competition, there are winners and losers. In this case the whole team is winning because of gaining more experience in robotic related fields! First is to determine the mistakes, like a Fault Tree many of you will develop for future products. Then, after you know why, start determining improvement options. It's a long process but...this is part of engineering!

I know from my experience the high school time is very challenging in modeling the new human-person with information from math, physics, bio-chemistry to better understand **the reality** and then **help populating it with better robots, for our help**. I hope you will learn and continue your self-education. Good luck ahead.

FYI, a few words about myself:

I worked as Electronics Engineer at IAMSAT and Electronics Engineer at United Technologies then Denso. I retired in 2017 but I keep working in promoting STEM, robotics included. Now, I'm chairman to SID Metro Detroit and Vice-president to Society of Automotive Engineers Detroit.

Very kind regards,

Silviu Pala

AutomotiveDisplay LLC chairman

75 Maywood Ave., Bloomfield Hills, MI 48304, USA.

Silviu.Pala@automotivedisplay.com

Annex 2

6th February 2019

To whom it might concern:

We met team 14270 Quantum Robotics in April 2018 at the FTC Detroit World Championships.

We were impressed not only by their achievements to qualify for the World competition, but also by their curiosity to learn as much as they can to improve. It was not a surprise that they contributed to Romania winning the FIRST Global robotics competition over the summer in Mexico.

Since then, we have had several conversations, with the deepest being a Skype call in December to exchange strategies and tactics for the new season's FTC Rover Ruckus challenge. Even though it was only several months after the challenge was released, the team had created an impressive working robot with many custom parts. We were again very impressed with the team's energy and focus on the call, which they seem to be able to channel well into their mission.

It is much more difficult for international teams to obtain the necessary robotics parts from US retailers, and it's always amazing to see international teams that can match and excel against the best US teams.

We look forward to seeing Team 14270's many successes this year and in future year.

Sincerely,

John Nguyen

Mentor

Brainstormers #8644

The FTC World Champion – Captain of Winning Alliance



Annex 3



<i>To: Quantum Robotics</i>	<i>From: ECAP Solutions</i>
Attn: Mr. Radu Pogonariu Head of Programming quantum.robotics@ichb.ro	No/Date: 139/12.03.2019 No of pages: 1
Contact: Eftinca Cristian e-mail: contact@ecapsolutions.ro	

12.03.2019

Dear Mr. Radu Polgonariu,

On behalf of ECAP Solutions company, I'm pleased to offer your Quantum Robotics apps solution, presented and awarded to the Hacking Health 2018 as follow:

- Compensations will be 6000 Euro for the revolutionary and fully functional application that helps people with food intolerances at various allergens to detect allergens on food labels, create recipes and buy online products from the nearest store.
- The solution must be practical, complete and useful and must be fulfilled by the end of September 2019.
- The team must offer fully maintenance for 3 months after delivery.

Our group of companies owns top websites in the various businesses such as: media, furniture, industry, insurance, and real estate.

We look forward for your answer.

Sincerely,
Eftinca Cristian
Managing Partner
ECAP Solutions

ECAP Solutions SRL, Str. Iuliu Maniu nr. 7, Cotroceni Business Center, Et.4, Bucharest, Romania
Tel/Fax: 0314255350, Email: contact@ecapsolutions.ro, website: www.ecapsolutions.ro

Annex 4



Splaiul Independentei 313,
Sector 6 București 060042
Web www.acs.pub.ro

Tel +40 021 410 1044
Fax +40 021 318 1014
Email decanat@acs.pub.ro

Recomandare echipă: Quantum Robotics

Data vizită: 15.Februarie.2019 & 16.Martie.2019

Locație vizită: laborator de cercetare CISL41, Centrul de Cercetări Avansate pentru Materiale, Produse și Procese Inovative – Universitatea Politehnica din București

Aprecieri despre echipă:

- echipă dinamică, pasionată de proiectul la care lucrează, deschisă la a accepta propuneri și sugestii;

Aprecieri mod de prezentare:

- am apreciat pozitiv modul de prezentare, având în vedere modul în care echipa a reușit să îmbine o prezentare "de la zero", compusă dintr-o descriere a concursului și o introducere în regulile de desfășurare și limitările impuse, cu o bună argumentare a deciziilor de proiectare, cu expunerea unui mod de dezvoltare iterativ ce a condus la implementarea curentă a robotului propus pentru competiție;

Aprecieri robot:

- am fost plăcut impresionat de faptul că partea mecanică a robotului a fost proiectată în detaliu în Inventor, permițând utilizarea cât mai eficientă a spațiului maxim impus de către regulamentul competiției;
- am apreciat în special numeroasele componente și subansambluri mecanice proiectate de către echipă;
- în opinia mea, proiectul respectă complet cerințele și rigorile concursului FTC;

Recomandari despre robot:

- am discutat cu echipa câteva posibile optimizări, ne-critice;

Recomandari pentru potentiali sponsori:

- recomand cu drag oricărui potențial sponsor să investească în susținerea echipei Quantum Robotics, având în vedere pasiunea și dedicarea demonstrate de către echipă.

ȘL. Dr. Ing. Daniel Rosner

18.Mar.2019

CISL41 Hardware Development Laboratory Technical Coordinator
International Visitor Leadership Program 2017 Alumni

Faculty of Automatic Control & Computer Science, University POLITEHNICA of Bucharest
Phone number: +40727 784 770 | E-mail: daniel.rosner@cs.pub.ro

Annex 5



12.02.2019

Universitatea Titu Maiorescu, Facultatea de Informatică
Laborator de informatică Aplicată

În data de 12.02.2019 în Laboratorul de Informatică Aplicată al Facultății de informatică din cadrul Universității Titu Maiorescu, am avut plăcerea de a-i cunoaște, în sfârșit, pe protagoniștii participanți la concursurile de robotică, unde au câștigat premii I, II și III.

Primele informații le-am aflat despre ei anul trecut pe facebook și apoi pe youtube, deoarece am fost impresionat de ceea ce au realizat.

În urma întâlnirii cu echipa Quantum Robotics și cu robotul proiectat și realizat de ei pot spune că am constatat că mentorul spiritual al lor Morgan Freeman <https://www.youtube.com/watch?v=3FHRH5bzEus> a fost cumva depășit în așteptările sugerate de acesta.

La prima vedere niște copii care trăgeau după ei o cutie imensă, din care te așteptai să iasă ceva mare, dar de acolo nu a ieșit decât un robot. Deja a trebuit să fiu atent la ce se întâmplă în continuare.

Ce pot spune? Da!? ... ce am văzut:

- niște entuziaști;
- un robot care răspundea comenzilor manuale;
- același robot care se deplasa autonom;
- un robot care îndeplinea diverse sarcini, de la colecta niște obiecte până la plasarea acestora într-un spațiu special amenajat.

Ce am înțeles?

- o prezentare în engleză din care am înțeles că sunt o echipă ce se completează foarte bine;
- prezentare și demonstrare concomitent, fără a avea la dispoziție materiale printate sau powerpoint;
- fiecare intervenea în prezentarea robotului și a ceea ce face robotul doar atunci când partea din robot la care a fost coordonator era în discuție;
- la descrierea hardware a robotului au știut toți unde sunt componentele, care sunt legăturile, la ce ajută controler-ul, acumulatorul de este poziționat acolo unde era etc.;
- au noțiuni de mecanică și fizică care i-au ajutat să modifice software-ul inițial, astfel încât, să poată modifica diverșii parametrii de funcționare;

Universitatea TITU MAIORESCU

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Fax: 021.311.22.97 - 021.316.16.46



- discuția privind centrul de greutate și modul în care acesta poate influența dinamica robotului a fost punctul fort al discuției – pentru că știau ce se întâmplă.

Din punctul meu de vedere și al colegului meu de laborator putem aprecia că proiectul echipei Quantum Robotics răspunde solicitărilor temei și a criteriilor stabilite în cadrul competiției FTC.

În opinia noastră, dar și al echipei Quantum, credem că robotul își poate îmbunătăți performanțele prin ajustarea câtorva elemente, cum ar fi:

- adaptarea sistemului de ecuații care guvernează viteza de rotație a roților;
- căutarea unor materiale pentru cauciucuri, cu indice de aderență crescut;
- rigidizarea ansamblului structural.

Sponsorii echipei ar trebui să aprecieze faptul că echipa Quantum nu a folosit un produs de serie, sigilat, pe care doar l-au pornit așteptând ca el să facă restul. Au preluat o serie de componente pe care au reușit să le organizeze într-un format credibil, care să le permită participarea la competiția FTC.

O investiție în continuare în proiectul/proiectele echipei Quantum Robotics reprezintă o garanție că investiția este sigură. Livrabilul este peste valoarea de piață a materialelor utilizate și a manoperei (ca ore om). De ce? Pentru că ei se antrenează să fie competitivi într-o lume în continuă schimbare și pentru care tehnologia face parte din viața lor.

Conf.univ.dr.ing.

Lucian Ștefăniță GRIGORE

Inginer Mecanic, Specializarea tancuri Auto

Titular disciplinele: Informatică Aplicată în Robotică
Inteligență Artificială

Universitatea TITU MAIORESCU

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Annex 6

Currency [Leu](#) (Leu or RON)

Fiscal year Calendar year

Trade organisations [European Union](#), [WTO](#), [BSEC](#)

Statistics

GDP ▲ \$239.851 billion (nominal, 2018)^[1]
▲ \$516.336 billion ([PPP](#), 2018)^[1]

GDP rank [48th \(nominal, 2018\)](#)
[40th \(PPP, 2018\)](#)

GDP growth 4.8% (2016) 7.0% (2017)
4.1% (2018e) 3.6% (2019f)^[2]

GDP per capita ▲ \$12,285 (nominal, 2018)^[1]
▲ \$26,446 ([PPP](#), 2018)^[1]

GDP per capita rank [62nd \(nominal, 2017\)](#)
[57th \(PPP, 2017\)](#)

GDP by sector agriculture: 4.2%
industry: 33.2%
services: 62.6% (2017 est.)^[3]

Inflation (CPI) 3.275% (2019f est.)^[1]
4.631% (2018)^[1]
1.344% (2017)^[1]

Population below poverty line ▼ 23.6% (2017, [Eurostat](#))^[4]

Gini coefficient 35.9 (2019)^[5]
▼ 33.1 **medium** (2017, [Eurostat](#))^[6]

Labour force 8.951 million (2017 est.)^[7]

Labour force by occupation agriculture: 28.3%
industry: 28.9%
services: 42.8% (2014)^[3]

Unemployment ▼ 4.2% (2018, [Eurostat](#))^[8]

Average gross salary 4,512 RON / 1147 \$, monthly (April, 2018)^[9]

Average net salary 619 € / 700 \$, monthly (January, 2019)^[9]

Main industries [electric machinery](#) and [equipment](#), textiles and footwear, light machinery and auto assembly, mining, timber, [construction materials](#), [metallurgy](#), [chemicals](#), [food processing](#), [petroleum refining](#)

Ease-of-doing-business rank 45th (2018)^[10]

Annex 7



Google Search Report for Quantum Robotics

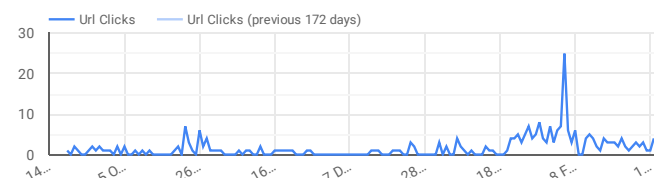
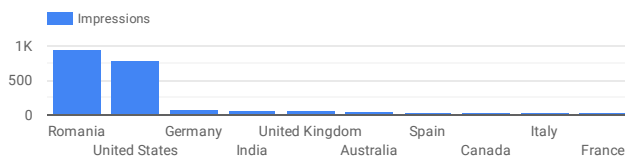
14 Sep 2018 - 4 Mar 2019

Filters Country Device Category

Impressions 2.5K No data
Last 28 days Previous 28 days

Url Clicks 261.0 No data
No data

URL CTR 10.6% No data



Landing Page	Impressions	Url Clicks
https://qrobotics.eu/		
https://qrobotics.eu/about.html		
https://qrobotics.eu/files/game-manual-part-1-tradus.pdf		
https://qrobotics.eu/about		
https://qrobotics.eu/media		
https://qrobotics.eu/contests		
https://qrobotics.eu/sponsors		
https://qrobotics.eu/media.html		
https://qrobotics.eu/sponsors.html		
https://qrobotics.eu/contests.html		
Grand total	2,454	261

Query	Impressions	Clicks	Average Position
quantum robotics			4.24
qrobotics			3.46
q-botics roboter			32.43
quantum robotics romania			2.75
quantum robots			6.17
quantum robot			51.13
q-robot			81.62
andrei tudor robotics			7.08
q robotics			3.56
pc robotics			47
Grand total	1,696	258	10.68

Quantum Robotics Website Performance Report

1 Jan 2019 - 4 Mar 2019

Users

378

New Users

378

Number of Sessions per User

1.38

Sessions

520

Page Views

1,305

Pages/Session

2.51

Avg. Session Duration

00:01:33

Bounce Rate

53.08%

New Visitor

27.3%

Returning Visitor

72.7%

User Acquisition

Source/Medium	Page Views
1. google / organic	590
2. (direct) / (none)	491
3. ln.facebook.com / referral	65
4. l.instagram.com / referral	45
5. stilipescur.ro / referral	31
6. facebook.com / referral	28
7. m.facebook.com / referral	25
8. l.facebook.com / referral	12
9. bing / organic	5
10. web.facebook.com / referral	5
11. paypal.com / referral	2
Grand total	1,305

Device information

38.3% desktop, 60.1% mobile, 1.6% tablet

Browser

Browser	Page Views
1. Chrome	735
2. Safari	171
3. Firefox	94

User Demographics

Language

Language	Users	New Users
1. en-us	178	177
2. ro-ro	98	97
3. en-gb	35	35
4. ro	24	22
5. c	15	15
6. es-es	8	8
7. fr-fr	6	6
8. ko-kr	2	2
9. en	2	2
10. de	2	2

Country

Country	Users	New Users
1. Romania	253	253
2. United States	55	55
3. Spain	11	11
4. United King...	9	8
5. France	6	5
6. Germany	5	5
7. Italy	4	4
8. India	4	4
9. South Korea	3	3
10. Russia	3	3

City

Town/City	Users	New Users
1. Bucharest	177	170
2. (not set)	20	19
3. Chicago	15	15
4. Cheshire	11	11
5. Craiova	9	9
6. Iasi	9	6
7. Brasov	7	7
8. Madrid	7	7
9. New York	7	7
10. Cluj-Napoca	5	5

User Behaviour

Page views

Page	Page Views
1. /index.html	538
2. /about	244
3. /sponsors	100
4. /contests	94
5. /media	85
6. /about.html	41
7. /media.html	31
8. /sponsors.html	15
9. /robots	13
10. /contests.html	13
11. /thankYou.html	2
12. /index.html?fbclid=IwAR0ewO-s5I2waGFv...	2
13. /index.html?fbclid=IwAR3bd-Q7L4VhMmF...	1
14. /index.html?fbclid=IwAR0Mzi4u8IGThym...	1
15. /about.html?fbclid=IwAR3qEVK0Nz_TOKL...	1
16. /index.html?fbclid=IwAR34Ux4uvfM8_5N...	1
17. /index.html?fbclid=IwAR0B1Uybo-QiyJ1L...	1

Exit pages

Page	Exits
1. /index.html	332
2. /about	88
3. /media	38
4. /contests	18
5. /about.html	17
6. /media.html	15
7. /sponsors	14
8. /robots	7
9. /sponsors.html	2
10. /index.html?fbclid=IwAR3qC-HWcL3TFd...	1
11. /index.html?fbclid=IwAR1SryWLSocScVx...	1
12. /robots.html	1
13. /index.html?fbclid=IwAR29QwDv9GdYg...	1
14. /index.html?fbclid=IwAR3ne18GnewPjp...	1
15. /index.html?fbclid=IwAR3dJF3wmHxECr...	1
16. /index.html?fbclid=IwAR0B1Uybo-QiyJ1L...	1
17. /index.html?fbclid=IwAR1L9Ek-dCm85XG...	1

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