Portfolio #10183

F.R.O.G.
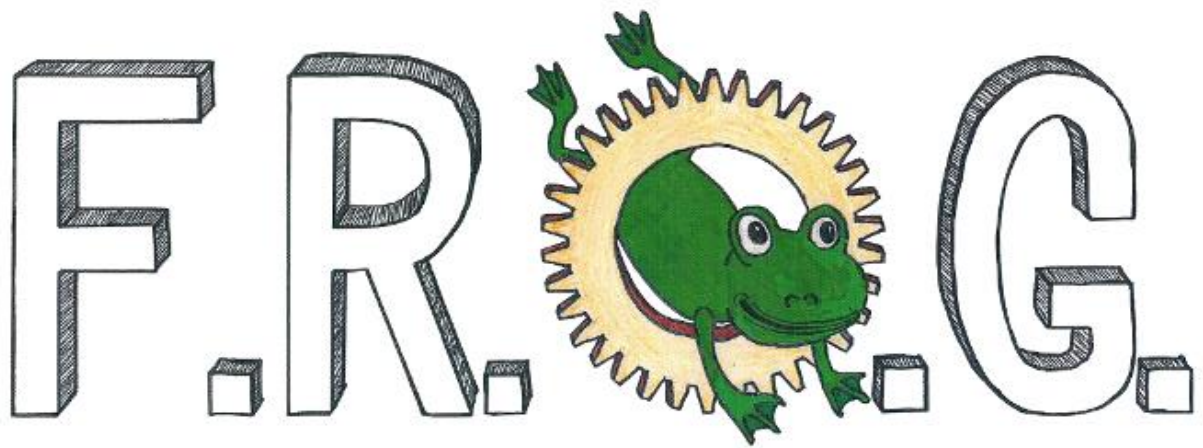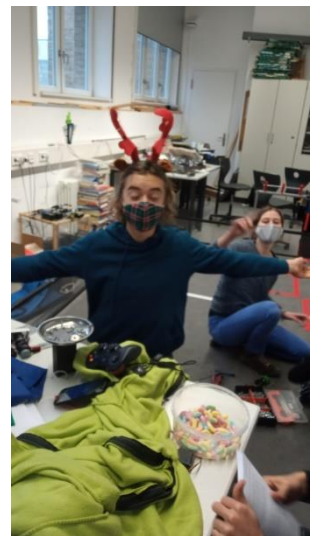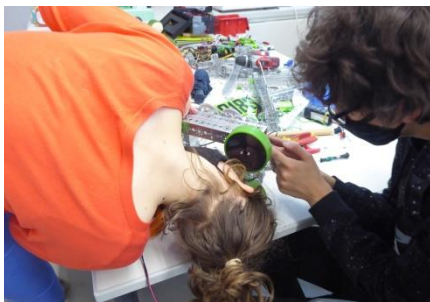
Frog Robots
of
Germany

Introduction

This is the notebook of the team F.R.O.G.: Frog Robots of Germany. It is the work of the whole FTC season by five inspired students of different ages and grades. **This portfolio gives a little insight in our FTC season.** You can see how our team grew together and how our robot became able to solve this seasons' tasks. We did also as much outreach as possible to stay a part of the huge FIRST community. Because of this contact and our work, **the FIRST core values became a part of all of our lives**. They inspired and advanced us.

We hope that this insight in our season we spent together will convince you of our work. **To make sure that we are not just a team of many others but a very special one.** Have fun reading.

F.R.O.G.
Frog Robots of Germany

Team Name

Our school has a history of more than 200 years. It began as an elite girls' school in 1818 founded by Queen Catherine Pavlowa of Russia. Their school uniforms consisted of a green dress. Every morning, when the girls dressed in green, went through the park to school, the citizens gave them the nickname « green frogs » or just « frogs ». Later the **frog became the mascot of our school** and also for our team. After the previous team « What the frog » reached to the top of their carrier winning the Aviano Invitational and going to the world finals in St. Louis **we found a new rookie team: F.R.O.G**. Is an abbreviation for Frog Robots Of Germany and refers on the one hand to our school and on the other hand also to our way of thinking. We are a green, economic team but also young students lively and animated like young frogs. Due to the word Germans, it's easy to identify us as a German team, which is at international competitions very helpful. During two competitions in the Netherlands, we learned a bit of Dutch language while giving frogs to other teams and visitors. The Dutch word for « frogs » is kikkers and now we are calling ourselves all the time the kikkers.

Hello, I am **Feli**, 15 years old and this is my **second FTC season**. My main task is to **build, design and repair the robot**. I am very glad that I can bring in my own ideas into the building process since I have a lot more knowledge than the last season. I also help writing the notebook, outreach and preparing for competitions. I am the **B-Driver** too. In FTC you can collect your knowledge and learn things and how to solve problems together with your friends.

Hey, I am **Leontine**, 18 years old and this is my **third FTC season**. Most of my friends call me Lemontine, but please don't ask why. As I am the oldest team member, I'm very familiar with **almost all kinds of tasks**. I help allot with the hardware, especially with **solving problems** and at the beginning of the season while planning the robot. With the time, we build our robot together as a team. It's just so much fun, when things finally work out as we planned them!

I am **Mahir**, 16 years old and hoping to have lots of fun in my **third season**! In this season I am still primarily **working on the robot** but also for the **drawings in our Notebook**. With two seasons already under the belt I believe that I can offer interesting suggestions to our robot and lend a helping hand in mechanism related problems. I like that FTC has more to offer than robotics. It is much more.

My name is **Juri**, I am a **Rookie**, 15 years old and probably own the biggest number of nicknames such as, Dozy, Erklärbär or Dulli. I`m responsible for the **outreach, writing the notebook** and I take care of our Instagram account. I am also a **mechanic**, especially since we took all our stuff to my home where I often build on my own until midnight. I love the combination of building a robot, programming it, spending time with good friends and meeting new teams. I, too, am the **A-driver**.

Hello, my name is **Tobias**. I'm 16 years old and this is my **second season** of FTC. Since **programming** is my passion, I am happy that I can program our Robot Gorfi too! I like to see how my theoretical thought also appeal in real life. I love robots and programming. In FTC I can do both of it with great team members and not only for my own. I too like the community.

And I am **Gorfi**, the last but probably most important team member. I am very attached to my mates and vice versa. I remind them constantly what they're doing in FTC and why they are doing it: Having fun and working together on a common goal! Still, I often can be **very grumpy** and if I need to take a nap there is no way to get me running.

Our Robot Gorfi

This is our robot Gorfi. Over the time he has become an important team member we all love and are very proud of. The following we will present you Gorfi, its mechanism and its development:
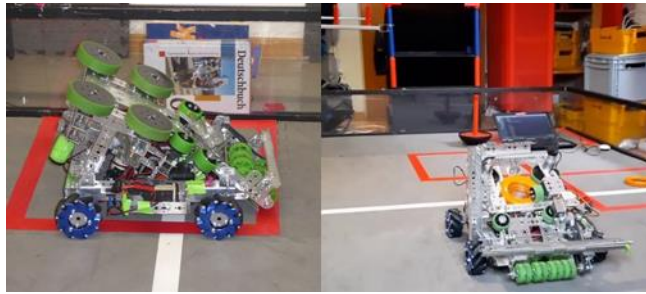
Intake mechanism:

Compared to most other parts of our robot which underwent several changes over time, our intake mechanism stayed relatively the same in its functionality.

It:

- uses chains to power the axis's the wheels are attached to

- green silicone wheels for good grip and flexibility

- improvements we did over the time:
- change the height of the wheels
- stabilization for the axis
- **cable ties for better grip and more efficiency of the wheels**
(→ perfect combination)
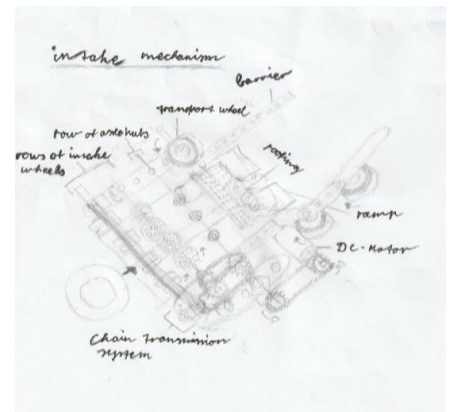
Transport mechanism:

First Version:

- servos were vertical and therefore easy to attach

- servos→ **way to slow, caused problems during the game** (as one ring was overtaking the other one; the rings didn't fall into the loading box; rings fell completely out of the robot)
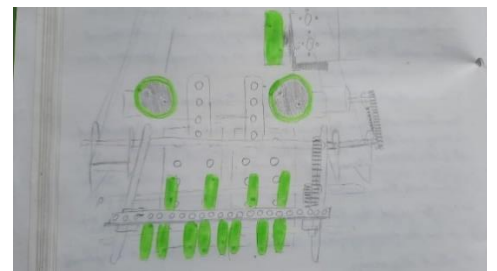
Second Version:

- **chain attached to the collecting mechanism→ speed fits perfectly**

- horizontally attached servo with several wheels and cable ties let the ring fall into the loading box reliably
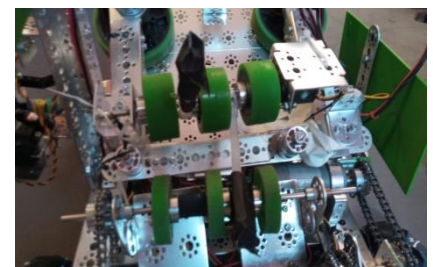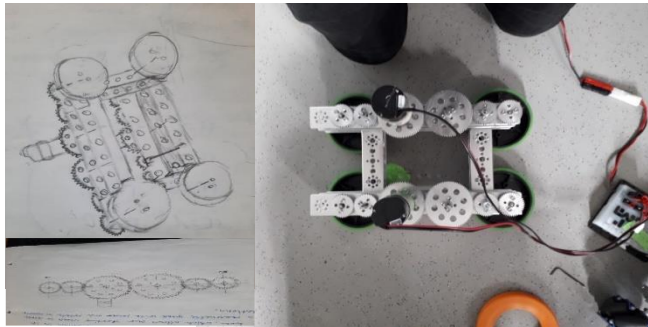
Shooting mechanism

First Version:

Mentioned aspects:

- shooting strength
- straight trajectory
- flight range

Resulting mechanism aspects:
- 3.7 Motors with transmission, 4 Wheels with plastic internals

positive aspects	negative aspects
straight trajectory	flight range was way too far and flight trajectory was way to high
easy changeable angle of the mechanism	problems to shoot the ring after each other because of no loading mechanism
	Loud (the gears)
	rub off of the gears was bad for electronics (metallic dust)
	needed long to go on and off since the wheels needed to run out

→ **We needed to redesign it**

Final Version:

Important aspects and improvements:

-**loading mechanism** to shoot 3 rings faster after each other-->more space for this mechanism→ **only 2 wheels**
- the wheels have not to turn that fast as expected: **no transmission**
- each wheel can be powered separately
-**the wheels itself are grea**t→ use them again
- **keep the mechanism as simple and effective as possible**
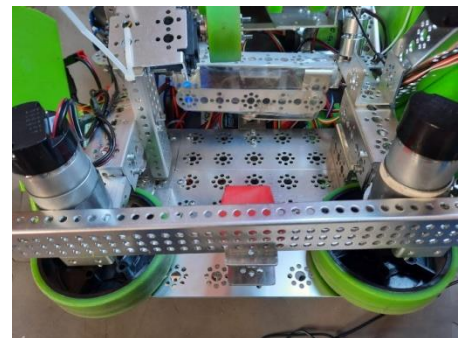
This was the result:
-works as expected
-very fast and reliable
-most of the problems solved

This mechanism taught us that the first idea isn't always the best. You need to accept downsides and problems and work on them and learn from them for an improvement. This mechanism proves that we were open minded enough for new ideas, and settings of priorities. We are glad to create a second version of which we can be very proud of.

As we learned this important lection about the designing process of our robot, we set the following priorities for our **wobble goal mechanism**:

Wobble Goal Mechanism:

-should be able to transport the wobble goal and bring it into the drop zone; **simple design** for more **reliability** and **faster building**; only use one motor (since the limitation to 8 in total); needs to fit onto the robot (wasn't that much space left)

→ the easiest way to move something up using a motor is to turn:
So we build this simple mechanism. We used two servos with lego grippers as lego is very lightweight but also stable enough to hold the wobble goal. We attached the tetrix profile with two axle hubs on the motor since one wasn't strong and durable enough.
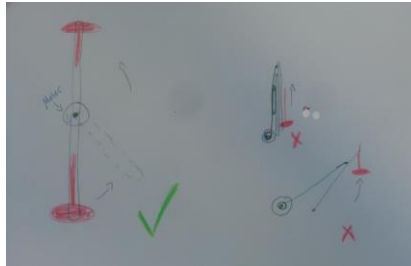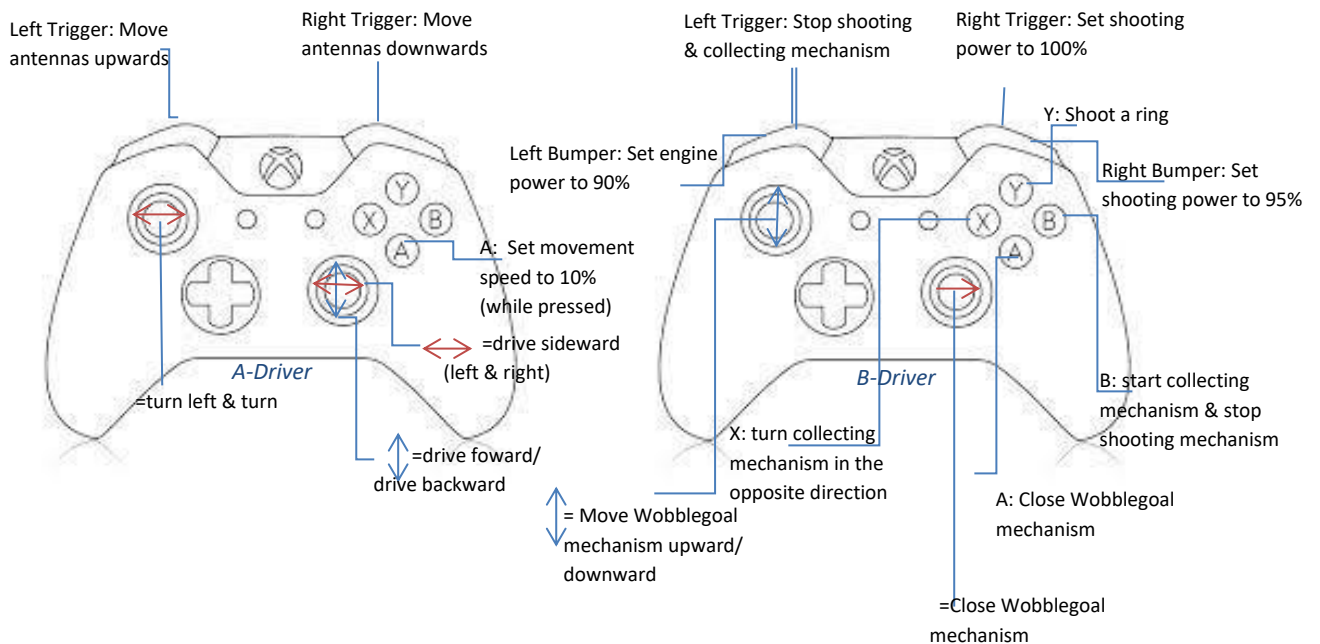
➔ Very reliable; easy to fix mechanism; good for use during autonomous and endgame

Programming:
Driver Controlled:

Left Trigger: Move antennas upwards

Right Trigger: Move antennas downwards

Left Trigger: Stop shooting & collecting mechanism

Right Trigger: Set shooting power to 100%

Left Bumper: Set engine power to 90%

Y: Shoot a ring

Right Bumper: Set shooting power to 95%

A: Set movement speed to 10% (while pressed)

= drive sideward (left & right)

A-Driver

B-Driver

B: start collecting mechanism & stop shooting mechanism

= turn left & turn

X: turn collecting mechanism in the opposite direction

A: Close Wobblegoal mechanism

= drive foward/ drive backward

= Move Wobblegoal mechanism upward/ downward

= Close Wobblegoal mechanism

Our robot uses a method Tobias designed last year to drive diagonally. First, the robot calculates how much it has to drive forward, sideways, and how much it has to turn. Then, the robot calculates what each wheel has to do.

Autonomous

1. Version (December):
AutonomousUtils ⟶ initializing ⟶ driveForward ⟶ driveLeft ⟶ driveRight

⟶ driveBackward

Autonomous1/ Autonomous0.9/Autonomous0.95

In the class AutonomousUtils, we wrote all the methods so that the actual Autonomous OpModes are more structured. We had three different and we choose the opModes depending on the voltage sensor.
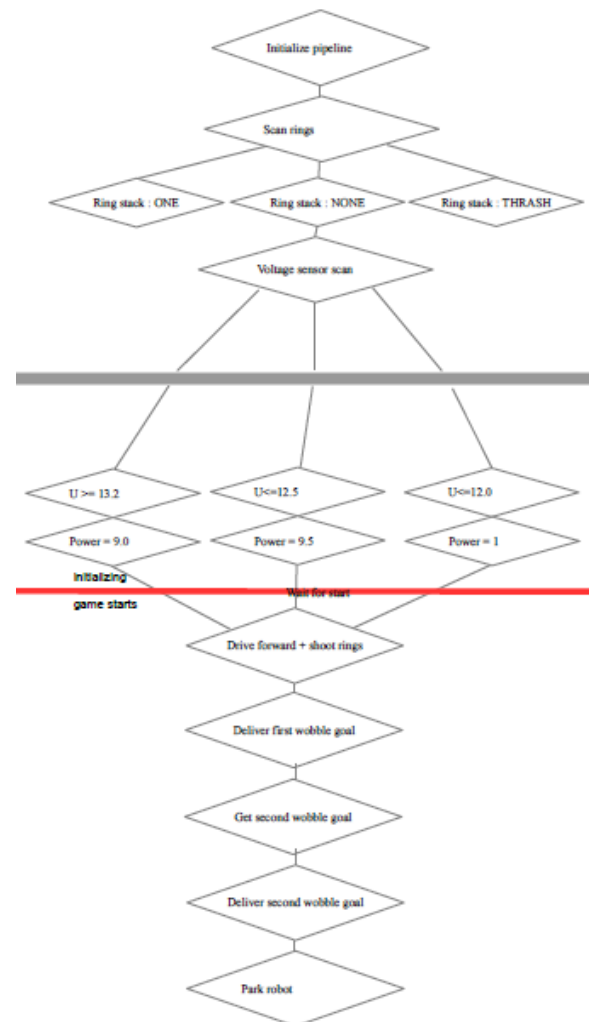
Now that we could drive precisely, we wanted to be able to put the wobble goal in the correct part of the field. That for, we used **Vuforia**. We used the sample OpMode of the FTC RePlay Repository. We scan during the initialization routine. As the Vuforia camera detection wasn't that reliable, we **asked some other teams** (f. ex. team #7247).

2. Version (March): Our goal was to have a **more reliable Autonomous**. We divided our classes in the packages Autonomous, AutonomousUtils and OpModes. In the package Autonomous, there is our Autonomous Period, the camera calibration program and a backup Autonomous. That means that if due to light differences or other disturbing factors the recognition doesn't work, we still have an autonomous period. In the package AutonomousUtils is everything we need for the different autonomous periods and in the package OpMode everything we need during the driver-controlled period.

This program allows us to calculate the **needed ticks** very fast, so that we don't have to test the values to find the right ones:

| distance	what we want to calculate
position	the distance the robot has to drive
radius	4.2 this is the radius of our wheels
ticks	1440 we use AndyMark motors, so this is the number of ticks of one rotation
circumference	radius*2*pi
rotations	position / circumference
distance	rotations * 1440

For driving, we wrote methods for all driving directions (360 degrees). That way, we have to **write less code** and have a **better overview** over the code. The methods need two inputs: the power and the distance. To detect the number of rings, we use an **easy open cv** provided by **wizard.exe**. That for, we **scan during the initialization** routine. That's how we have more time during the 30 second autonomous period to fulfill as many tasks as possible. We start with shooting the rings as it's very important for this task to know the exact position.

Errors and how to fix them:

1. Received message: "cannot find device with name …"	2. can't find device → look at voltage sensor	3. disconnected with WIFI etc.	4. nothing is working	5. motor continues rotating
-wrong config-file -wrong name when getting from hardware map/wrong name in config	-power -dead battery -check for loose cables - -restart robot	-pair with none → pair again -check names -WIFI: forget all groups (in settings) -reconnect	-what's about the gamepads? -Is the program started? -plug in and out- test new gamepad/ USB distribution hub	-forgot to set power to 0 → put in an else and set power to 0

Outreach
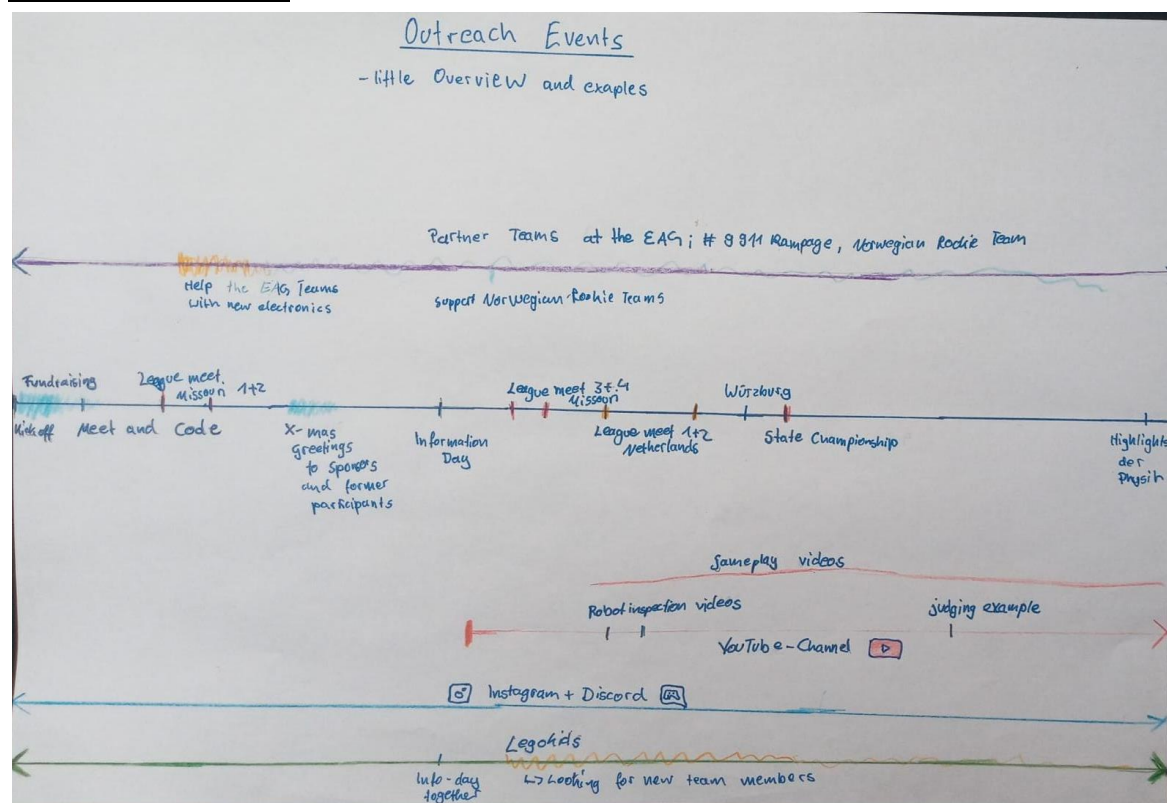
FIRST Community in Germany

Until now, there isn't a wide FIRST community in Germany. During the last years, we could get several school starting FTC teams. But the problem is that there aren't annual competitions in Germany, just our scrimmages. Now, we met a teacher in Wetzlar, Hessen who lived in Virginia and therefor has been involved in FIRST for a while. **Together, we are now trying to build up an FTC community here, which is very exciting!!!!!!**

Würzburg

Last season, we went to an automotive fair. There we met Mr. Kalkenbrenner, who organizes every year a meeting of about 100 heads of companies of Germany. He invited us there to present our robot and also to collect money and seek for new sponsors.

Therefore we prepared a presentation, updated and printed our flyer and prepared some sort of pit.
We prepared ourselves and the robot for the presentation and 10 minutes later it started. We went in with the robot and our frog Quewak a **presented FIRST, our work and FTC**. This was a very great opportunity for us also to **practice our presentation skills**. Most of the people were very interested in us and our work. We collected lots of money and even got an **interview** which you can now see on YoutTube: gründerTalk Frog Robots Of Germany.
This year, we got invited again and we are already preparing our presentation. We present them our team, work, FTC. They sponsor us, we had an interview which you can find now on Youtube and we also ask them to sponsor a competition in Germany. This was a very great opportunity for us also to practice our presentation skills. I have been very nervous because standing in front of 100 heads of companies isn't anything you are doing every day.

Legokids

At our school, there are one FTC and several FLL teams. Almost everybody in our team has some FLL experiences and we are a lot more experienced than they are. Some of our materials are in their room. That's why we work together with them. Participants of the FLL are mostly age 10-14. **We help the teams with programming or building the robot. Often FTC participants did FLL before.** Helping other the FLL Teams means also looking for new Team members for our FTC team to continue our work as they already got in touch with a FIRST competition which helps them doing FTC.

WRO – World Robot Olympiad

This competition isn't part of the FIRST organization and the tasks are easier than these of FLL. We want to **spread the FIRST Core Values also at these competitions** in order to **inspire the kids** at doing more than just building a robot. Because the teams consist of only three people, it's difficult to feel a real team spirit, but difficult doesn't means impossible! With us as role models it gets also easier for the girls in the teams to involve them.

Meet and Code

We don't just have to pass our knowledge on to other teams and programs. But also, to make sure that knowledge is as passed on within the FTC teams. That's why we participate every year in the Meet and Code event. All over Europe groups and individual people share their programming knowledge with others.

This year**, Leontine held a workshop on the basics of programming and on the new control system.** The REV control hub is new to use, some new members of the FTC didn't know yet how use the FTC app, configure the robot. In else it was great for everybody who didn't do any programming before to get an introduction and to learn the basics. As teams change every year, students graduate etc. it **is very important to us to spread our knowledge!**

Information Day

Goal: Representing FIRST as a whole and FTC more accurate

With the inclusion of different pictures, the showcase of our robot Gorfi and the little end slide where we're all jumping from an edge, we tried to **incorporate the FIRST Core Values not only in the context of a robotics competition but also in also in a social context**. This is necessary to make clear that FTC isn't just a robotics competition and in fact an event that strives to create a fun environment for ambitious people to express themselves, inspire each other and to build a future together.
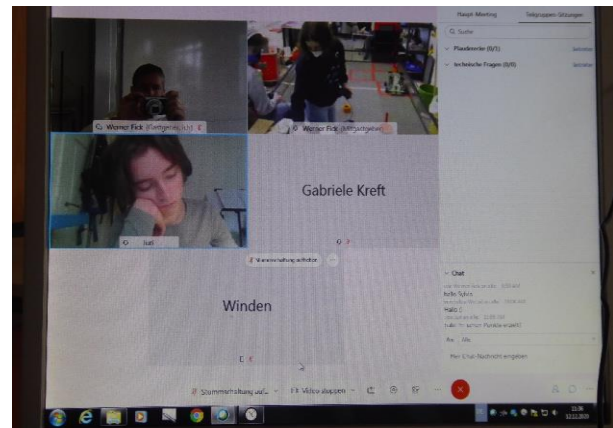
  This year, we had a special role at this event at it was an online competition due to corona. We **helped the teachers to join their screen and managed the questions** as the teachers had been a bit overwhelmed by the technical aspects. This was a really great opportunity to us because we could once again make an **impact in the real live with our skills.**

FTC in Missouri

As this year only remote events take place, we had at the beginning of the season the idea of participating in another country. We immediately thought of Missouri, because St. Louis is the partner town of Stuttgart. That's why we already stay in contact with teams from there, especially team rampage #9911, which is our partner team.

By participating in the states, we can get **lots of new impressions regarding FIRST but also strengthen the partnership between our cities** and countries even during such a difficult time.
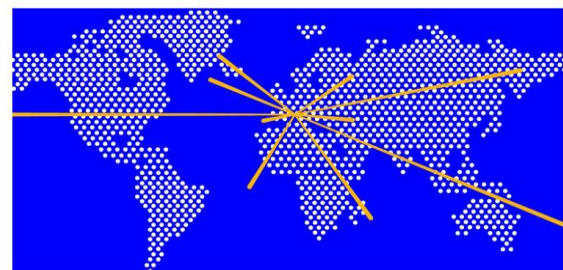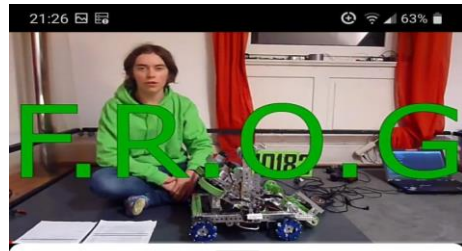
Obstacle Covid19

As one can imagine, the COVID-19 pandemic has given us a great share of inconveniences and unfavorable circumstances that we needed to overcome. We were **sad that the travel to competitions all over the world had to be cancelled**, which would have given us a multitude of opportunities to take like sharing and receiving ideas, reaching out to other teams and testing out the skills of our robot in an official competition.

We were still determined to make the best of our situation and improve Gorfi even further. After our robot was transferred and the playing field set up, we now have the ability to work on it and drive some matches.

Firstly, we created a schedule to see on which days which person could come over to our teammates residence where we set up everything.

We **communicated trough social networks and conferences,** so that we can still stay in touch with each other and coordinate our next steps.

The alternative FTC Room at a team members' house

We are convinced that it is even more important to stay in touch with the other team during Corona. Therefore, we increased our effort of sharing our work progress and staying open minded via Instagram by publishing multiple videos and refreshing the contact to well-known teams. We too created an own **YouTube channel called "Frog Robots of Germany"** which we use to make tutorials on how to do the robot self-inspection or giving an judging example. We uploaded also videos of our robot game.

Costs

playing field	1 500€
new building materials	ca. 1 500€
new tools	200€
additional costs like notebook etc.	100€
Earning	

Note: this is the cost plan of our two teams at the Königin-Katharina Stift. We share all materials, tools and our room, so it's impossible to calculate the costs for just one team. Some of the sponsors are the same as last year, some found our coach and some are companies our team asked.
The size of the logos on our pullies depends on the donation of the different companies.

Sponsors

To cover our costs, we **needed to fundraise**. We wrote over 500 letters with information about FTC and its philosophy, our team and why we need support to a lot of different companies. This was a **great way to spread FTC into STEM related companies and get known by companies some of us want to work in later**.

EnBW	2000 Euro
BOSCH	2000 Euro
VDI	2000 Euro
vector Stiftung	2000 Euro
MEET AND CODE	500 Euro
c't magazin für computer technik	Gifts (umbrellas, sticker, etc.)
In total	**8500 Euro**

Team Plan

Goals we have and had during the season and partially achieved already.

1. robot goals	2. outreach goal	3. financial goals
→ fast and reliable shooter → good autonomous with camera input	→support new teams in Germany and Europe → new team members → connection with non - technicals → spread STEM → connection with technicals → spread exchange → this year it is more difficult than during the last years to exchange and meet other people due to corona. Nevertheless, we try to make the biggest impact possible.	→ seek for sponsors → cover coasts of both teams → this year we don't need that much money because we can't travel
4. sustainability goals → new team members → rookies → FLL/WRO → robotic competitions → technical workshops for ex. meet and code → encourage other girls → FIRST like a girl → skill sharing so that we can pass our knowledge	**5. events** → participate in at least 3 events → go to the Netherlands championship → go to the Missouri state championship → op. qualify for the world championship → host an online scrimmage for more possibilities for other teams	**6. others** → stay in touch with former participants → signalize that we will help new teams throughout the next years, even when we left school.

Gracious Professionalism

Gracious Professionalism is a **very important aspect of FTC which makes it unique**. We are **inspired by the FIRST Core Values and live them** not only in the LEGO Room, but **also in our everyday life**. Since pictures can show a lot more than thousands of words, we created a little collage give a little insight what these values mean for us:
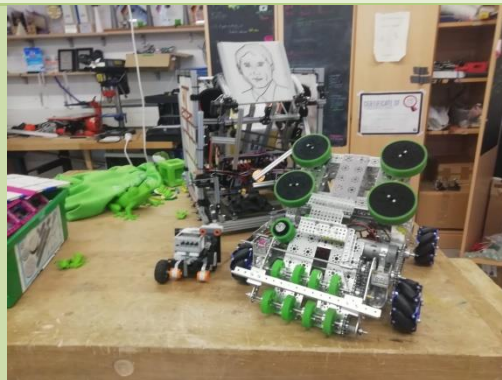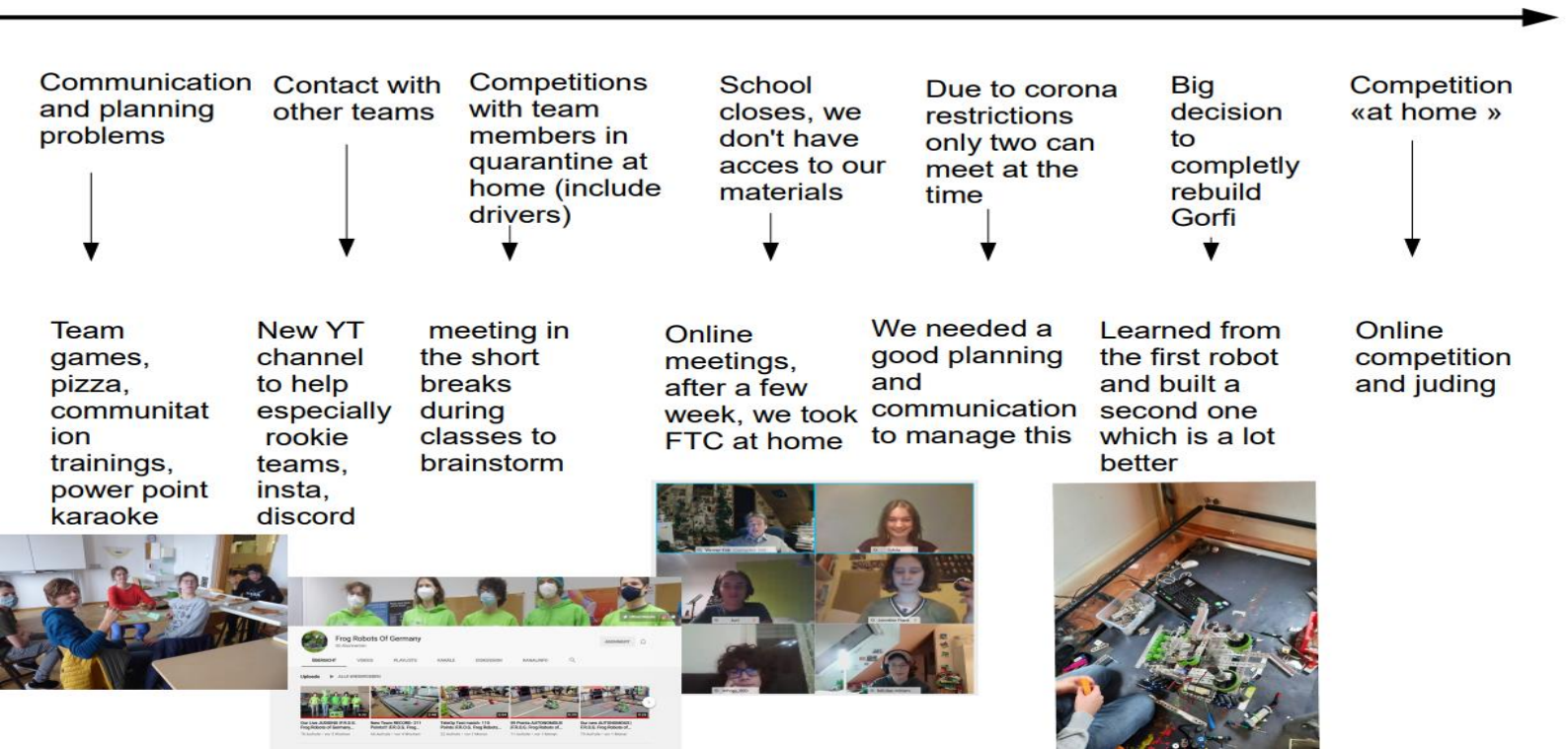

Discovery

Impact

Innovation

Inclusion

Teamwork

Fun

Problems we solved and helped us to grow

Communication and planning problems	Contact with other teams	Competitions with team members in quarantine at home (include drivers)	School closes, we don't have acces to our materials	Due to corona restrictions only two can meet at the time	Big decision to completly rebuild Gorfi	Competition «at home »
Team games, pizza, communitation trainings, power point karaoke	New YT channel to help especially rookie teams, insta, discord	meeting in the short breaks during classes to brainstorm	Online meetings, after a few week, we took FTC at home	We needed a good planning and communication to manage this	Learned from the first robot and built a second one which is a lot better	Online competition and juding

Milestones

First shooter

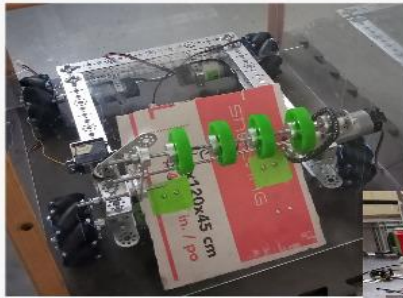Start programming

:koff

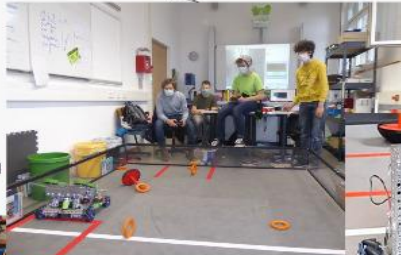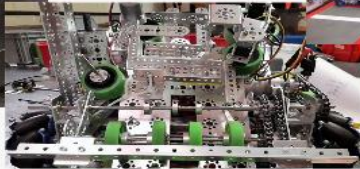Robot finished + school closes

New shooter

Wobble goal

Early intake mechanism

Transport mechanism

First League Meet

🔵 Contacts through the RTC Squad Server

🟢 Team F.R.O.G.

🔴 Other teams

RobotIGS-11515-Germ

Location	Number of Members	Rookie Season	Join Date	Total Number of Teams
Woodinville, WA, USA				
Pune, IND				
McMinnville, OR, USA				
Highland Park, IL, USA				
NJ, USA				
Highland Park, IL, USA				
Central NY, USA				
Overland Park, KS, USA				
Eldridge, IA, USA				
Seattle, WA, USA				
Wilmington, DE, USA				
Foxboro, MA, USA				
Glen Rock, New Jersey				
Misgav, ISR				
Stuttgart, GER				
Waukee, IA, USA				
Fairfax, VA, USA				
Taiwan				
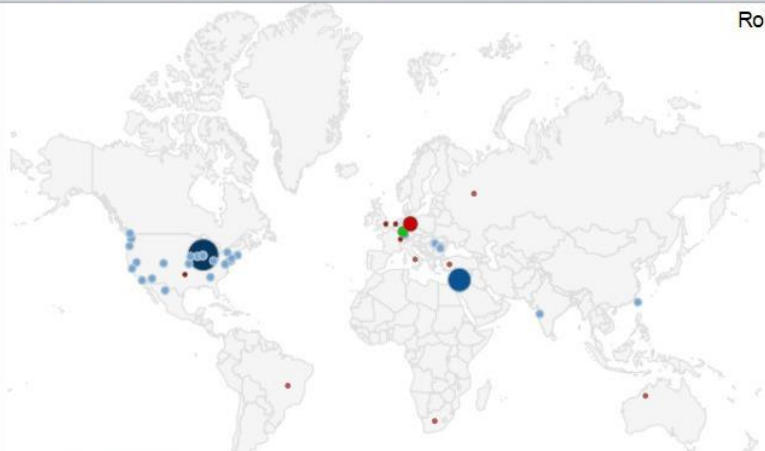
1   5
PSR-16641-NL

FTCAMP-16049-Brazil

Summary Page

Our Robot GORFI:

Our Team:

Outreach:

Schoolevents, FLL, WRO:

Würzburg:

-contact to teams at all continents

- building up FTC in Germany

Fun:

This holiday season...
TURN OFF YOUR MIND,
BECOME FROGGE.

Der sächsische Dialekt
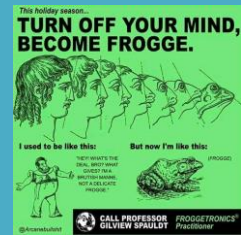
Gracious Professionalism and FIRST Core Values