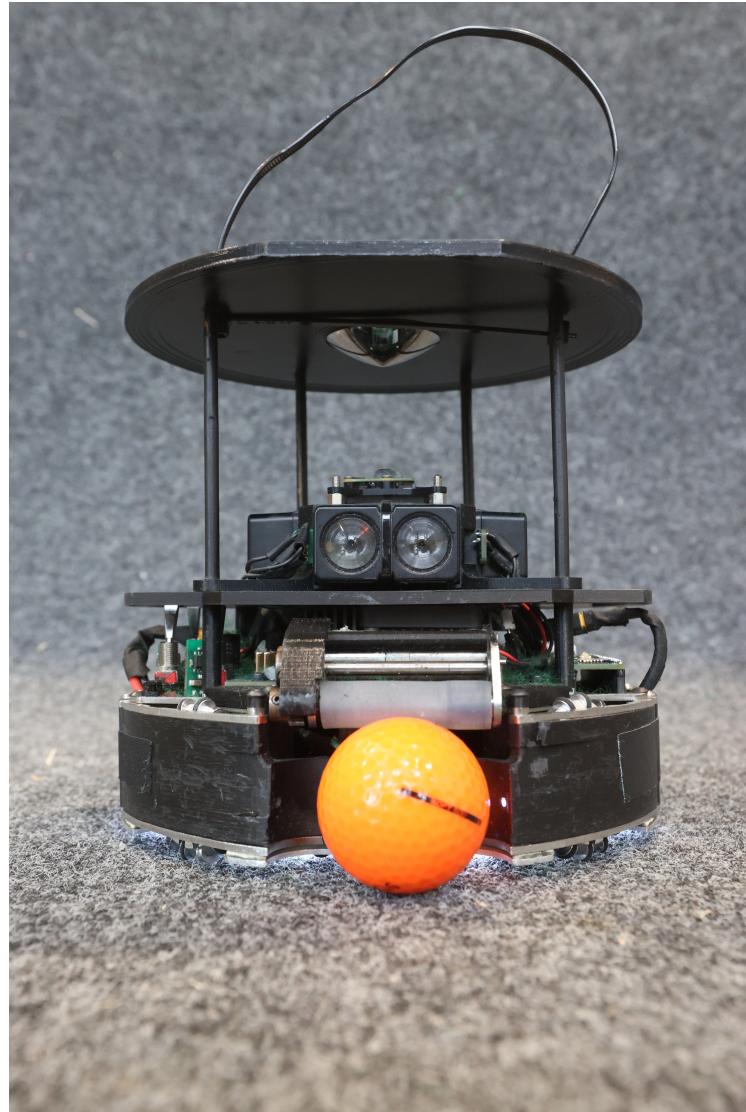


# Team Faabs

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Robotik TDP

Lessing Gymnasium Neu-Ulm

Technical description paper

ROBOTIK

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Robotik TDP

Lessing Gymnasium Neu-Ulm

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# 1 Introduction

## 1.1 School



Figure 1: Lessing Gymnasium Neu-Ulm - German Open 2023

The Robotics program of our school was created in 2007. Since then, we managed to win the World Open multiple times in either Soccer LightWeight, Soccer Open or OnStage. We try to put our new Teams as fast as possible in top leagues. With the gathered experience, we always have teams to follow our footsteps.

## 1.2 Team



Figure 2: Team Faabs - Fabian, Mark, Jurij

In our Team, everyone has a specific task to do:

1. Fabian Brune : Hardware/Software → CAD-Design, PCB-Board-Routing, Tactics
2. Jurij Lenz : Hardware/Software → Hard-Hardware
3. Mark Krause : Hardware/Software → Electronics, Software

## 1.3 Abstract

### 1.3.1 2020 season and founding

We founded our Team in 2019 and first participated in the RoboCup Junior in 2019. Robotics is a big part of our daily life. We meet on school days and even on weekends and holidays.

### **1.3.2 2023 season**

We started developing our robots in mid 2022 and had a first prototype in late 2022. After final design choices, we had our robots for the German South-Open in early 2023. From this point on, some progress was made in the Hardware sector. After optimizing our program, we managed to reach the second place at the German Open. After some small improvements for the World championship 2023 in Bordeaux we successfully got the first prize for the best individual Team Champion and our hardware was acknowledged with an outstanding design Award. For the first season in the Open League we were really satisfied with the results.

### **1.3.3 2024 season**

As our robots were still completely functional and we didn't reach all the hardware potential, we decided to improve on the software. Although some aspects of the hardware already reached a critical physical maximum point, for example speed, battery duration etc., the robot had some things to improve on. There was a huge potential for our Team, because we were able to collect a massive amount of experience from playing against the best Teams in the world. We used this knowledge to improve the 2023 season robot and I think we did some great work. On the South-German Open (Vöhringen) and on the German Open we managed to win every single match and with these results qualify for the Worlds in Eindhoven.

## **2 Hardware**

### **2.1 Mechanics**

#### **2.1.1 Dribbling-device**

We experimented a lot with the dribbler after the dribbler malfunction in Bordeaux, and now we are capable of extracting the Ball from every corner in the field. The main focus was to improve the dribblers hardware. We tried things like injection molding with silicon, which was pretty hard and not very effective, because its hard to achieve a good outcome without any holes or air inclusion. We also experimented with the location of the pivot point, which actually makes a huge difference in the behavior of the dribbler especially the ratio how it grabs the ball and how it keeps the ball. You must find the golden middle for your scope of application, it varies a lot on how the robot is build in general and the speeds it reaches.

We also improved our gear cover to be more safe to handle the ball.

#### **2.1.2 Replacement of worn out parts**

Many of our used aluminium sheet metal parts and 3D printed parts have worn out over time of the last year and competitions. So we ordered new ones from our sponsors, but this time from stainless steel for more reliability.

### **2.2 Electronics**

Basically all electronics have remained the same as last year so you can read about the in last-years paper.

## 2.3 Other projects

### 2.3.1 CNC



After the 2023 Robocup, our main focus was not directly the robocup, but more to build our own 3 axis CNC mill. We were actually working on this project since 2022 but managed to mill our first usable pieces in the beginning of 2024. Over all, seven people were involved to build the mill, do the electronics and program it. Were looking forward on using the mill over the next years to mill aluminum, wood and plastic pieces for our robotics club. While writing this, were trying to mill our motor blocks out of aluminum for more weight at the bottom of the robot, and as some kind of heat spreader. The mill is a very fun and interesting apparatus, and we all learned a lot in the long building and testing process. Were still constantly working on our mill and making major improvements like filling it up with sand to reduce vibrations, a handwheel or a suction system. This project was completed without any help from outside, it's a real student only product. We realised that it is much more fun from the mechanical side to build in bigger dimensions than 18cm because there are many more possible solutions for each problem.



Figure 3: First attempt milling aluminium

### 2.3.2 Building a new soccer field

As our old one got pretty worn out, we decided to build a new one. It was also a lot of fun!

### **3 Software**

Most improvements aimed to make the robots even more aggressive in the attack situations and have a higher chance to score a goal. A lot of work for that was put into calibrating all small regulators for the ball-handeling. We also tried out some experimentation with non standart tactics for the ball approach but in the end we concluded, that in most cases, our approach is still the best. For the GermanOpen in Kassel we tried out a real bluetooth communication between both robots. It definetly helped us not to hinder the attacking robot with the defending one but because of a poor implementation it didn't give us the advantage we hoped for.

## **4 Experience**

With our members beeing able to compete for two more years we are willing to challenge ourselves to build a completly new robot for the next season, with all of the experience we collected over the last few years

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- Website: Technulg.com
- Instagram: @Team Faabs

Thanks for reading!

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