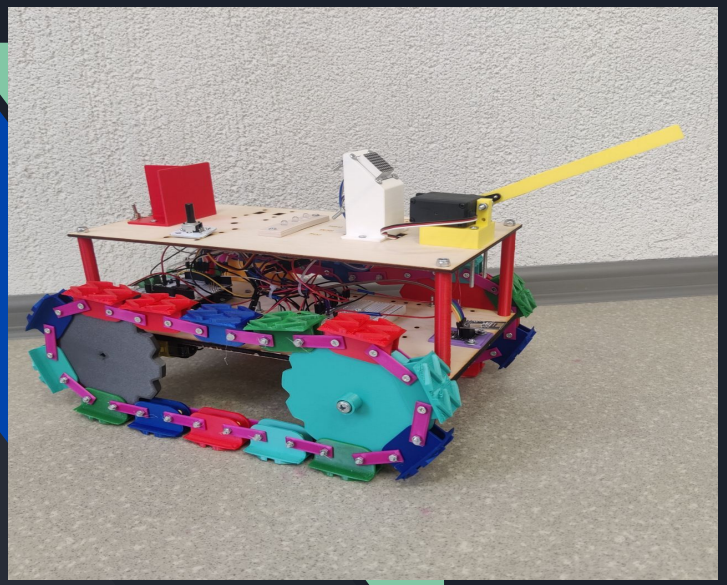

Lunar Rover

Report of Stage 1 & Proposal of Stage 2

By: Bhuvan, Ivan, Kafi, Reza

Thanks to Phystech.Fabrica, MIPT, Dolgoprudny

Code and parts: github.com/kafiulshabbir/evil_robot_hehe

Rover overcoming obstacles

Team: Darknight

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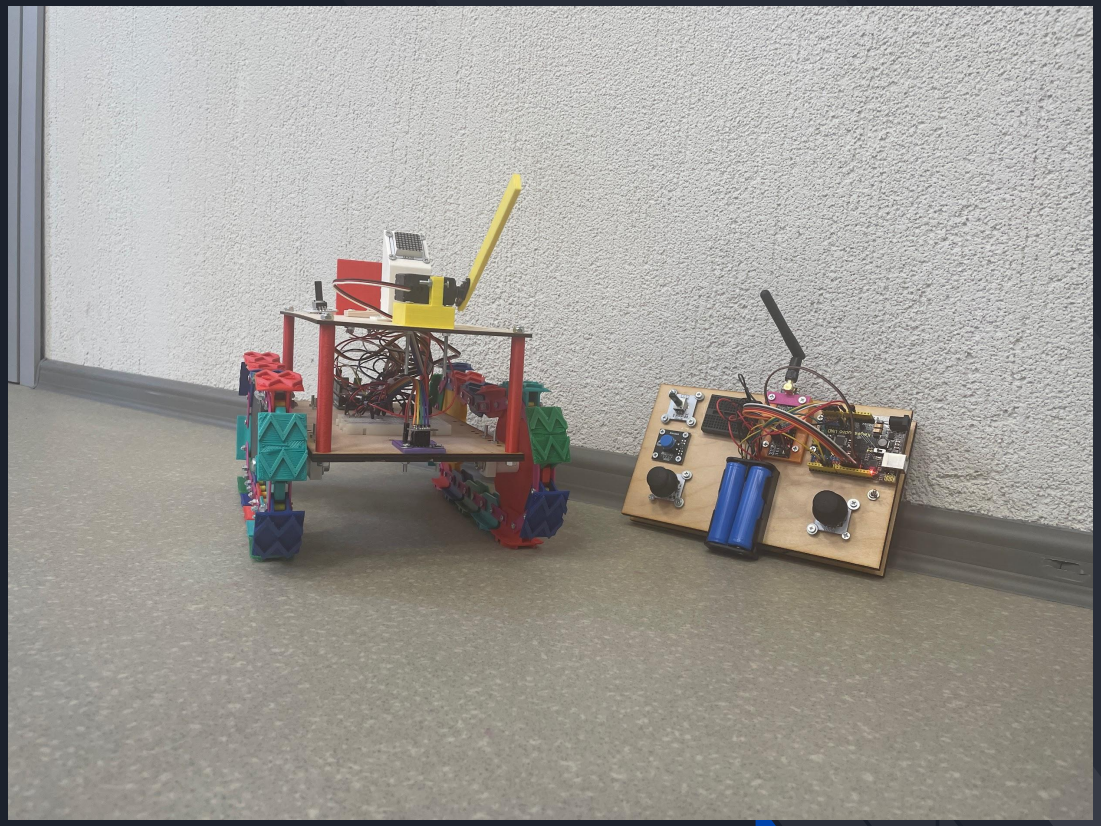
Contents of This Presentation

1. Why we want to build this project?
2. The Stages of Development: 1, 2, 3, 4
3. Stage 1: Features and Performance
4. Stage 2: Features and Materials
5. Other successful projects of our team

Part-1 Objectives



What will our Lunar Rover Do? Why do we need it?

- After building this rover, we will be more experienced at building, programming and controlling machines which can move on rough terrain.
- One example of such a terrain is the moon.
- We want to build the rover considering the moon, for mainly:

1. Exploration of resources on the Moon.
2. Making small holes and conducting soil tests.
3. Mining of Heluim-3
4. Interplanetary travel
5. Moon to be used as the base

What we want to learn from our Lunar Rover

While building the stage 2 rover we plan to become more skilled at:

1. Manufacturing Caterpillar Track system which delivers the maximum performance.
2. Designing good suspension systems, which can overcome uneven terrain.
3. 3D printing small parts, for mechanical system and boxing various instruments.
4. Connecting parts using standard screws. Creating proper thread and holes.
5. Antenna, radio communication, programming arduino.
6. Managing power and torque of motors.
7. Coordinating between data of sensors and output of Rover.

Part-2 The Stages of Development

Targets and Approximate Deadlines

Stage 1: 08.04.2023 - 26.05.2023 Completed, basic 3D printed + wood

Stage 2: 05.06.2023 - 15.10.2023 More Durable, 3D printed

Stage 3: 15.10.2023 - 15.12.2023 Steel with basic Instruments

Stage 4: 15.01.2024 - 15.06.2024 Advanced Instruments, Steel

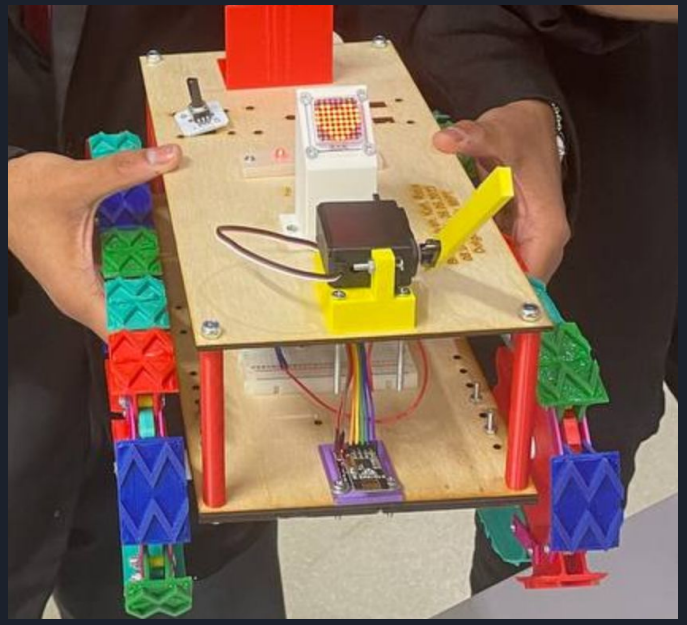
If stage-2 materials can be provided, then:

- We will find different exhibitions and contests to display our model.
- Any new findings about mechanical design and durability of 3D printed mechanical parts will be presented in 66th MIPT scientific conference.
- Detailed manual to develop Stage-2 rover will be published. All parts and electronic design will be made public

Stage-1 Wood + 3D print Hybrid (Functional)

Features :

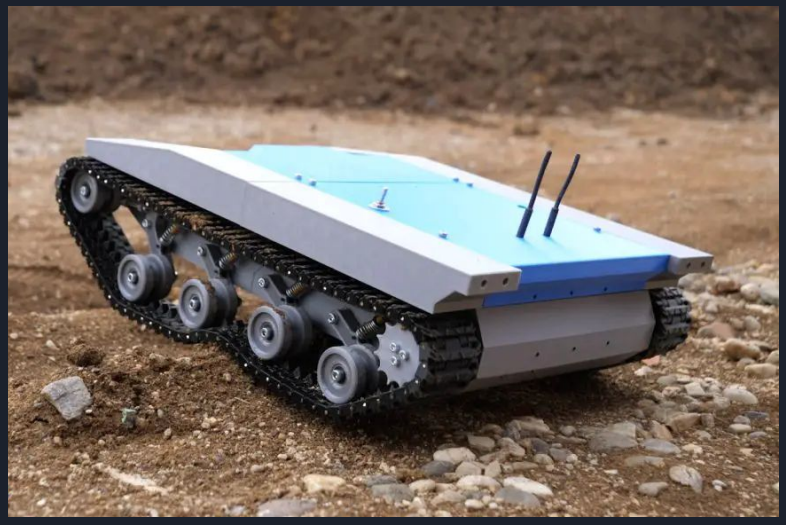
1. A caterpillar wheel system to move in all four directions
2. A drill positioning system (Servo Motor)
3. A Matrix Light system to communicate key information
4. Multiple LED’s to notify the user about tank modes (Automatic(on/off), Manual(on/off))
5. Manual mode - for the user to control the rover
6. Automatic mode - controlled by Photoresistors placed behind the rover



Stage-2 3D Print with more powerful motors

How it will be different from stage-1?

1. Four Batteries - To increase power
2. Entirely 3D printed without any wooden parts.
3. Suspension system for the Tracks (belt-wheel)
4. Drive wheel to be above the ground to reduce the vibrations
5. Different caterpillar belt mechanism to reduce friction and vibrations



Stage-3 Small Steel Lunar Rover

It will be same as stage-2, but made of metals.

Our objective in this stage is as follows:

1) To expand our knowledge and experience working with steel.

2) Implement and learn the process of welding in working with steel.

3) Install and use electronics and the electrical parts on steel with a stable structure.

Stage-4 Steel Lunar Rover with Advanced Scientific Instruments

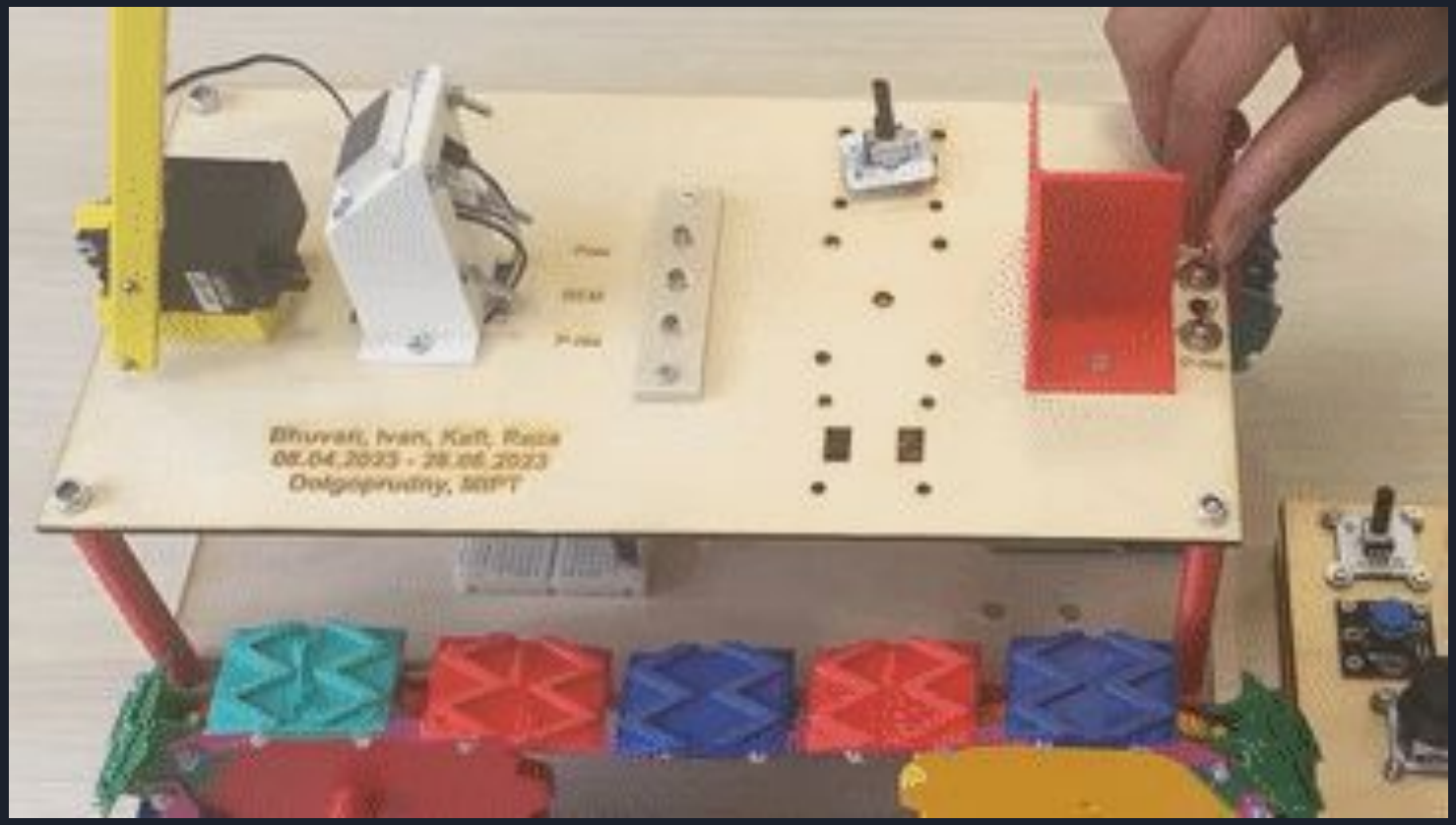
In this stage we plan on building a small scaled model of a potential lunar rover. The tasks in this stage are as follows:

1) Estimate the final size of our model, scale it down or up compared to stage 3.

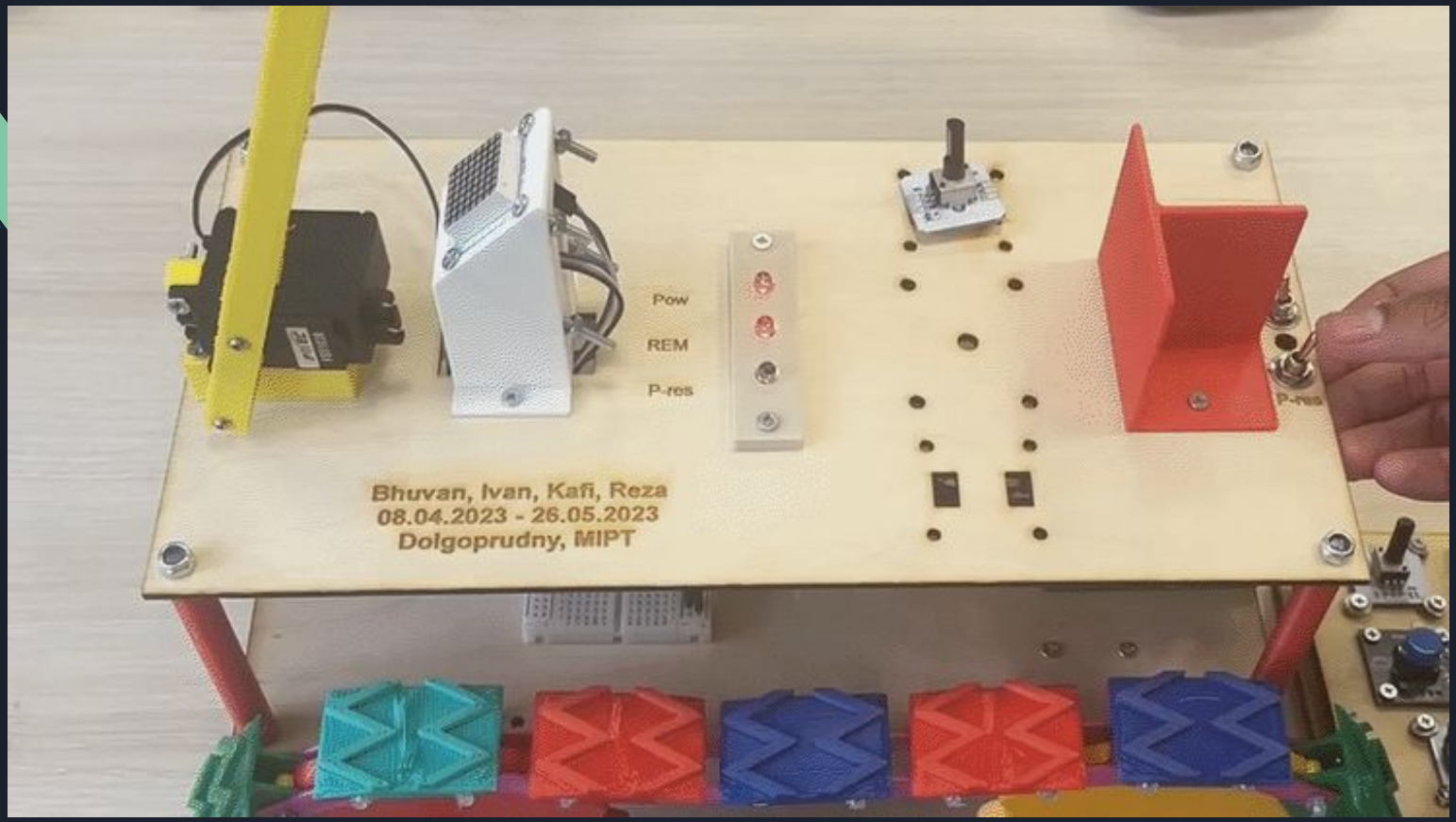
2) Simply more advanced, more features and installing components capable of lunar research.

3) The model would be able to withstand the harsh conditions of outer space, its resistivity towards radiation will be high and the electronic components will be resistive.

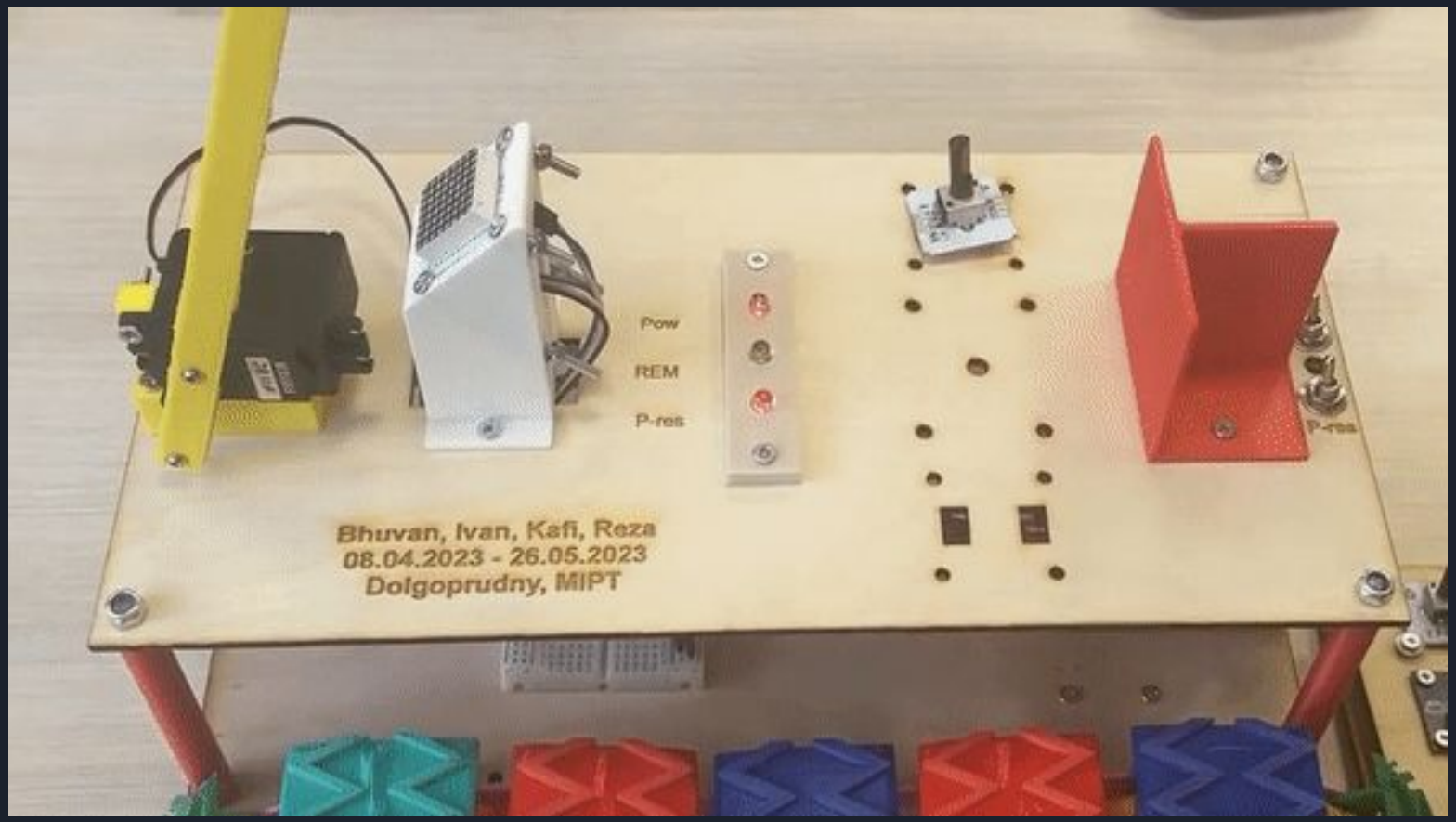
Part-3 Features and Performance of Stage 1



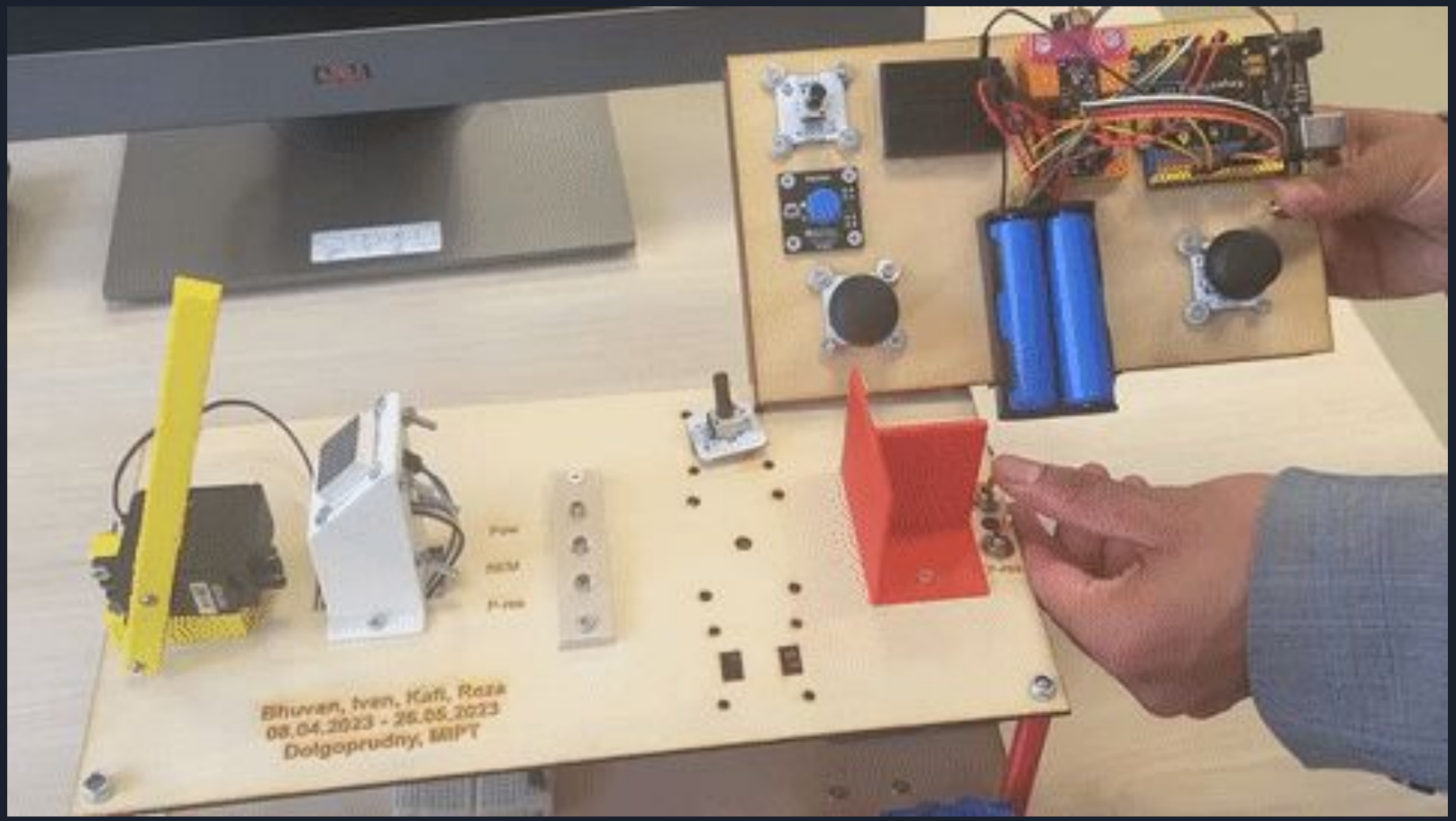
Feature-1: When switched on, the POW LED lights up, if not connected to the remote then the REM starts blinking.



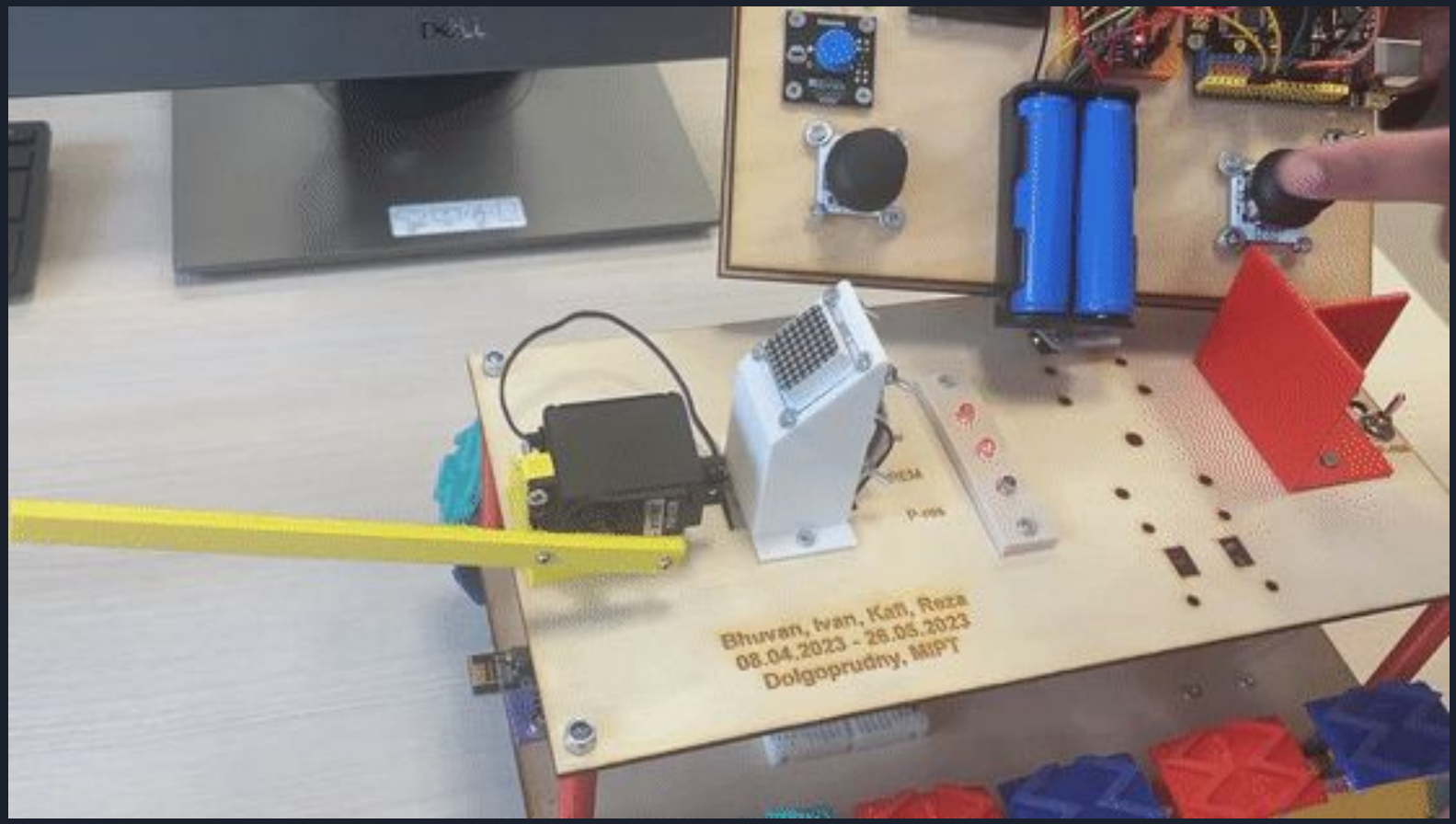
Feature-2 When P-res button is pushed forward. The P-res LED gets switched on , the rover goes into automatic mode and it disconnects itself from the remote. In automatic mode the rover will try to move away from obscure objects.



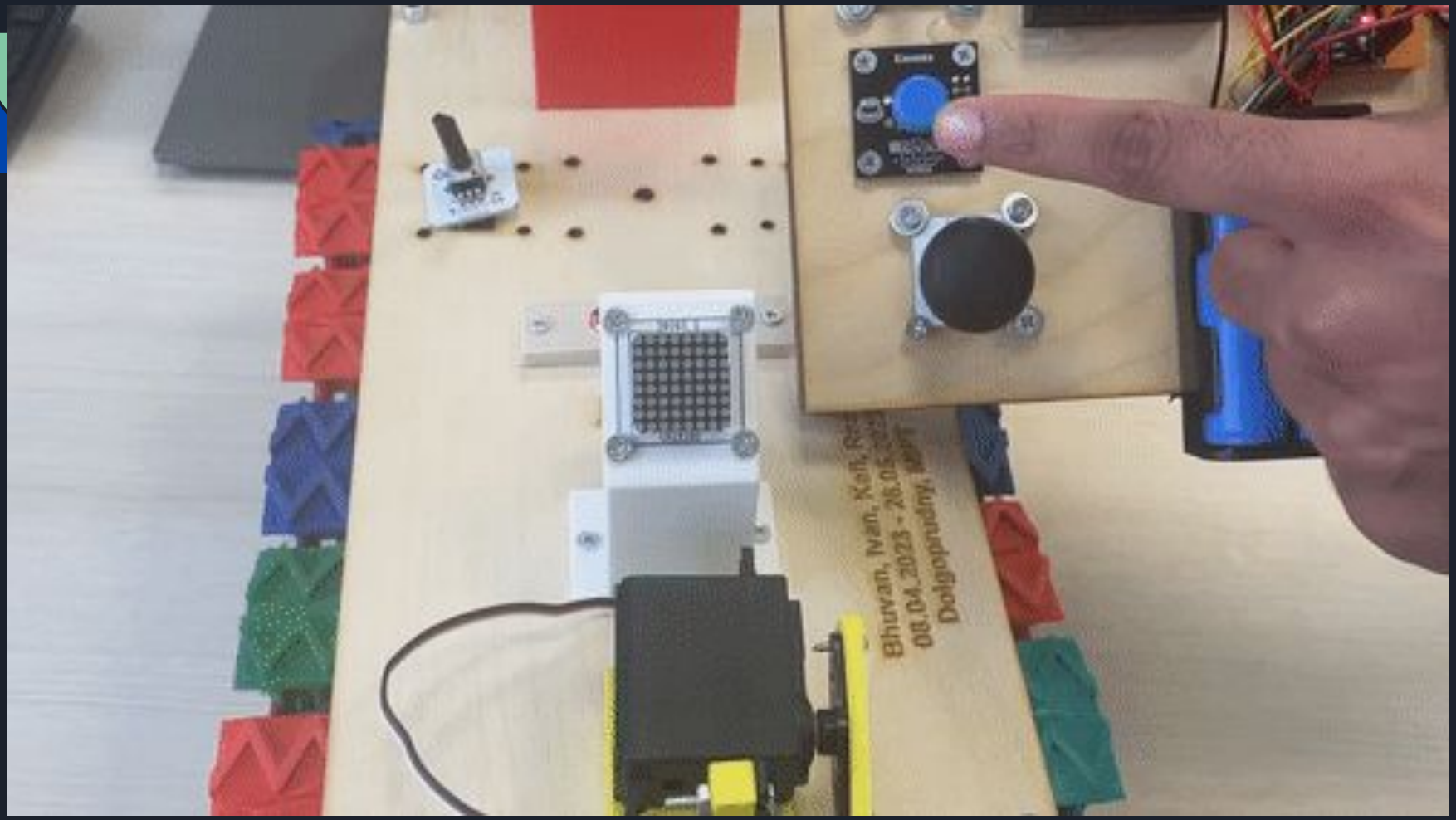
Feature-3 Turning the potentiometer will increase/decrease the threshold for the sensitivity towards shadows .



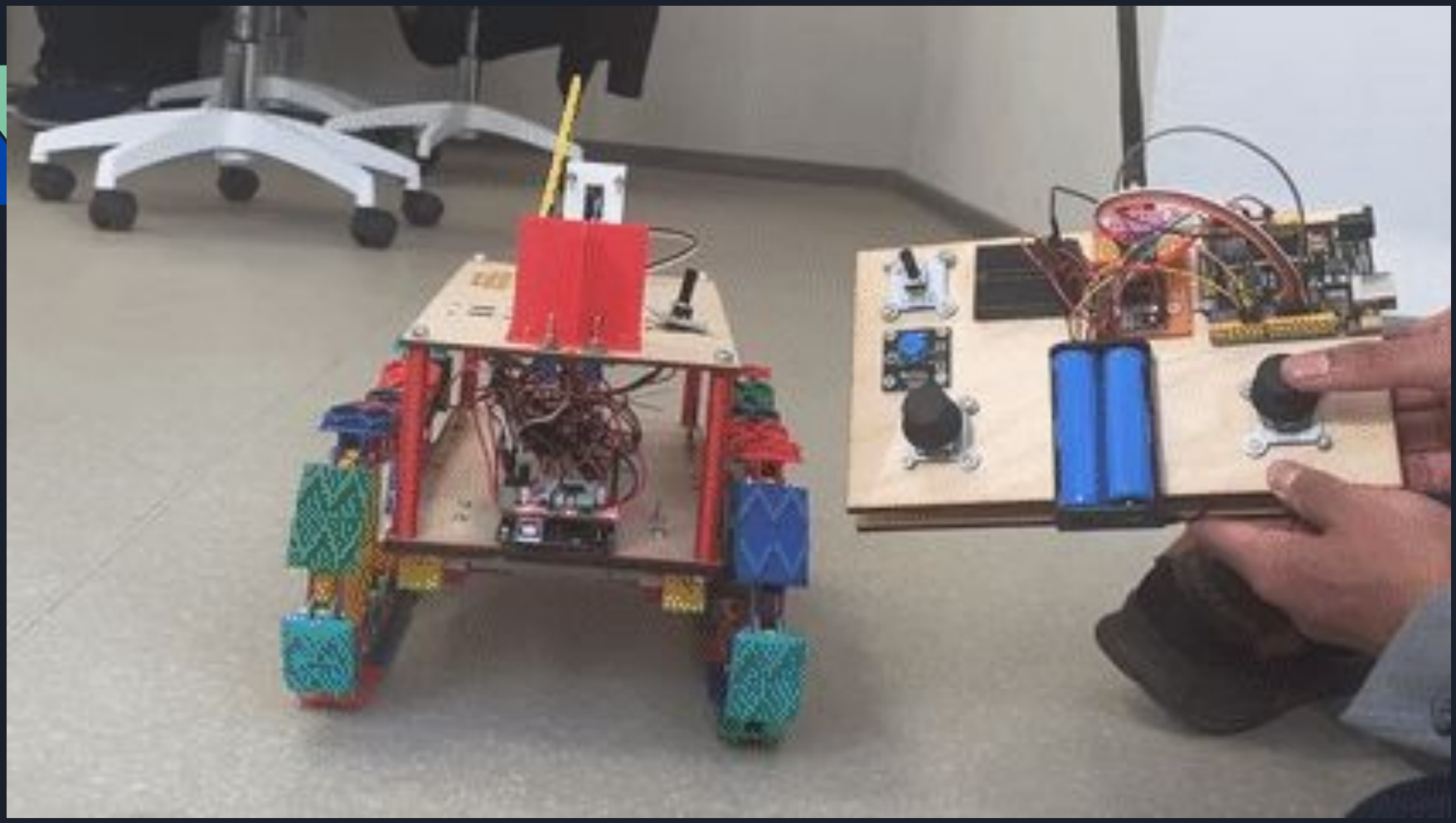
Feature-4 When the rover is switched on without being connected to the remote the REM-LED will blink until it gets connected to the remote .



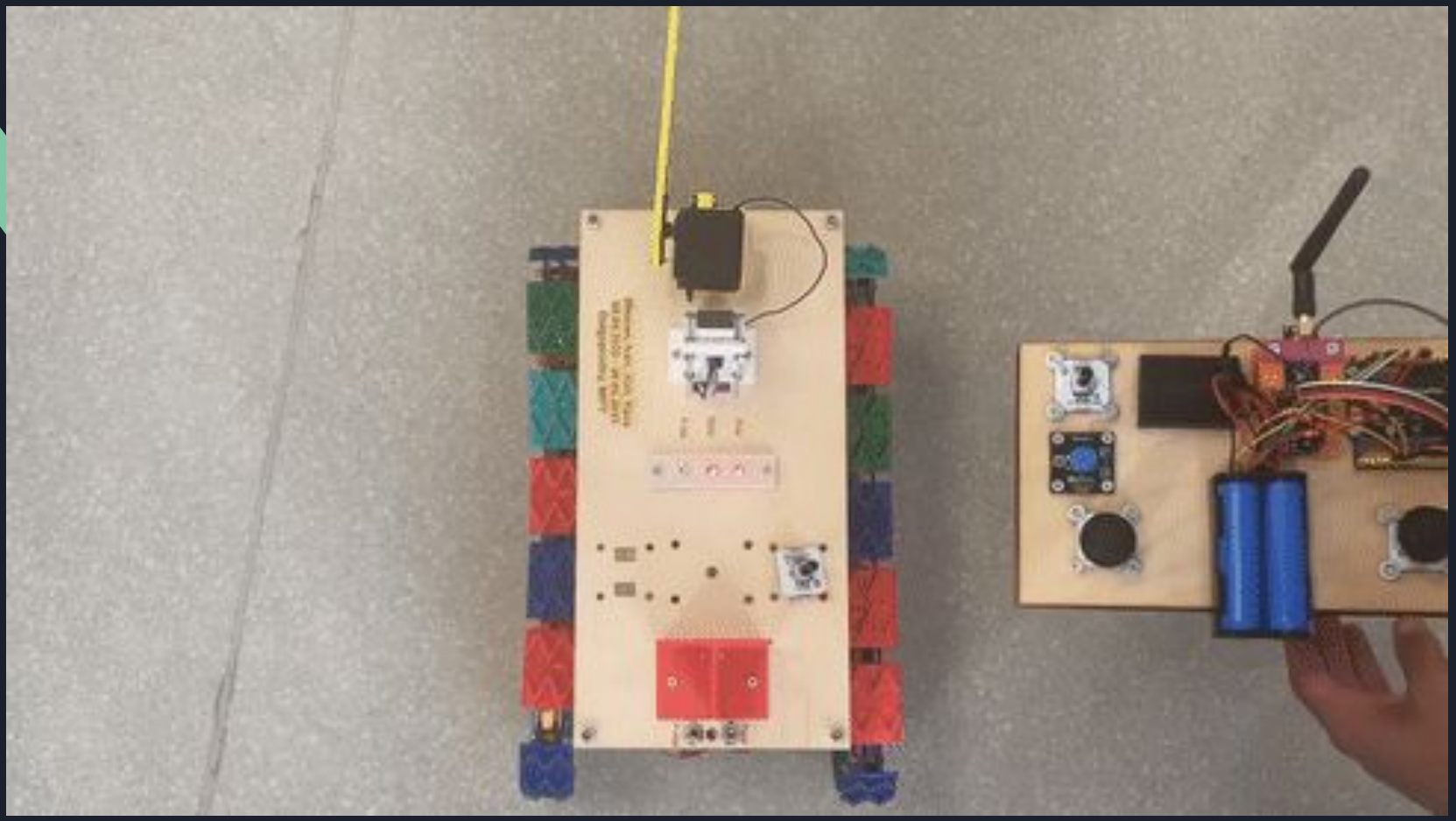
Feature-5 When the (Left) Joystick is pushed up and down the Drill lever will move up and down respectively



Feature-6 when the Blue button is pushed, the matrix LED will turn on to display key information .(To tell the Aliens that we come in PEACE).

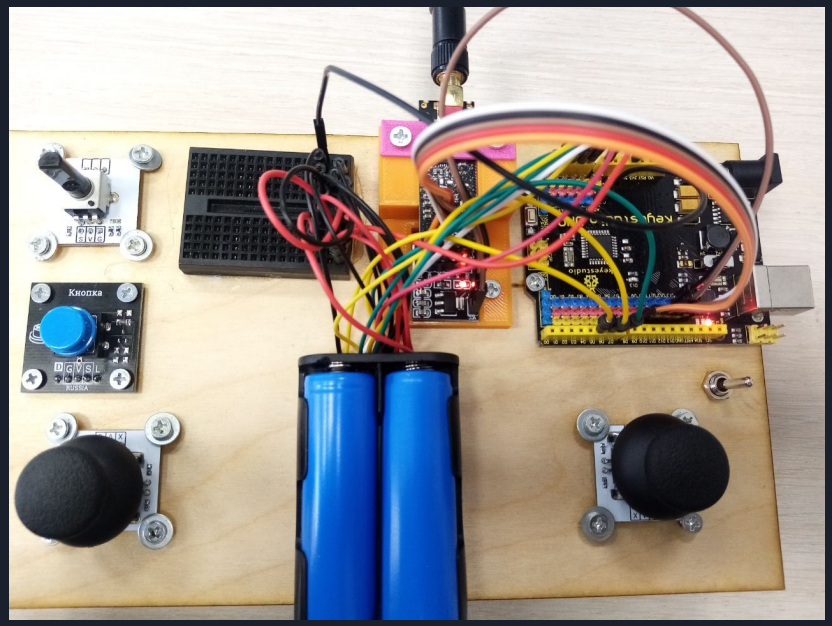


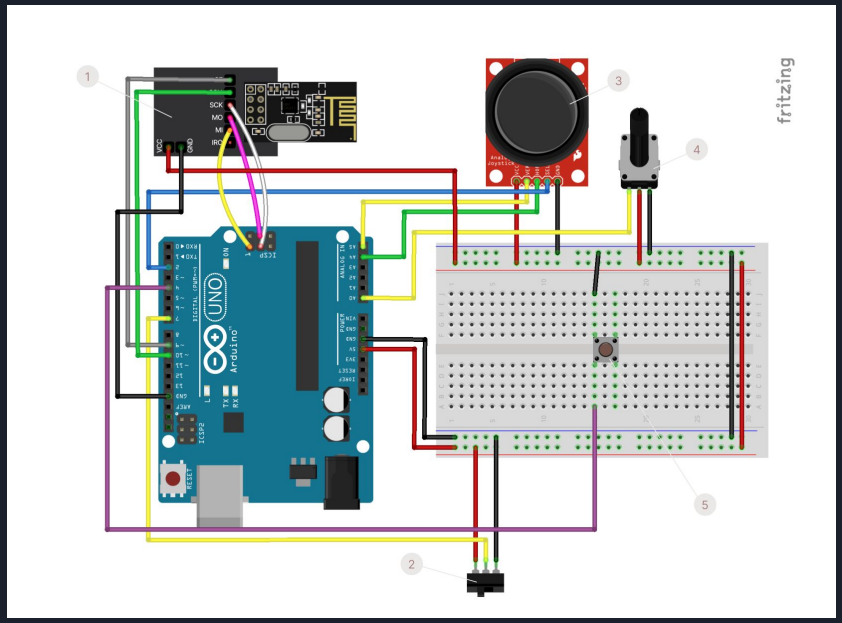
Feature-7 When (Right) joystick is pushed up and down the Rover moves forward and backward using the Rover tracks.



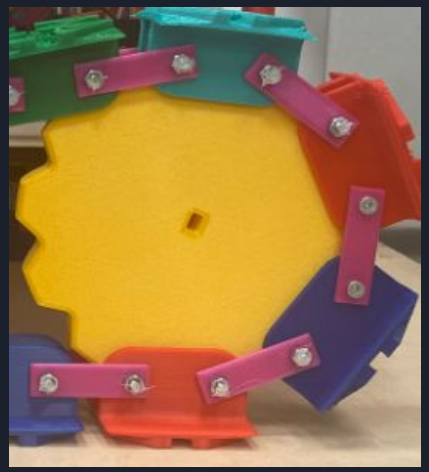
Feature-8 when the (right) joystick is pushed left and right the rover rotates clockwise and anti-clockwise by making the motors rotate in different directions.

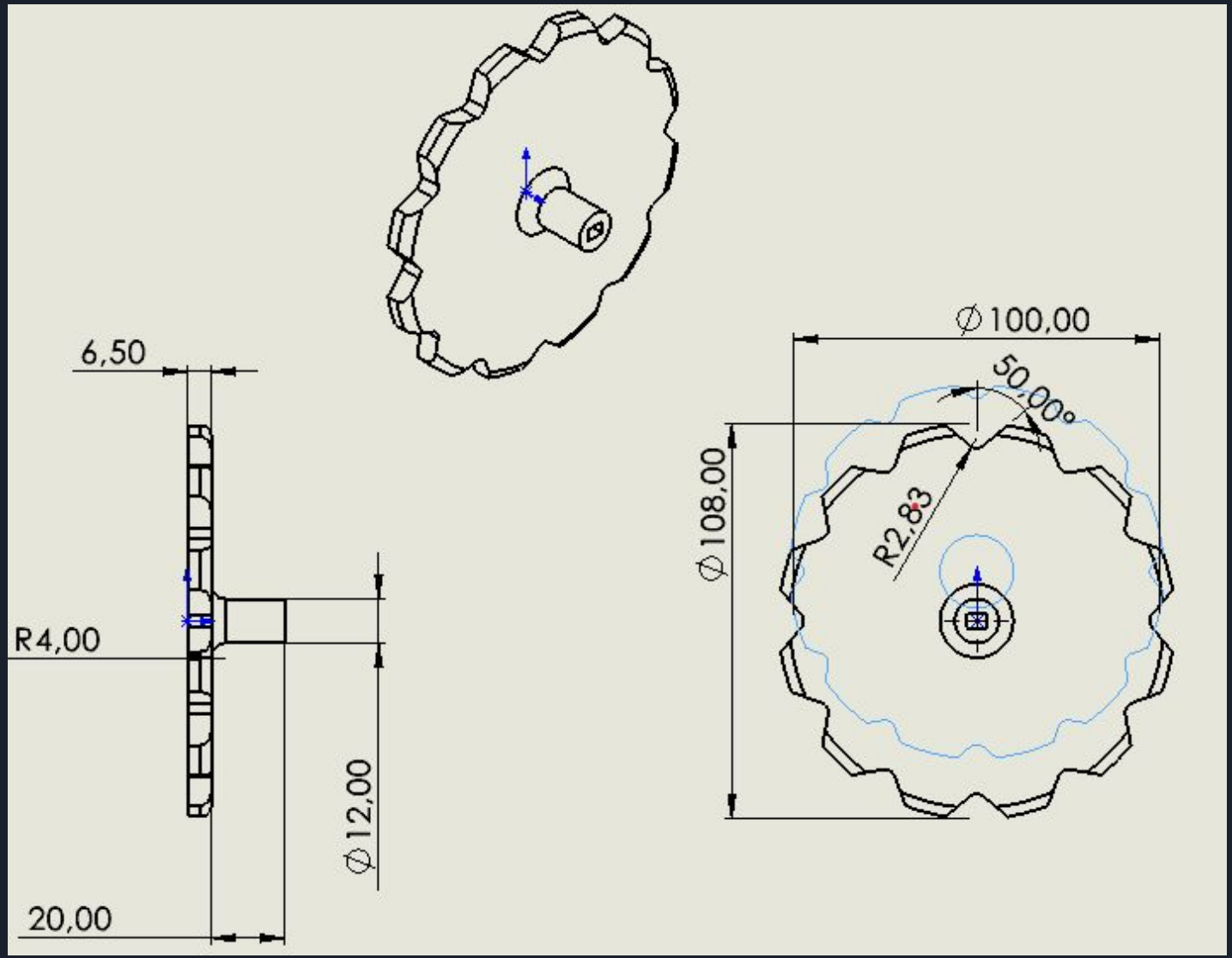
Approximate Layout of our Remote



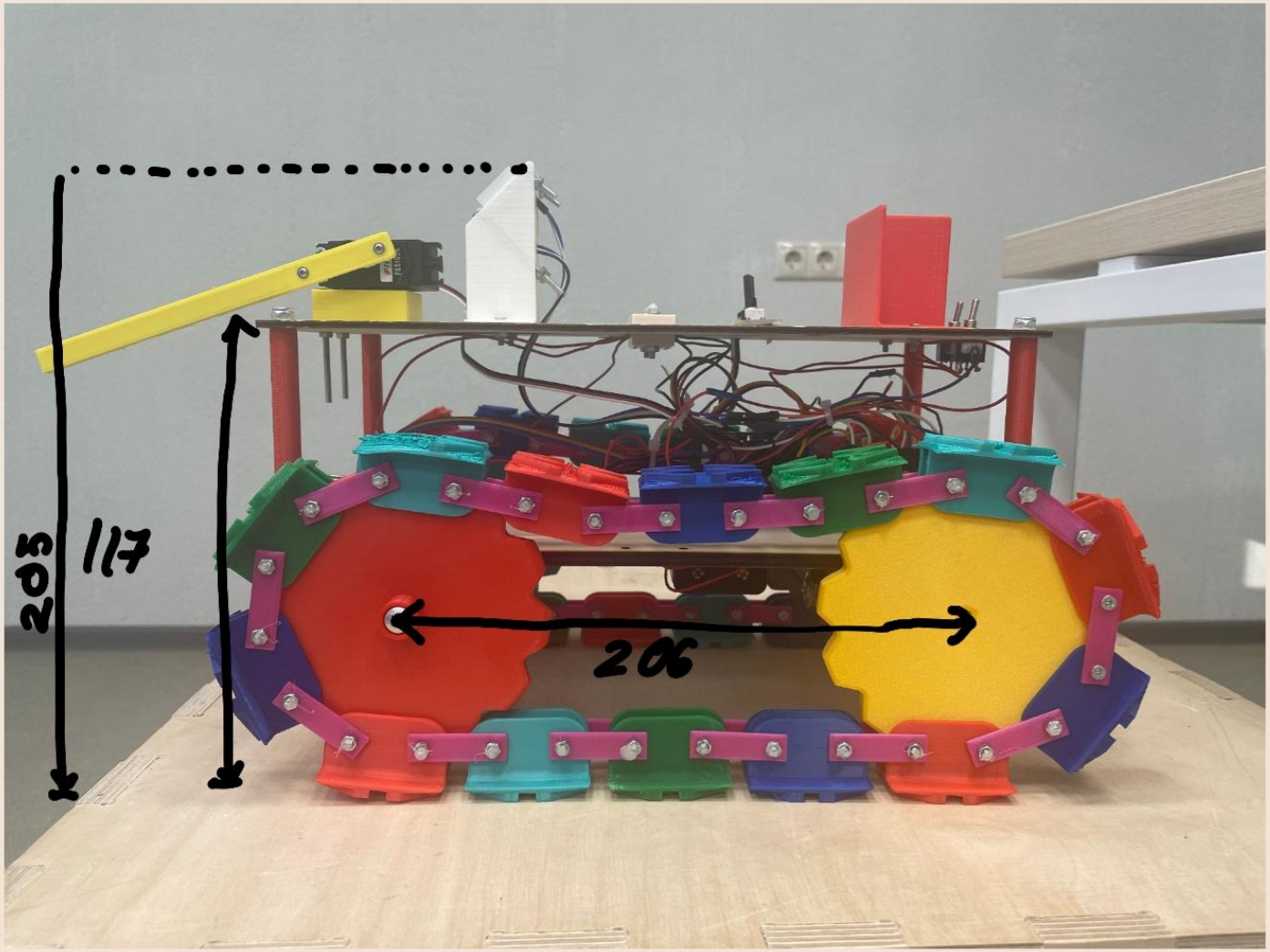


Drive Gear Dimensions

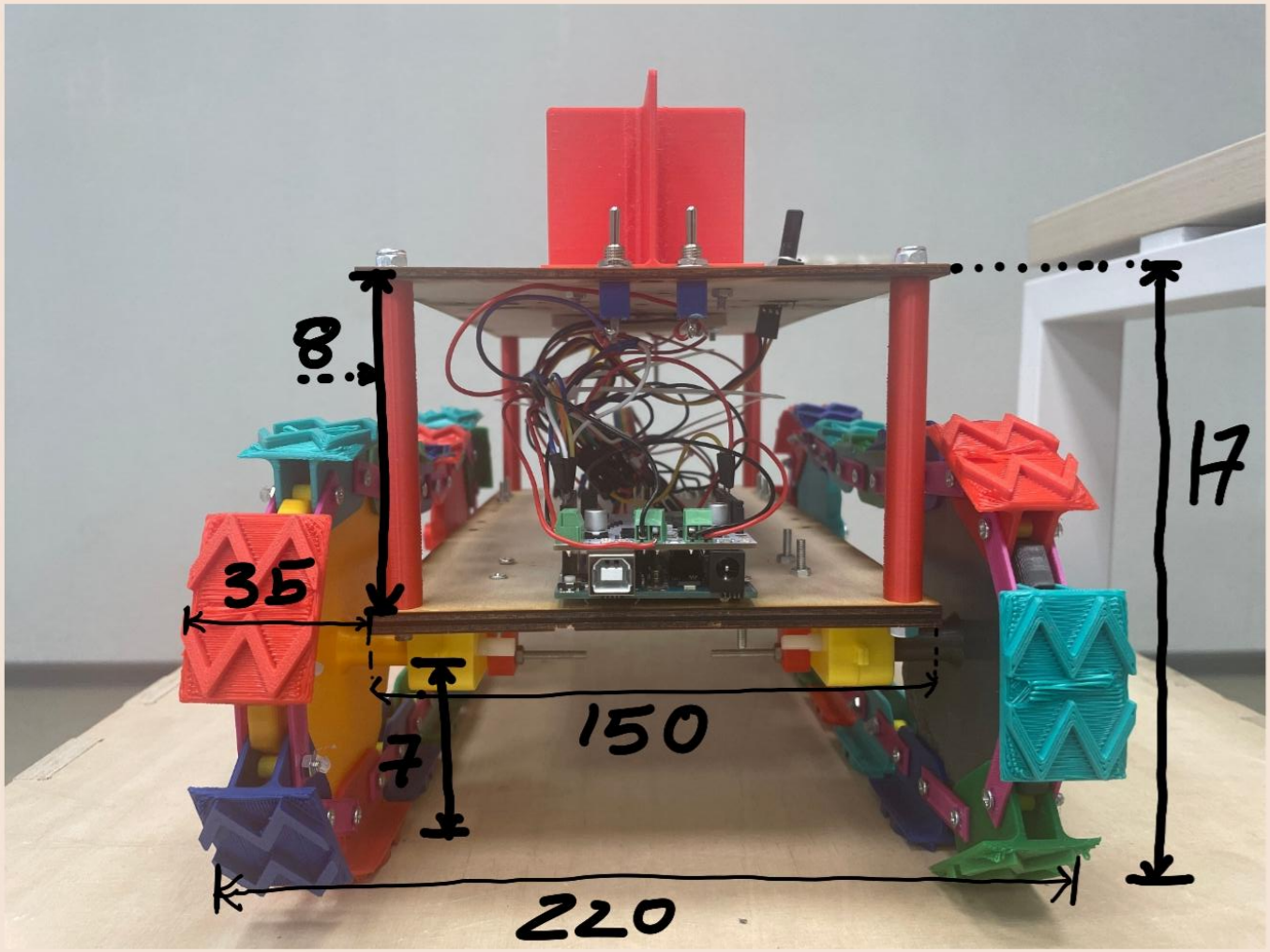




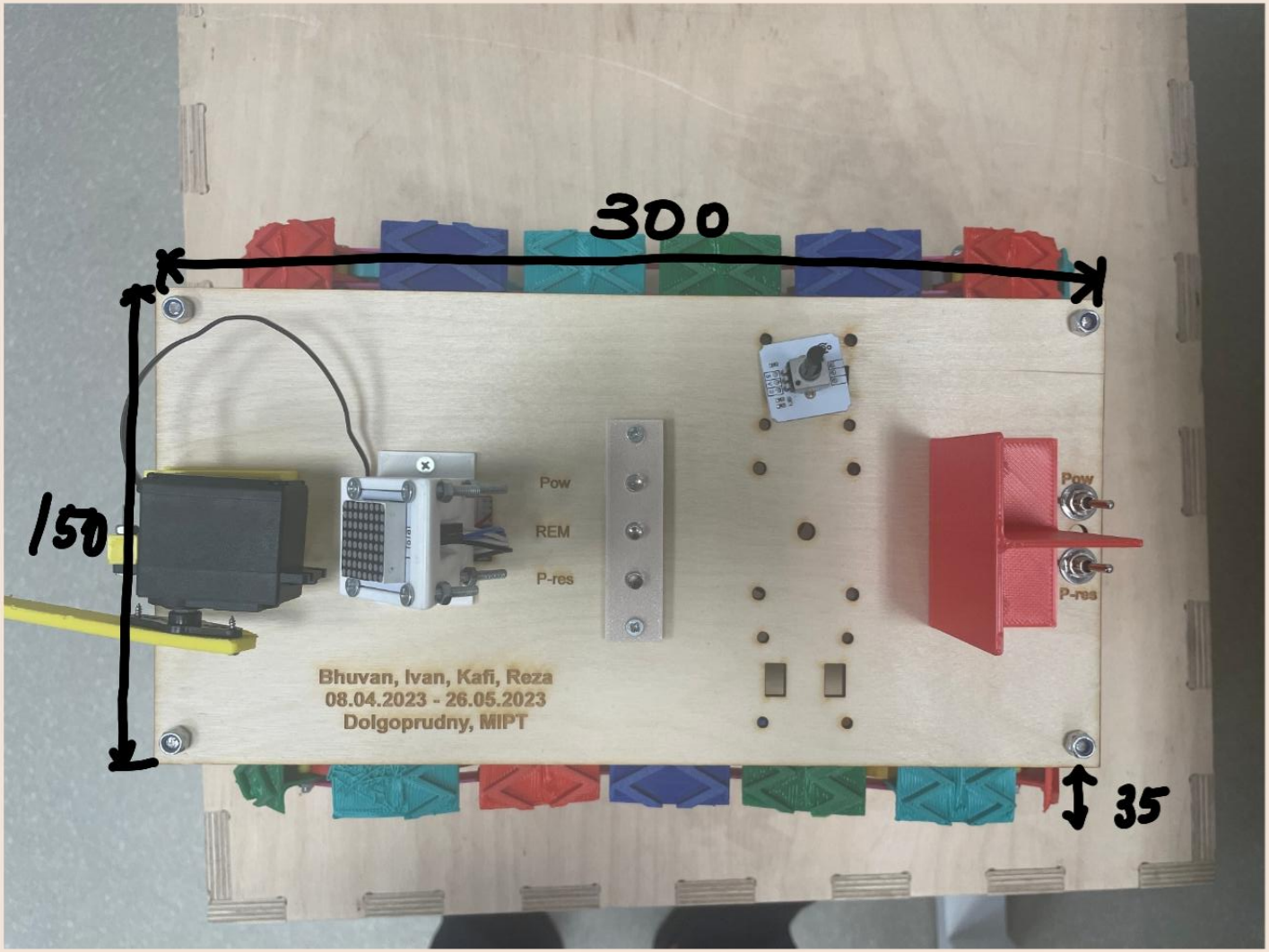
Side View



Back View



Top View


300
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35
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REM
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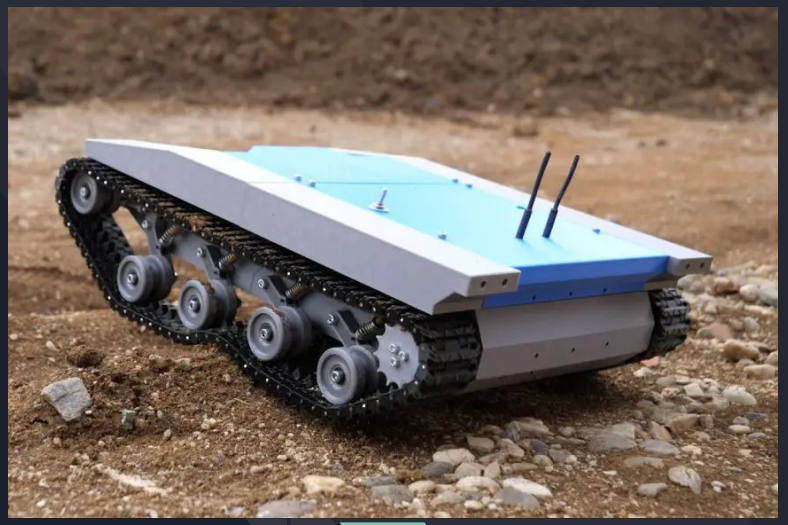
Bhuvan, Ivan, Kafi, Reza
08.04.2023 - 26.05.2023
Dolgoprudny, MIPT



Part-4 Features And Materials for Stage 2

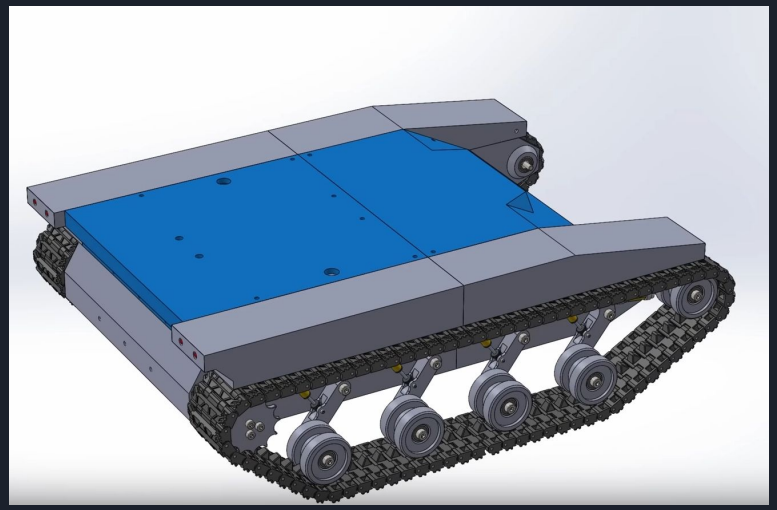
List of Materials for Stage 2 [More details will be made later]

Rover:

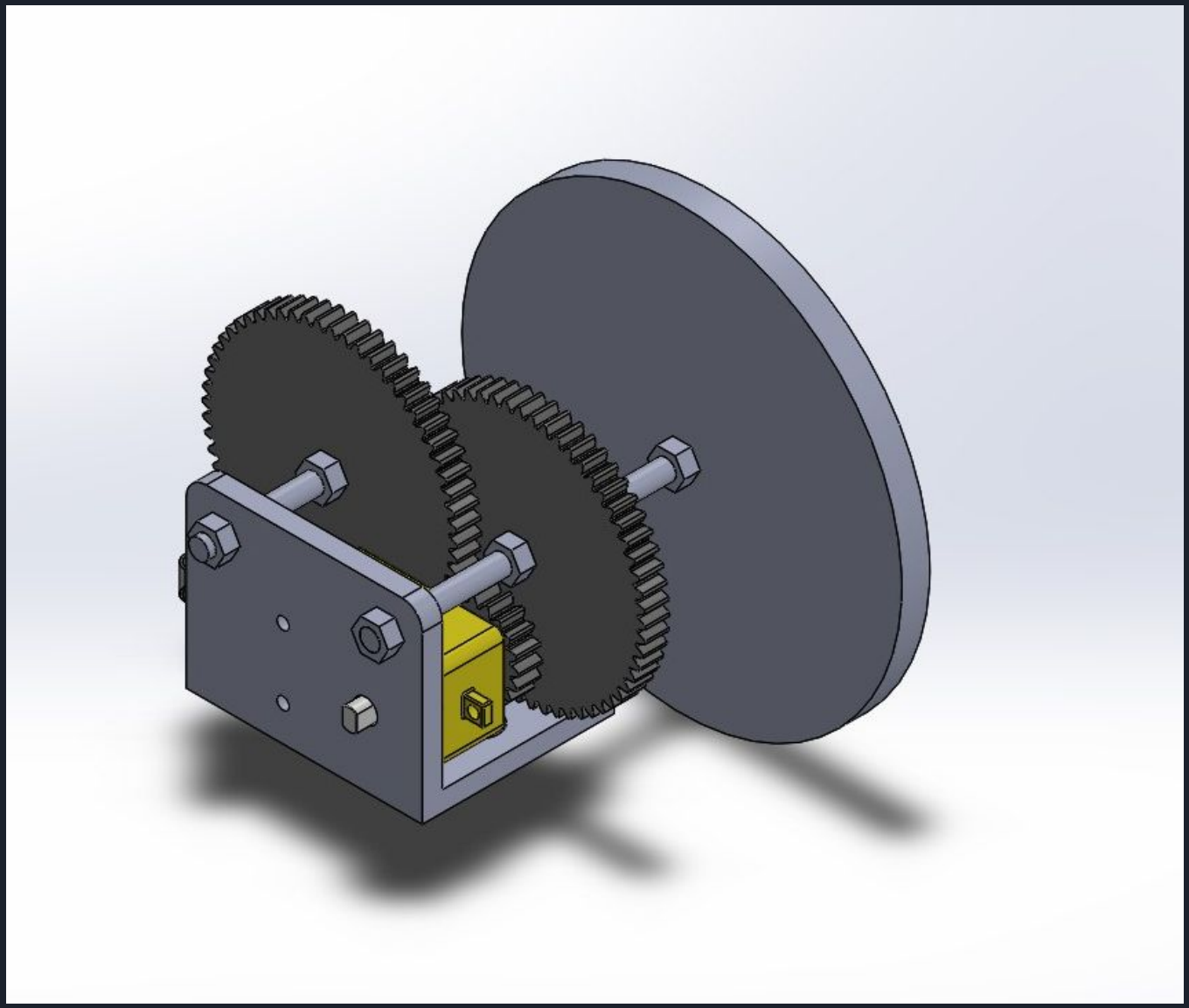
1) Arduino Mega
2) Antenna Nrf24
3) 12V or 16V motors (https://alii.pub/6ncsf1)
4) Servo Motor
5) Switch
6) 2mm Welding pins
7) Spring, shock absorbers (https://alii.pub/6nclc4)
8) More M3 screws
9) 16 4mm bearings
10) M4 screws
11) M3 M4 washers

Remote:

1) Arduino Uno
2) Nrf24 Antenna
3) Joystick 2x
4) Potentiometer
5) Pushbutton
6) Battery Holder for 2
7) A switch, for power cutoff



Stage-2 will be similar to: https://youtu.be/q3XNYwNZ97w
We will explore the effect of dust and dirt on different designs of caterpillar wheels



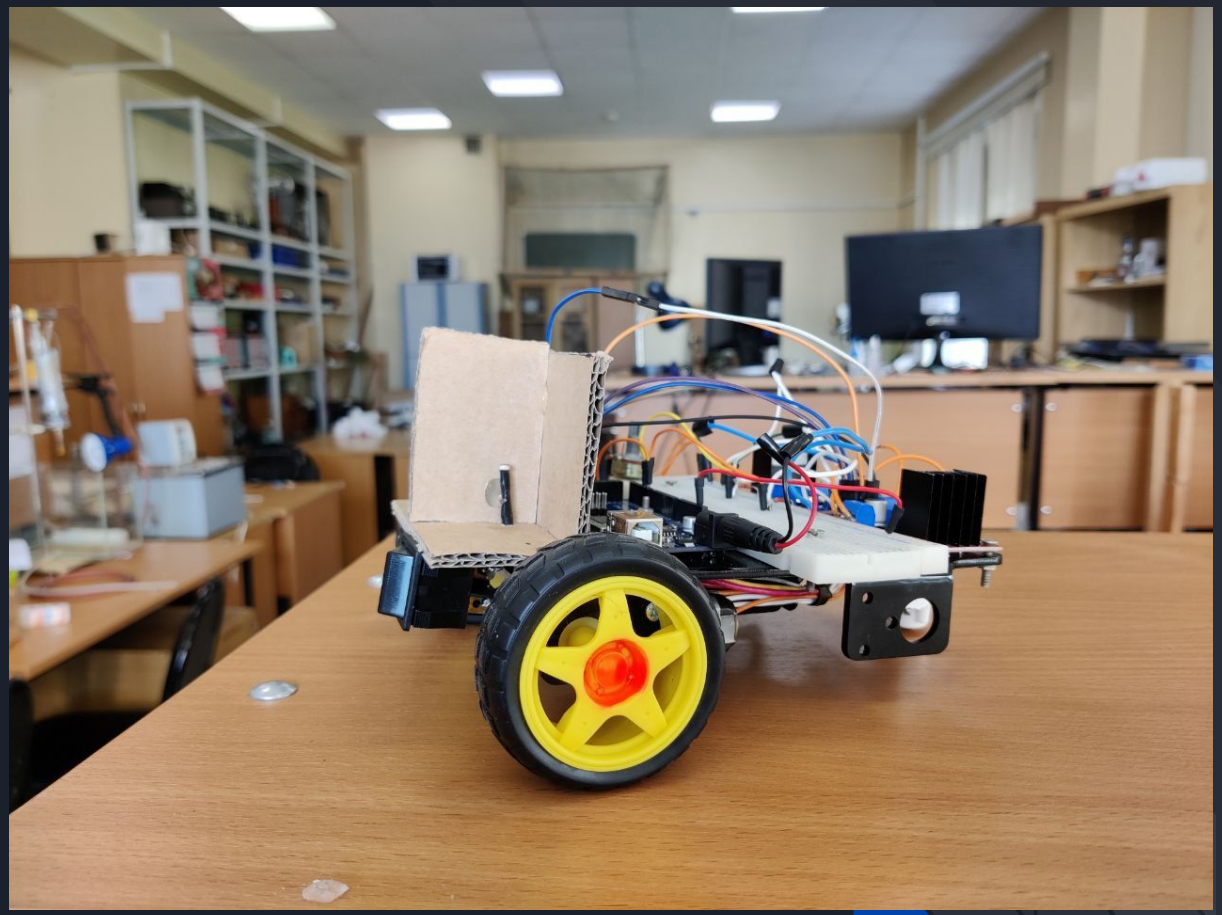
Gear Box being designed by Ivan, we also want to explore 3D printed gear boxes, and how to perfect this technology, 3 different gears

Part-5 Other Successful Projects by our team

Targeting system March - May 2022

The “Targeting system” is miniature model that uses photoresistor and phototransistors to position and aim itself in the direction of any unidentified flying objects.

More: https://github.com/kafiulshabbir/anti-aircraft-devil



Targeting System, 2022 Team

Rocket Launch,
Cosmonautics Festival 2023

More:
https://github.com/kafiulshabbir/rocket2023

Rocket Launch 09.04.2023 Team

We appreciate your willingness and kindness in giving us the opportunity to work at Phystech Fabrica. We are ecstatic, and eager to do more.