GDAŃSK UNIVERSITY
OF TECHNOLOGY

Karunya INSTITUTE OF TECHNOLOGY AND SCIENCES
Declared as Deemed-to-be University under sec. 3 of UGC Act, 1956
Karunya Nagar, Coimbatore 641 114, Tamil Nadu, India.

„Robotics in India”
Intelligent Robot - Remote Car project

by Bartłomiej Borzyszkowski (Poland)

Gdansk University of Technology (ETI)
Karunya Institute of Technology and Sciences (ET)

About the author

Bartłomiej Borzyszkowski

- Control Engineering and Robotics (BSc) student (ETI) at Gdansk University of Technology, Poland.
- Scientific intern with the IAESTE program at Karunya Institute of Technology and Sciences, Coimbatore - India.
- Gradient Science Club - artificial intelligence developer.
- IAESTE Poland IT Coordinator and Job Raising member.

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„Robotics in India" – Intelligent Robot project

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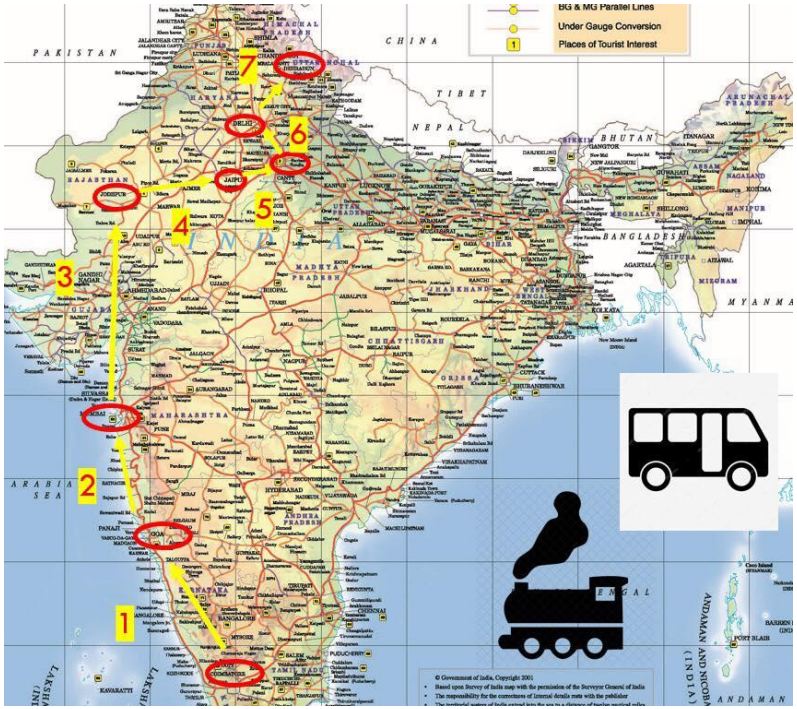
Project introduction

- 8 week internship at the Karunya Electrical Department under the supervision of Dr. K. Rajasekaran with an assistance of Mr. J. Chinnadurai.
- Creating and developing of the intelligent robot, remote/self-driving car.
- Cooperation in the international engineering team.



Besides the work:

- Over 3 week travel adventure including: Goa, Mumbai, Jodhpur, Jaipur, Delhi, Agra, Haridwar, Rishikesh, Ganges, Himalayas.
- Exploration of India, discovery of the rich culture, unique cuisine, wild nature and diverse environment of the country.

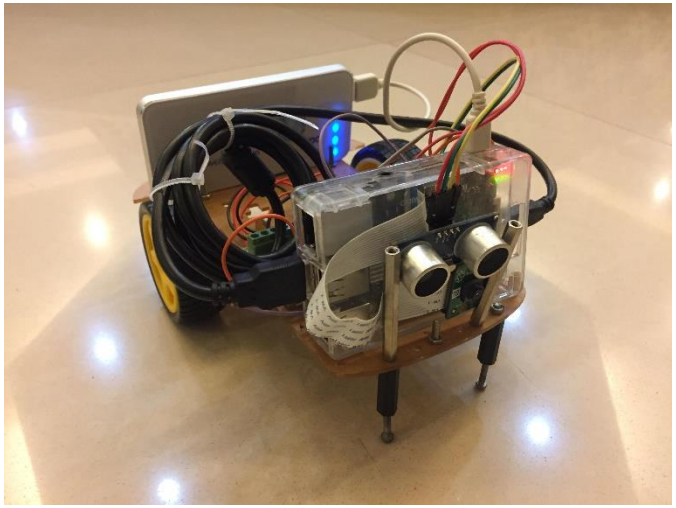
Project introduction

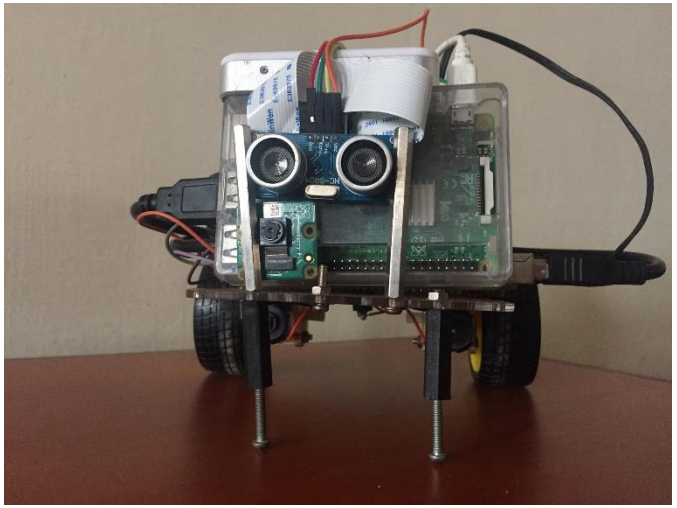
GitHub repository:

- github.com/Borzyszkowski/Robotics-in-India-Intelligent-Robot

Crowdfunding campaigns and the full internship description:

- zrzutka.pl/robotics **(Polish)**
- youcaring.com/robotics **(English)**





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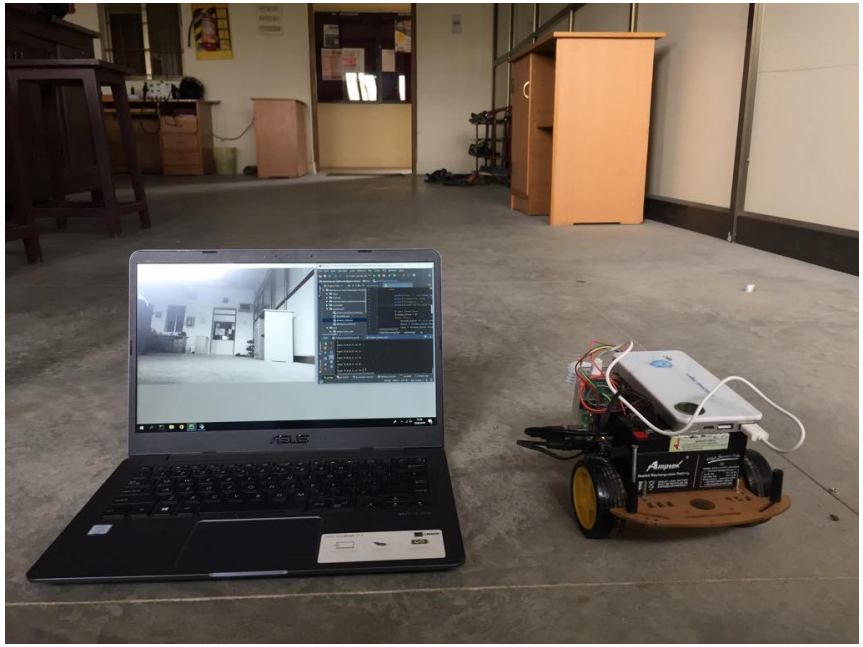
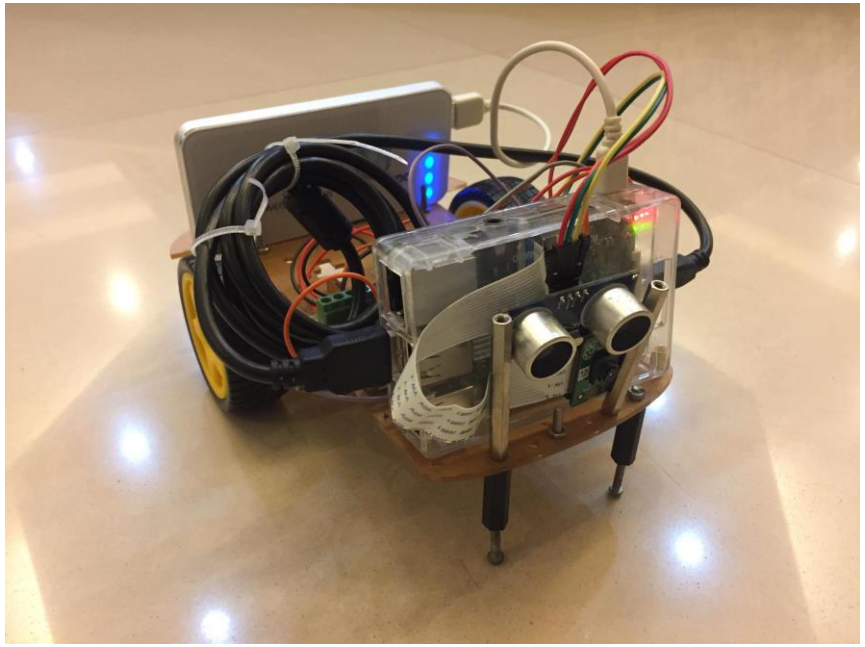
Robot overview

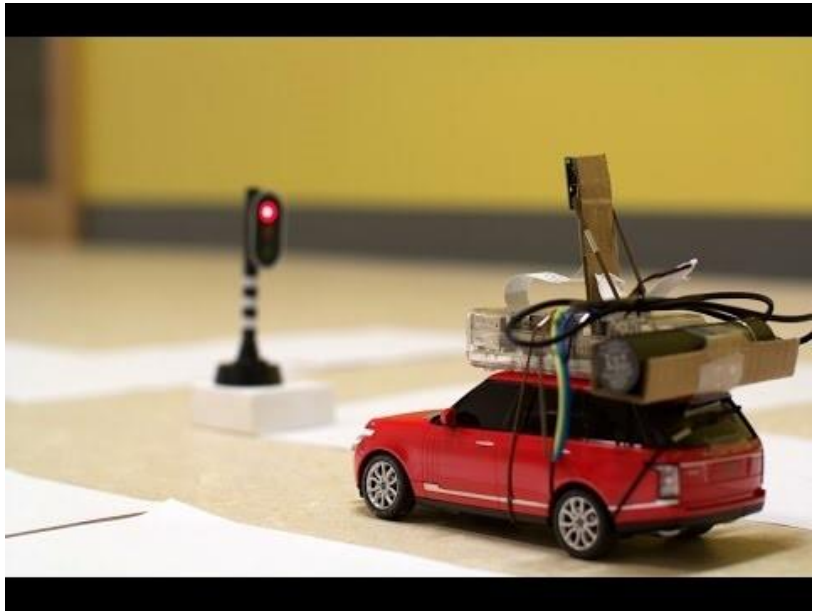


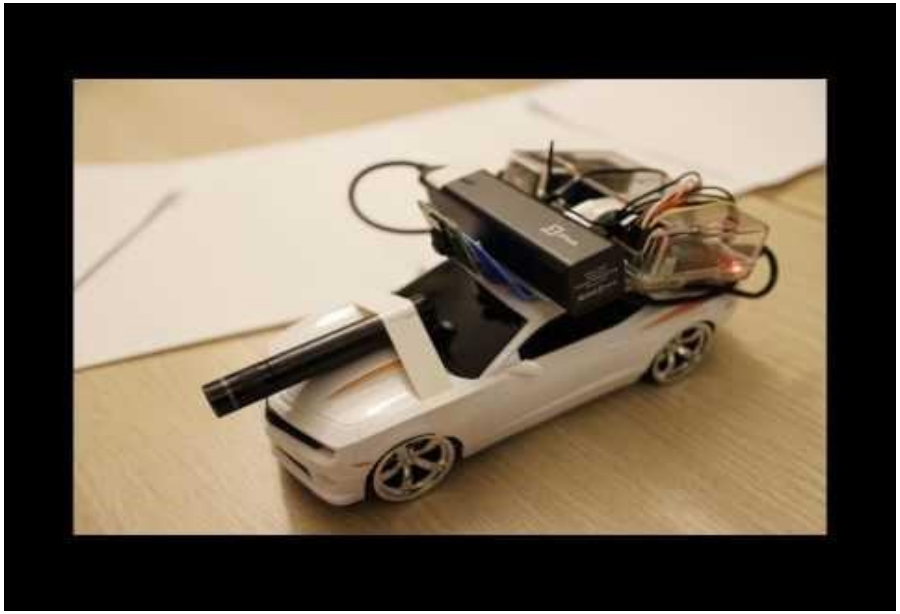


Inspiration

Zheng Wang Auto RC Car:

- github.com/hamuchiwa/AutoRCCar
- zhengludwig.wordpress.com/projects/self-driving-rc-car/





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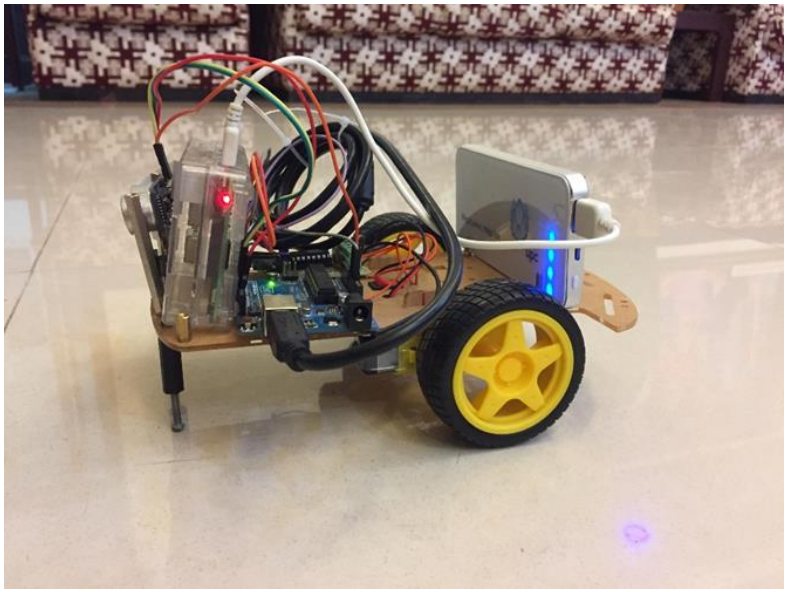
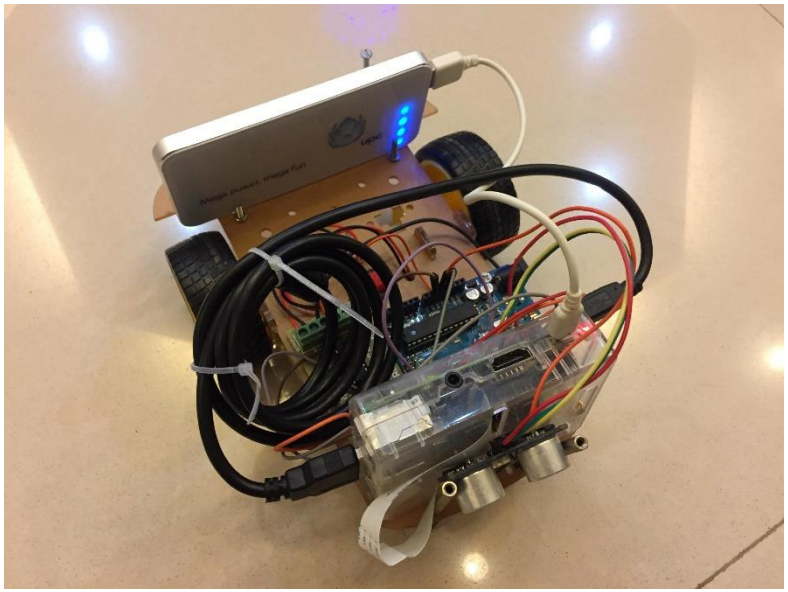
Functionality overview

- Remote control using laptop keyboard
- Camera display on the laptop
- Distance measurement thanks to ultrasonic sensor
- Steering (Forward, Backward, Right, Left, Stop)

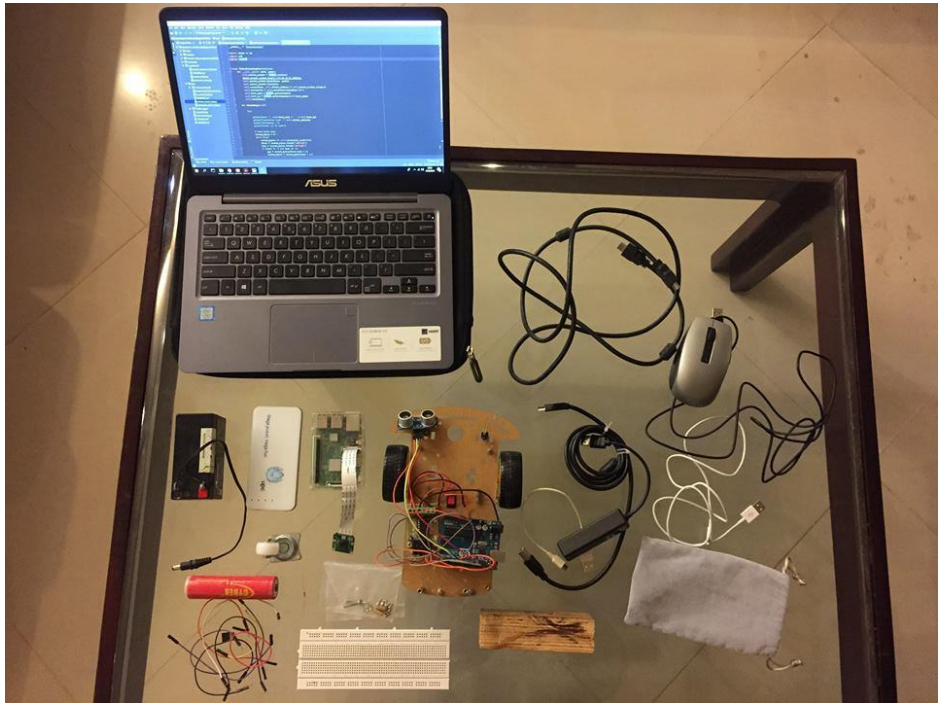




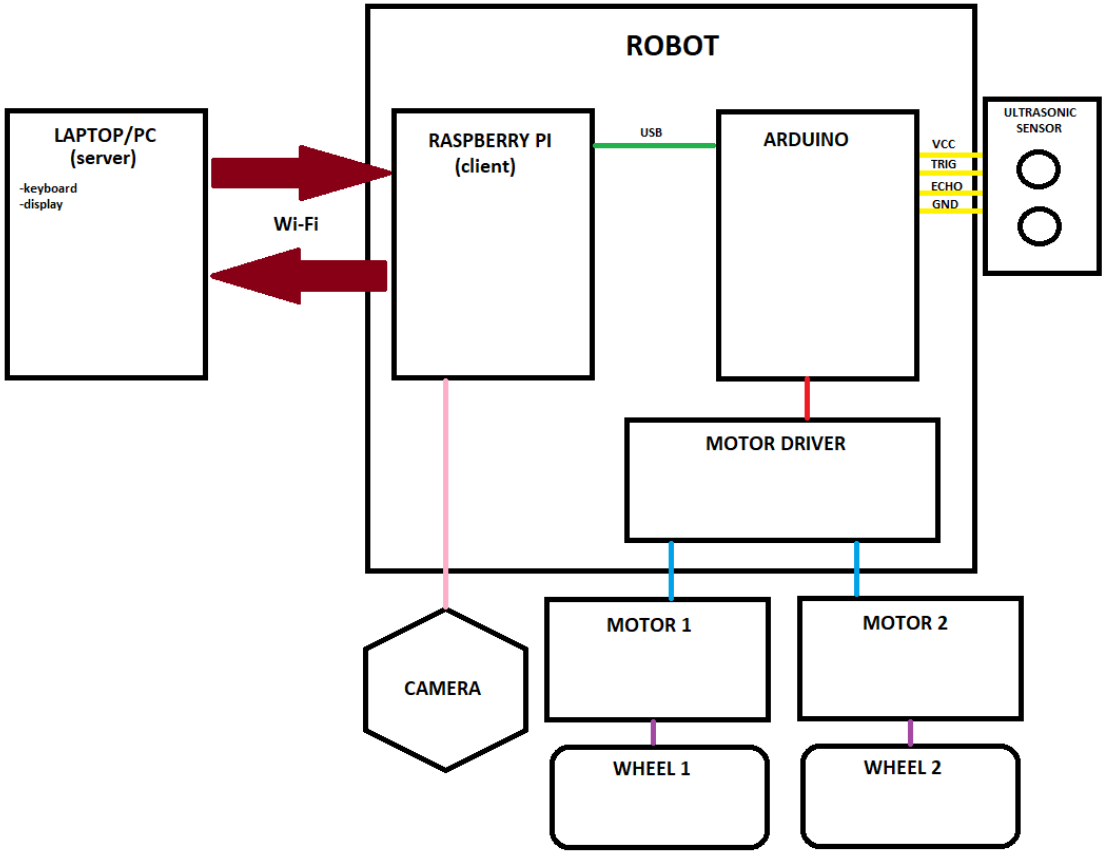
Construction details - components

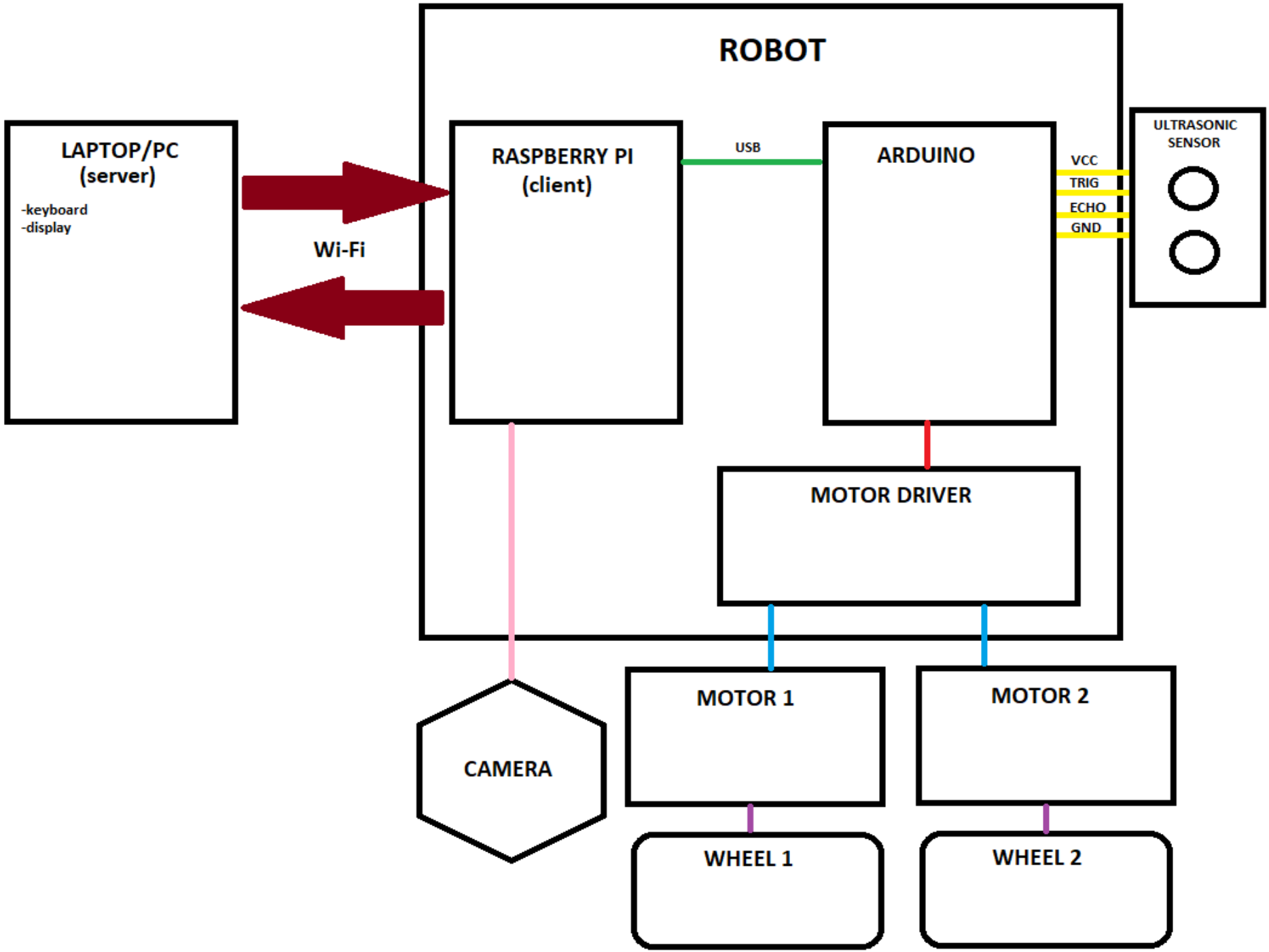
Project elements:

- Raspberry Pi 3 Model B
- Pi Camera desired for Raspberry Pi
- Arduino UNO
- Laptop/PC
- Ultrasonic sensor HC-SR04
- Motor driver L293
- 2 separate motors and 2 wheels
- Power supply (Power Bank)
- Robot board – car frame
- Cords/wires
- Soldering equipement
- Wi-Fi network
- External display
- Programming environment and software



Construction details - architecture

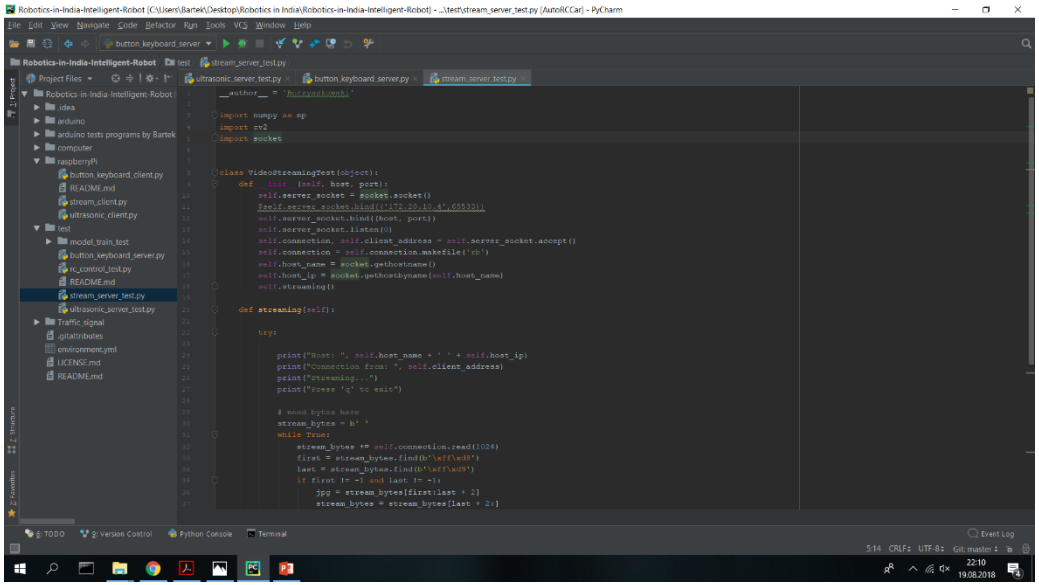


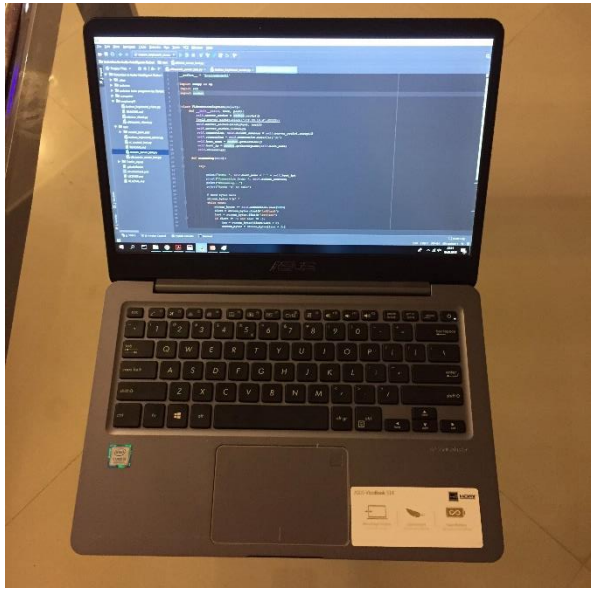

ROBOT
LAPTOP/PC
(server)
-keyboard
-display
Wi-Fi
RASPBERRY PI
(client)
USB
ARDUINO
VCC
TRIG
ECHO
GND
ULTRASONIC
SENSOR
MOTOR DRIVER
CAMERA
MOTOR 1
MOTOR 2
WHEEL 1
WHEEL 2

Construction details - Computer

Computer – laptop/PC:

- Working as a server for the Raspberry Pi (client) via Wi-Fi
- Collecting information about steering from the keyboard and forwarding it to the Raspberry Pi
- Receiving video from the Raspberry Pi and showing the display

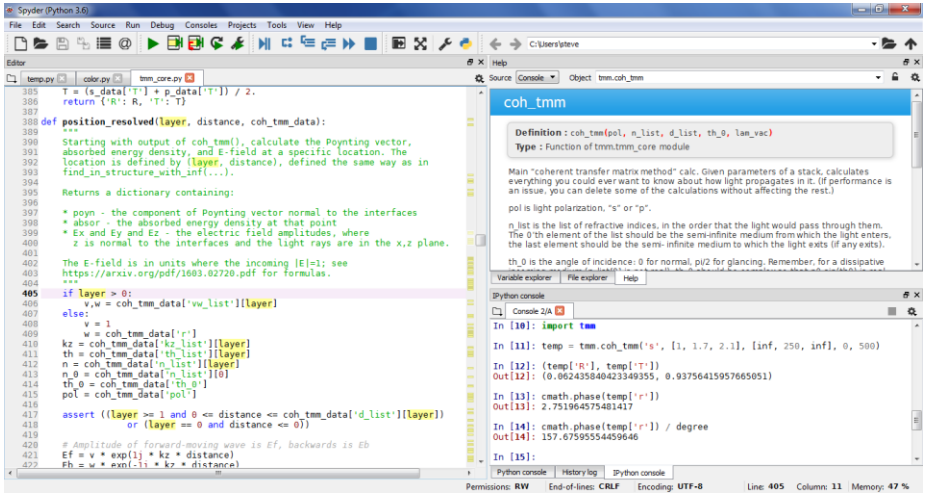


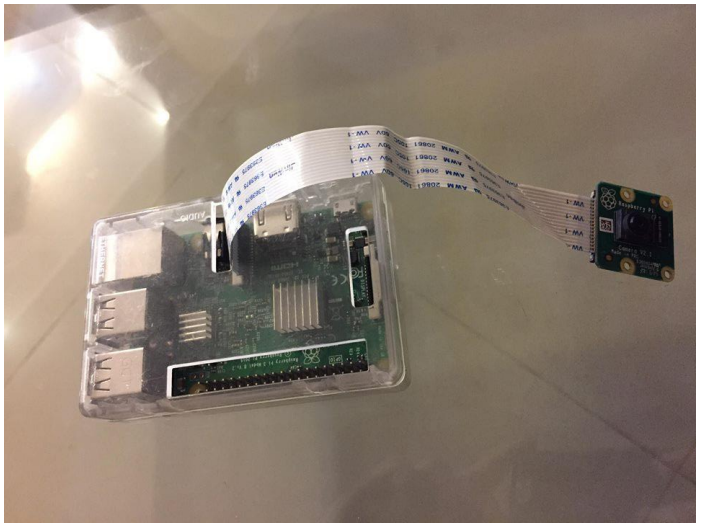


Construction details - Raspberry Pi

Raspberry Pi:

- Working as a client for the computer (server) via Wi-Fi
- Connected to the Arduino via USB
- Connected with the Pi camera
- Collecting information about steering from the computer (keyboard) and forwarding it to the Arduino
- Collecting data from the camera and sending it to the computer

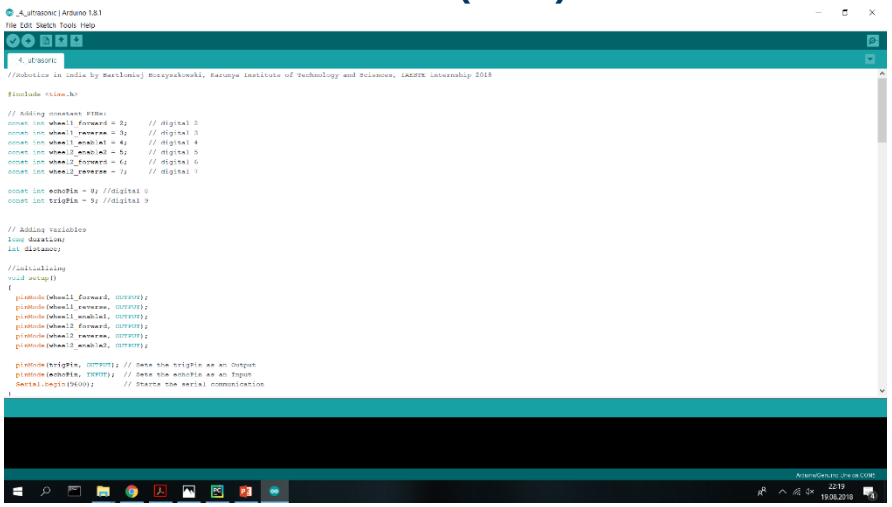


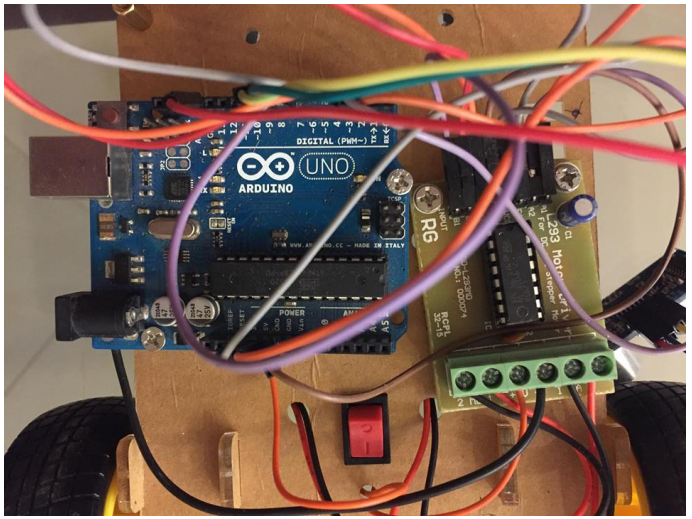


Construction details - Arduino

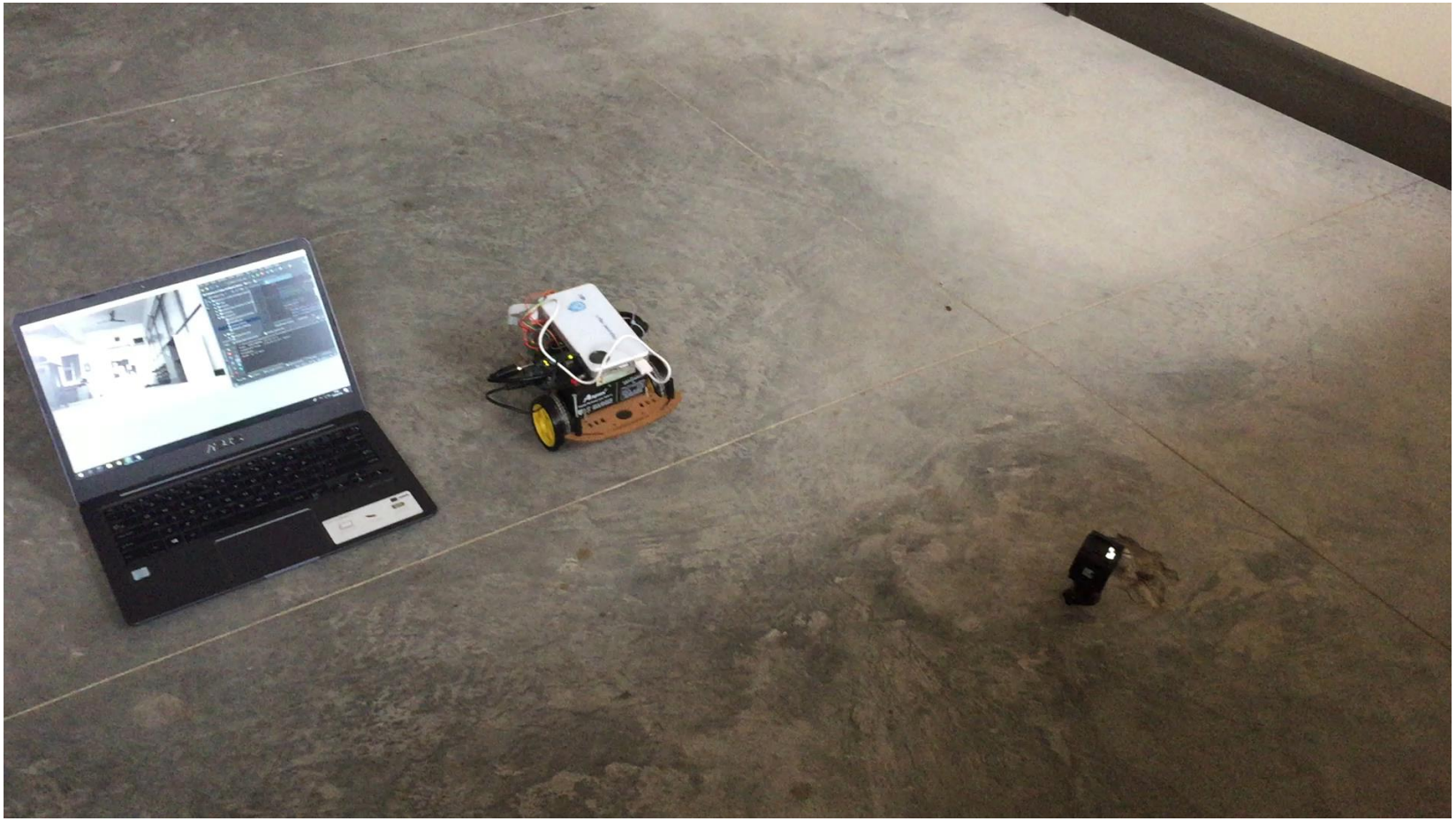
Arduino:

- Connected to the Raspberry Pi via USB
- Connected to the Motor Driver
- Connected to the ultrasonic sensor
- Receiving data for steering from the Raspberry Pi and forwarding information to the Motor Driver
- Receiving distance from the ultrasonic sensor and stopping the car in case of obstracle detection (front)

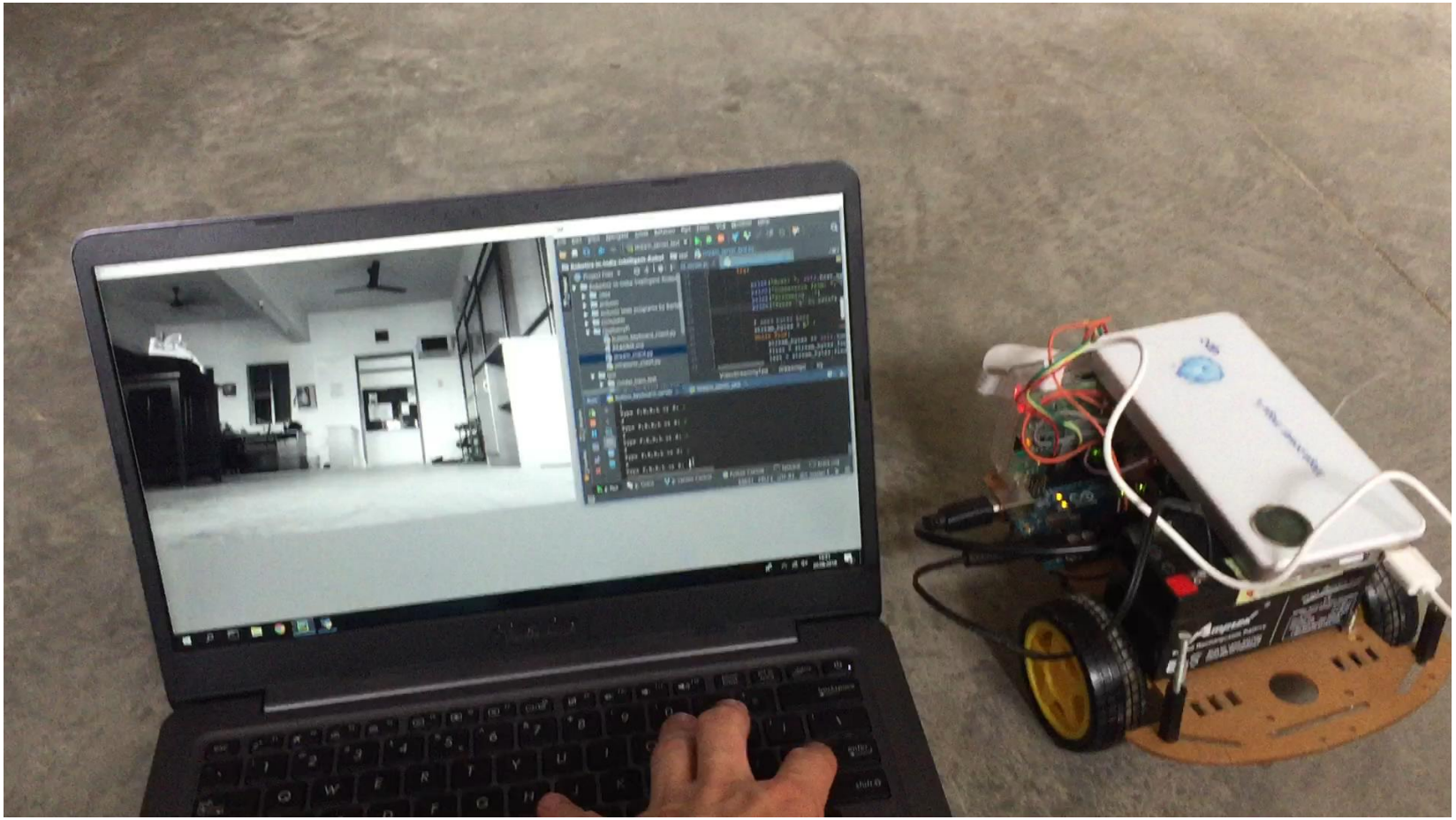




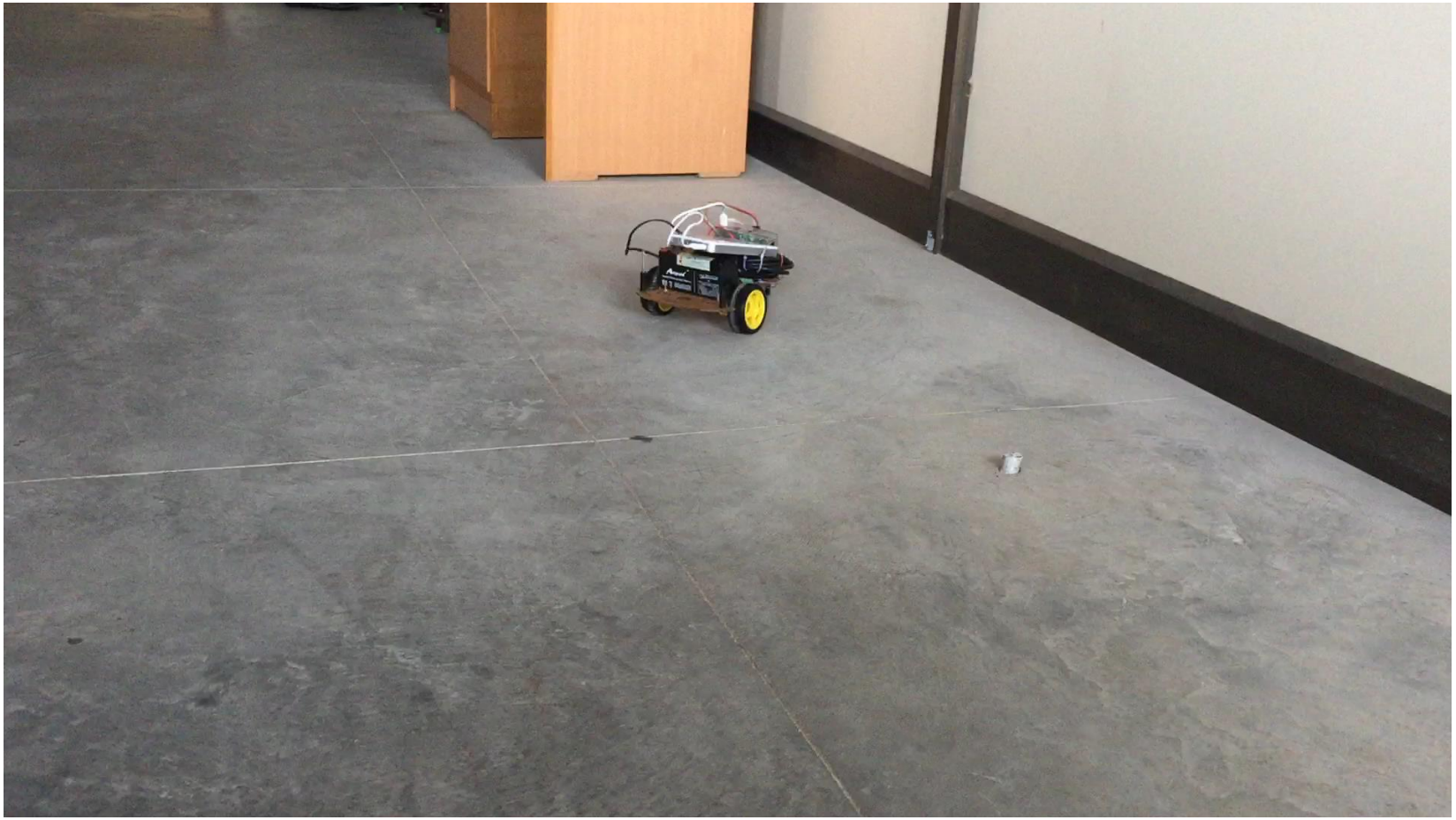
Actual effect



Actual effect



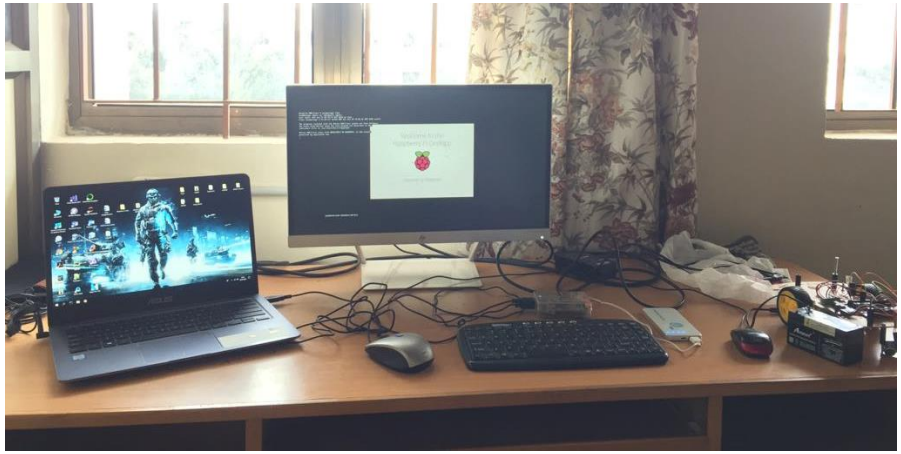
Actual effect

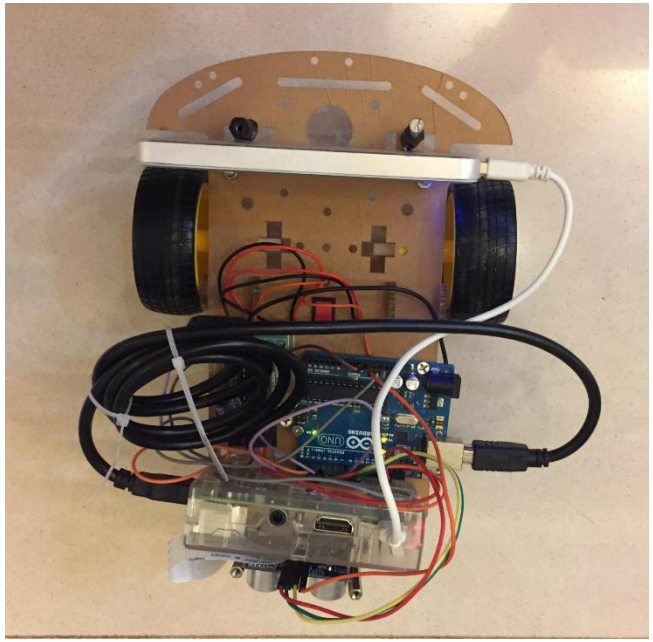


Difficulties

- Real time data transfer (a significant number of operations at the same time)
- Camera video streaming delay (scaling down the resolution is required)
- Multi-level architecture (long way for the information to cover)
- Complex software (big numer of programs)

Despite difficulties the robot works!

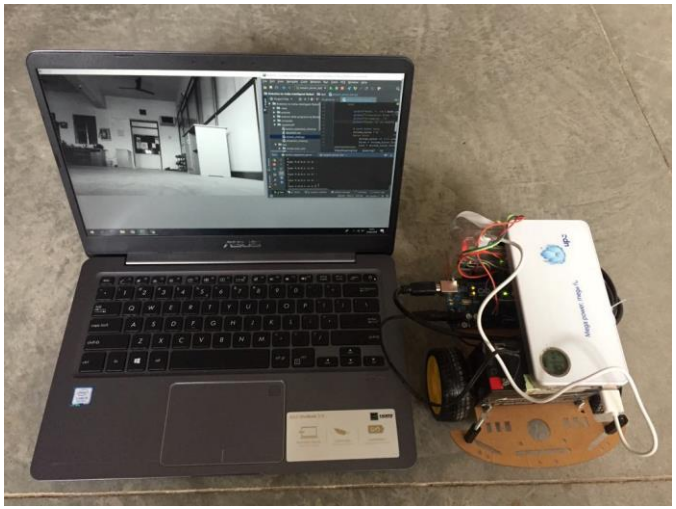


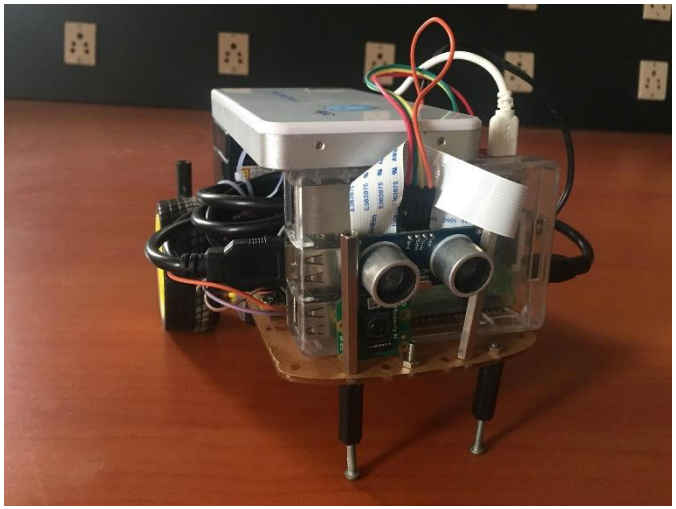


Further Develop

- Total autonomous
- Artificial intelligence, neural networks and image processing
- Road lines, signs and traffic lights recognition
- More advance steering
- Both kinds of control (self-drive and remote control) with balanced priorities

Project sum up





Useful materials

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FUTURE IS CHALLENGE