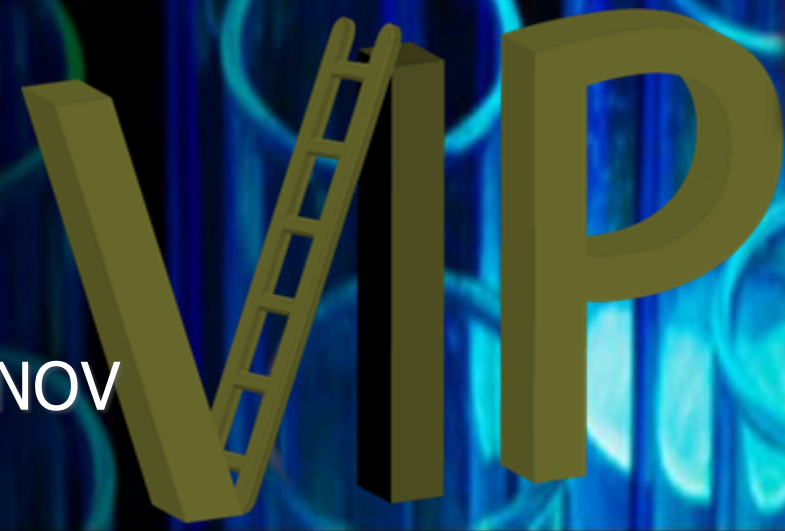




# COLLABORATION OF RASPBERRY PI RC SMART CAR

Team: **isee/ M. Ulugbek/ Prof. Kakani Vijay**  
KHALILOV ASADBEK, YUSUPOV ELBEK, KOMILOV KOBILJON, AZODOV JAVOKHIR, MAKHAMADJONOV IZZATULLOKH



## Introduction

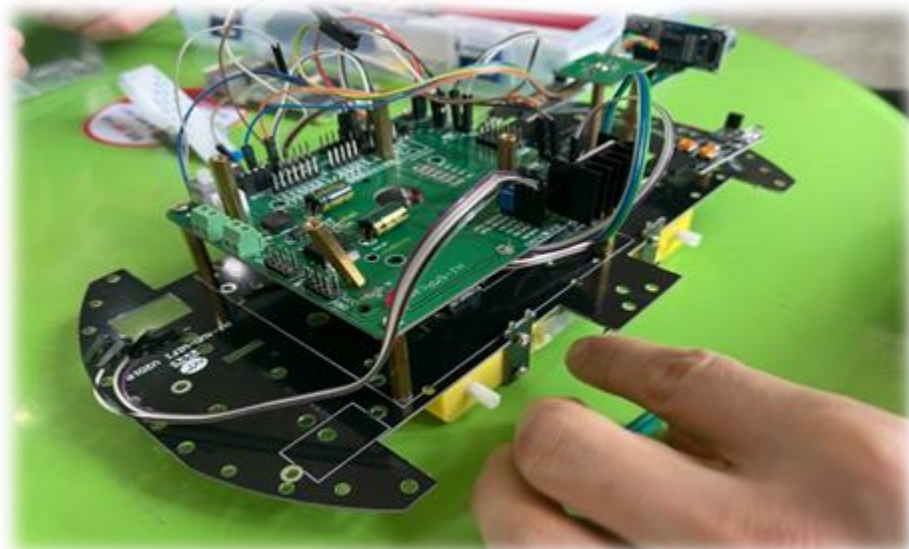
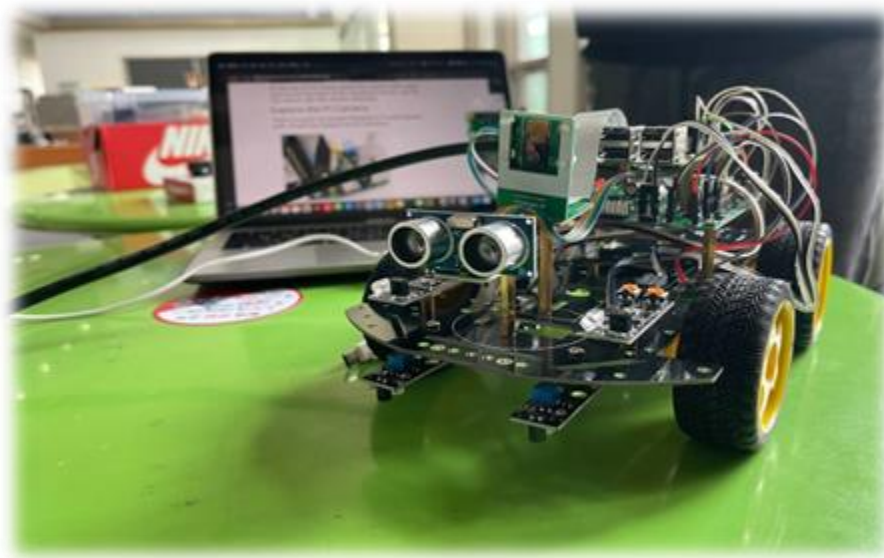
### Abstract

- ❖ Basic knowledge about Raspberry PI RC Smart Car and basic configuration
- How to assemble the body part including the sensor, dc motor, camera, main board and another important parts
- ❖ Through this semester, our course mainly focused to assemble all parts including everything like sensor, lidar and etc, and with controlling the vehicle with basic algorithms

### Social value

- ❖ Practicing youth engineers with basic skills in computer vision
- ❖ Development in Artificial Intelligence
- ❖ Support A.I further projects and technological growth

### Hardware architecture



## RASPBERRY PI RC CAR

### Component Overview

Step 1

Main MCU	
	<ul style="list-style-type: none"><li>- 900MHz quad-core ARM Cortex-A7</li><li>- 1GB RAM</li><li>- 4 USB ports</li><li>- 40 GPIO pins</li><li>- HDMI, Ethernet port</li><li>- Camera interface (CSI)</li></ul>
SHIELD	
	<ul style="list-style-type: none"><li>- L298N interface</li><li>- IR interface</li><li>- INPUT/OUTPUT Pin interface</li><li>- Line sensor interface</li><li>- Ultrasonic sensor interface</li></ul>







- ❖ Main MCU board (RASPBERRY PI 3 MODEL B)
- ❖ Sensor Shield
- ❖ Learning basic skills of Raspberry Pi 3

Step 2

Frame		
	Base Frame	Raspberry Pi board, shield board, body frame, connecting motor, etc.
	Ultrasonic Frame	Ultrasonic sensor holder frame
	Camera Frame	Raspberry Pi camera holder frame

- ❖ Body frames
- ❖ Base frame
- ❖ Ultrasonic Frame
- ❖ Camera Frame

Step 3

Sensors and modules			
	<ul style="list-style-type: none"><li>• DC geared motor</li><li>• 4 pcs.</li></ul>		<ul style="list-style-type: none"><li>• Line tracer</li><li>• 2 pcs.</li></ul>
	<ul style="list-style-type: none"><li>• IR sensors</li><li>• 2 pcs.</li></ul>		<ul style="list-style-type: none"><li>• Voltmeter &amp; components</li><li>• 1 pcs.</li></ul>
	<ul style="list-style-type: none"><li>• Camera module</li><li>• 1 pcs.</li></ul>		<ul style="list-style-type: none"><li>• Ultrasonic sensor</li><li>• 1 pcs.</li></ul>

- ❖ Sensors and modules
- ❖ Most important components for moving the RC Car

Step 4

Other accessories			
	<ul style="list-style-type: none"><li>• Micro 5-Pin power supply cable</li></ul>		<ul style="list-style-type: none"><li>• Battery holder</li></ul>
	<ul style="list-style-type: none"><li>• Tires</li><li>• 4 pcs.</li></ul>		<ul style="list-style-type: none"><li>• 8G Micro SD Card</li><li>• SD Card Reader</li></ul>
	<ul style="list-style-type: none"><li>• Assembly bolt &amp; screws set</li></ul>		<ul style="list-style-type: none"><li>• 3.7V battery</li><li>• 2 pcs.</li></ul>

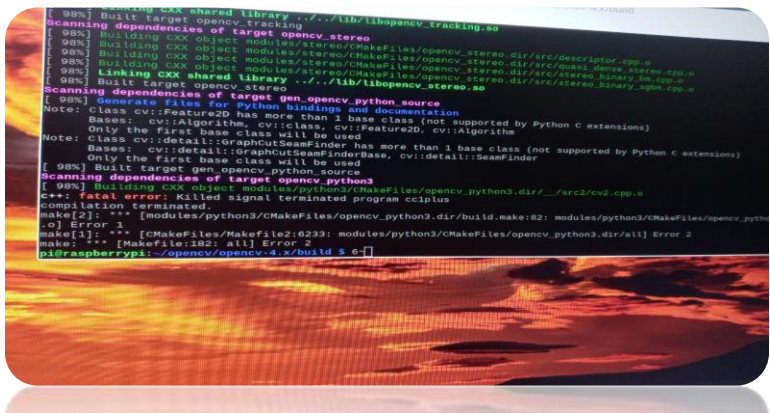
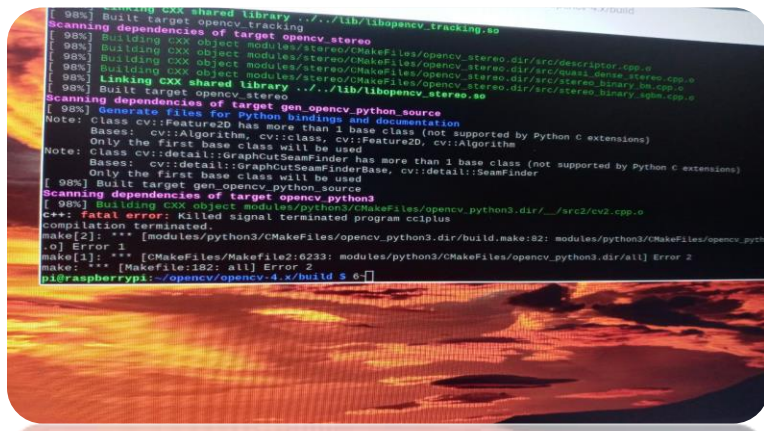
- ❖ Other components for battery supply and wire connection

Step 5

Other accessories			
	<ul style="list-style-type: none"><li>• Female-Female cable</li><li>• 33 pcs.</li></ul>		<ul style="list-style-type: none"><li>• Screwdriver</li></ul>

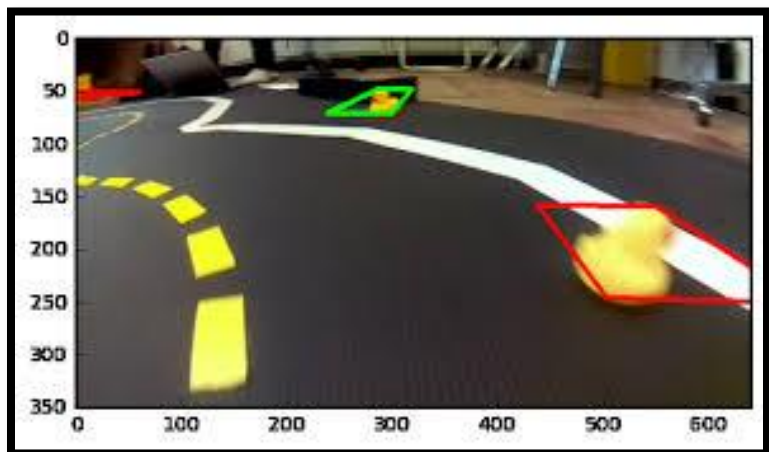
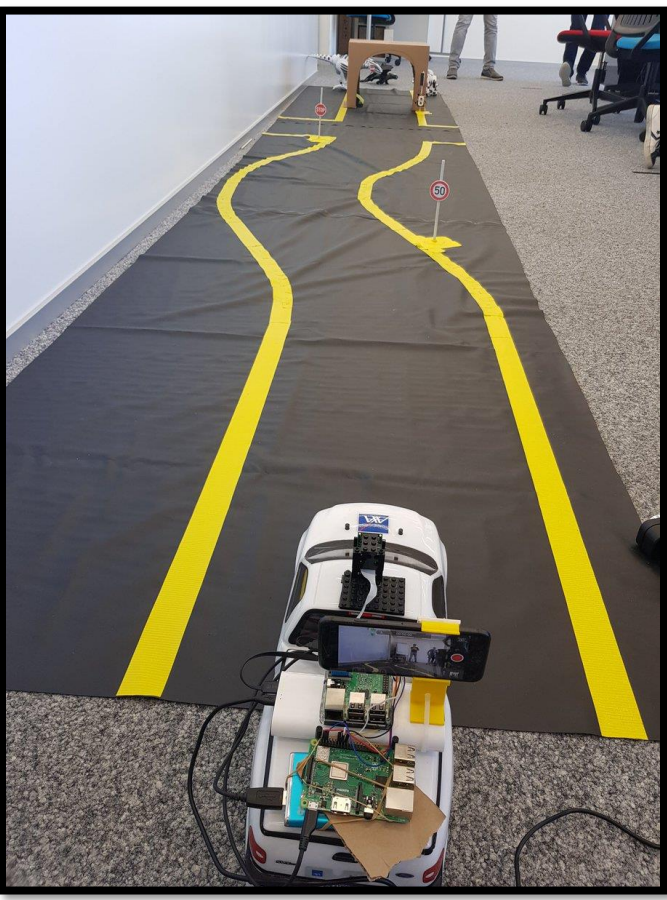
- Wire connection
- Screwdriver

### Package installation



- ❖ Through lectures, we installed many packages related to opencv and opencv itself. Package installations were smooth and without any problems.
- ❖ It is recommended to use compiler, configuration and build options which are compatible to the one used for OpenCV build, otherwise resulting library can refuse to load or cause other runtime problems. Note that some functionality can be limited or work slower when backends are loaded dynamically due to extra barrier between OpenCV and corresponding third-party library.

### Obstacle detection

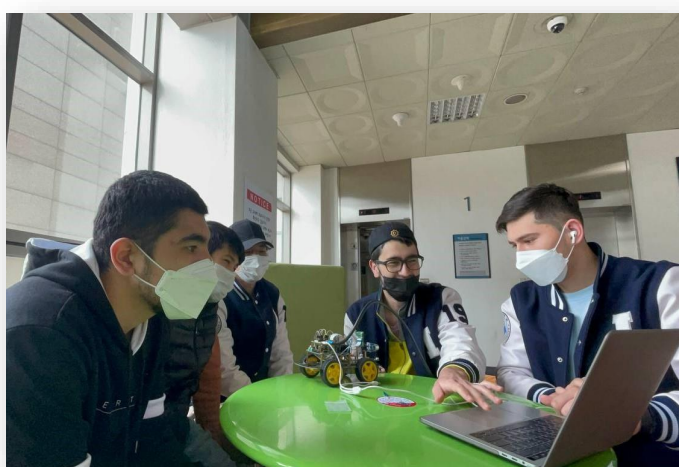


- ❖ Obstacle detection is the **process of using sensors, data structures, and algorithms to detect objects or terrain types that impede motion.**
- ❖ An obstacle detection system uses ultrasonic sensors mounted on the front and/or rear bumpers. These sensors can measure the distance between your car and nearby obstacles directly around the front or rear bumper. The driver is alerted by beeps or the dashboard display.

### Results

#### What we have learned

- ❑ Computer Vision
- ❑ Brainstorming
- ❑ How to assemble Smart Car
- ❑ How to use Raspberry pi
- ❑ OpenCV installations and testing.



#### Computer vision

- ❑ Computer vision works much the same as human vision, except humans have a head start. Human sight has the advantage of lifetimes of context to train how to tell objects apart, how far away they are, whether they are moving and whether there is something wrong in an image

- ❑ we found out Raspberry Pi 3 Smart Car. It has very interesting features that we can master good knowledge in terms of the team project we are going to do. First we made sure how to assemble the smart car learning its sensors and accessories, and we set up Raspberry Pi editor in order to learn the basic skills of it. We connected wiring connections and learned about its application with our team and created a bootable SD card. Also using the terminal to upgrade Raspbian OS, We did the installations and tried to connect RC smart car to control from PC without any wire.

