



**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
SUMY STATE UNIVERSITY  
DEPARTMENT OF COMPUTER SCIENCE**

# **SMART ROBOT CONTROL INFORMATION TECHNOLOGY**

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## WHY MAPPING SMART ROBOTS ARE NEEDED

- Consider a home robot vacuum, Without SLAM, it will just move randomly within a room and may not be able to clean the entire floor surface.
- Robots with SLAM can use information such as the number of wheel revolutions and data from cameras and other imaging sensors to determine the amount of movement needed.
- SLAM robots can also be used for parking a self-driving car in an empty spot, or delivering a package by navigating a drone in an unknown environment.

SLAM - simultaneous localization and mapping

# INFORMATION REVIEW

## AUTONOMOUS UV ROBOT WITH SLAM



Figure 1. Design of the UV smart car.

## WIFI CONTROLLED SMART CAR

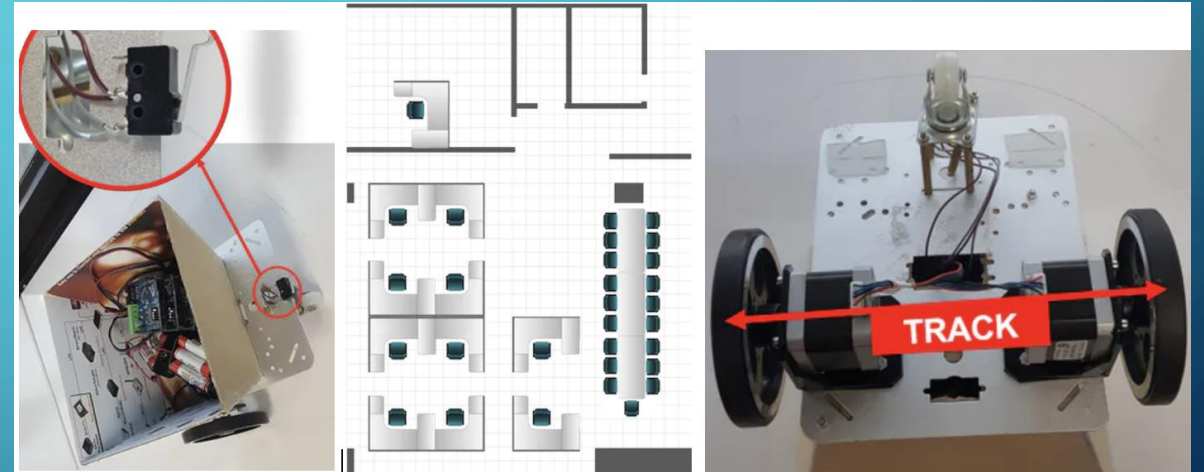


Figure 2. Design of a simple smart car which is controlled through the Wi-Fi

## HUMAN NAVIGATION SMART CAR

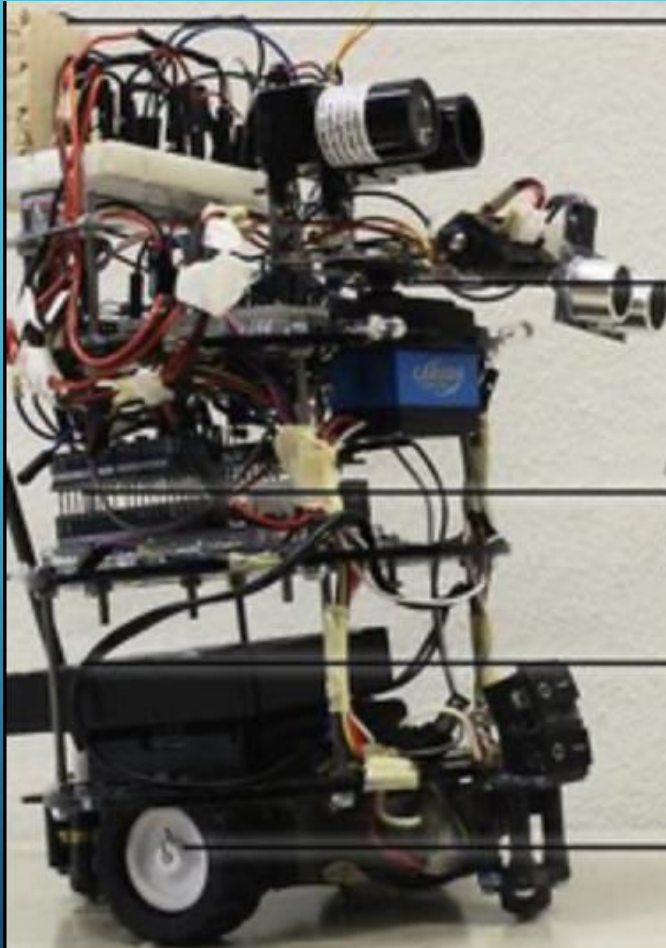


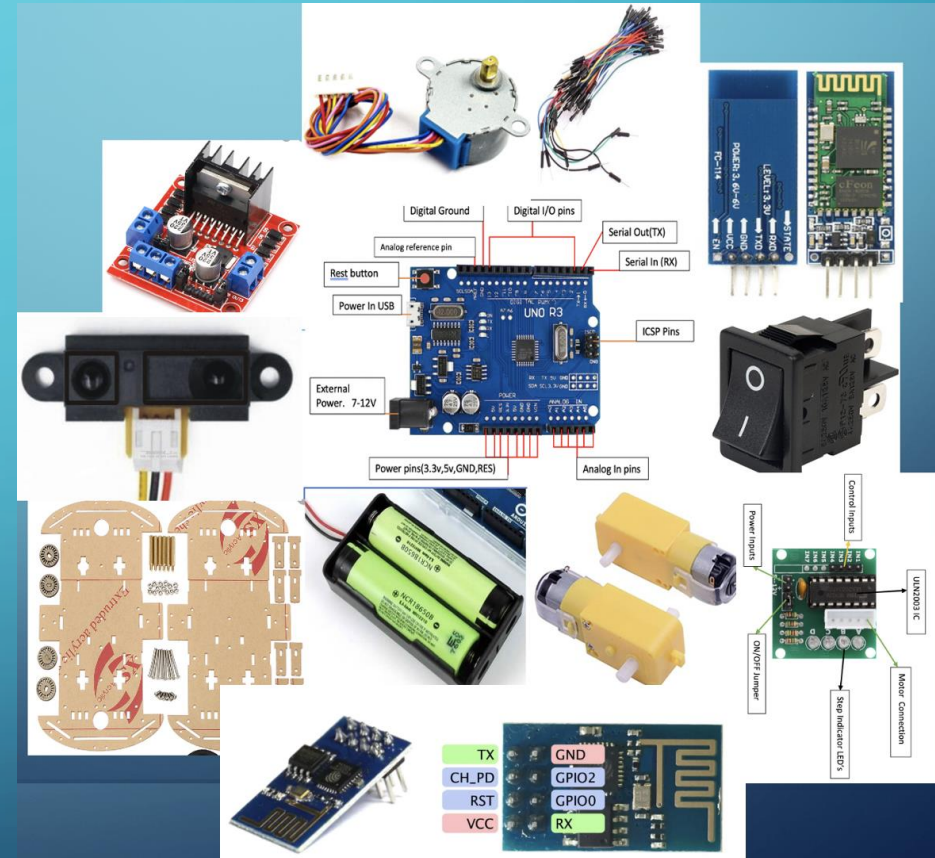
Figure 3. Human navigation bot using indoor mapping



# SELECTING OF PROGRAMMING INSTRUMENTS

## COMPONENTS USED

- L298N Motor Driver IC
- IR distance Sensor
- ULN2003 stepper motor driver
- Stepper Motor
- Arduino Mega2560
- Power Supply
- On/Off switch
- DC Motors
- Motor wheels
- Jumper wires
- HC-06 Bluetooth module
- 4WD smart car chassis



## Arduino Boards:

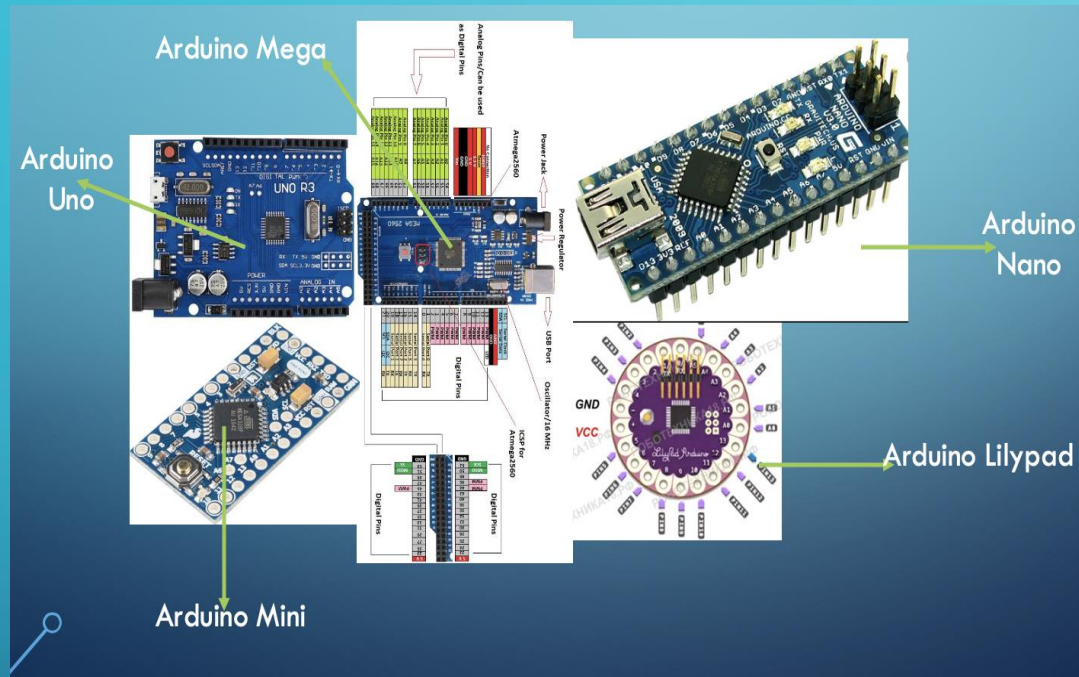


Figure 4. Different Arduino boards

## Arduino Shields



Figure 5. Arduino shields

# ARDUINO IDE

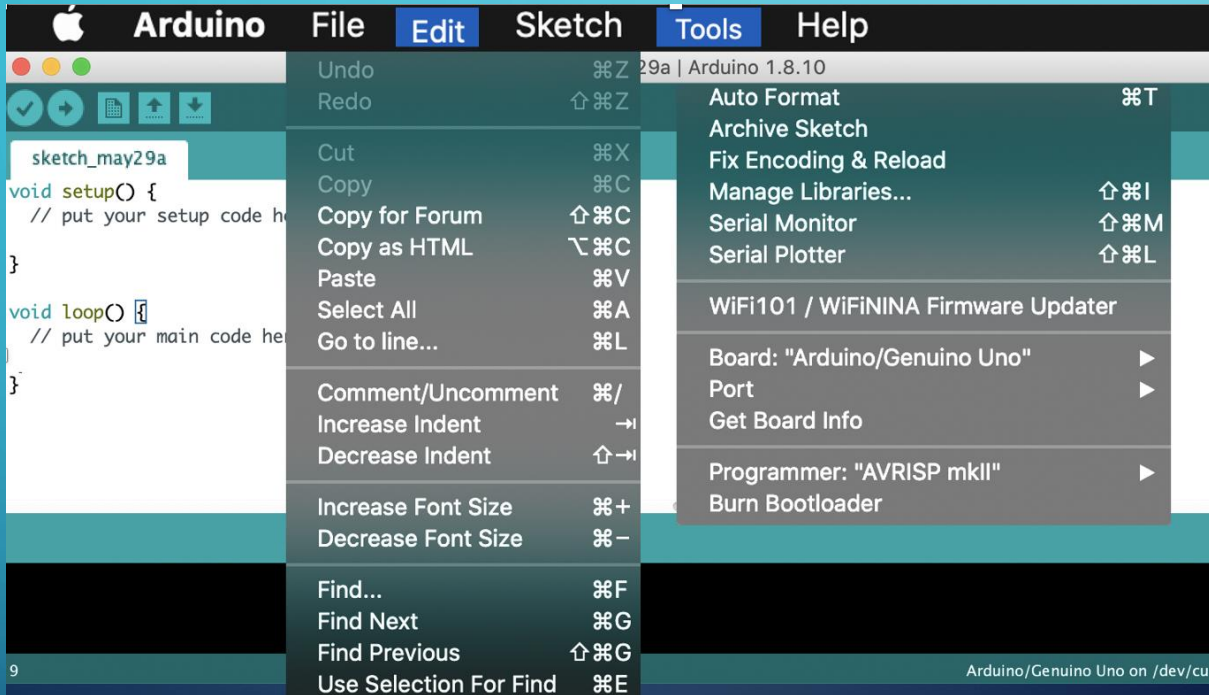


Figure 6. Arduino IDE

# PYGAME

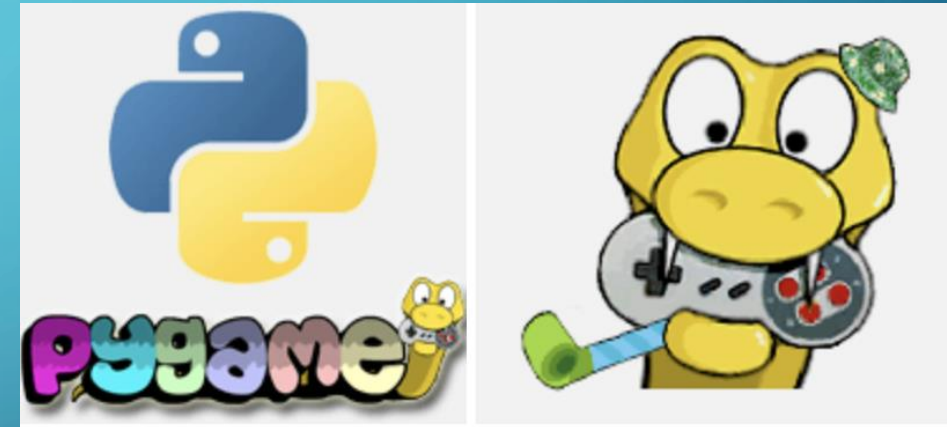


Figure 7. Pygame – Library For Game development



# APPLICATION REALIZATION

## STRUCTURE DIAGRAMS

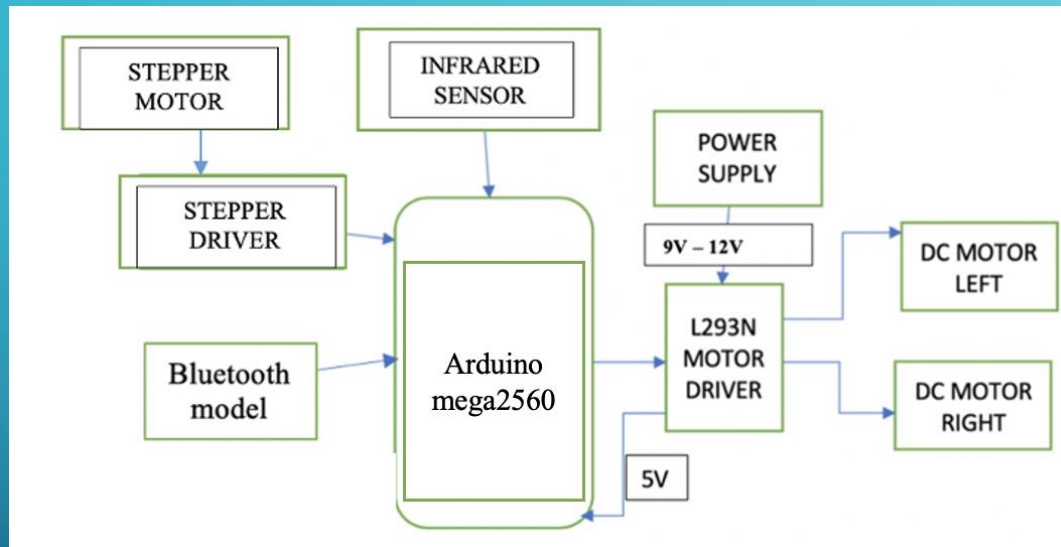


Figure 8. Structure Diagram

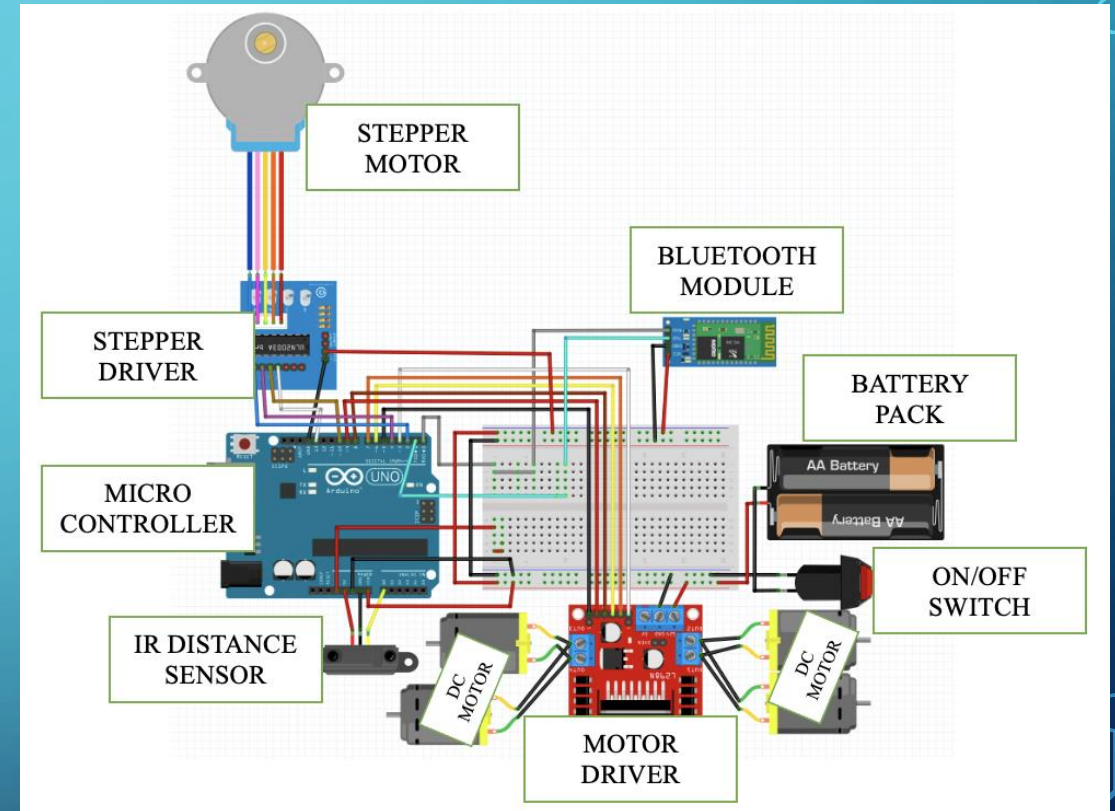


Fig. 9 - ROBOT SCHEME



# TELEGRAM-BOT

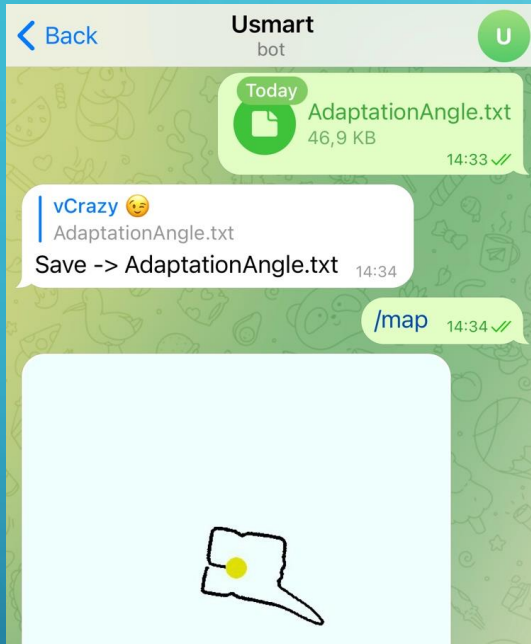
## Creating New Chat Bot

- BotFather ➡ use the “/newbot” ➡ input name and username.

\*The bot will give user a unique token entering details.

## Using “@Mappingcarbot” Chat Bot

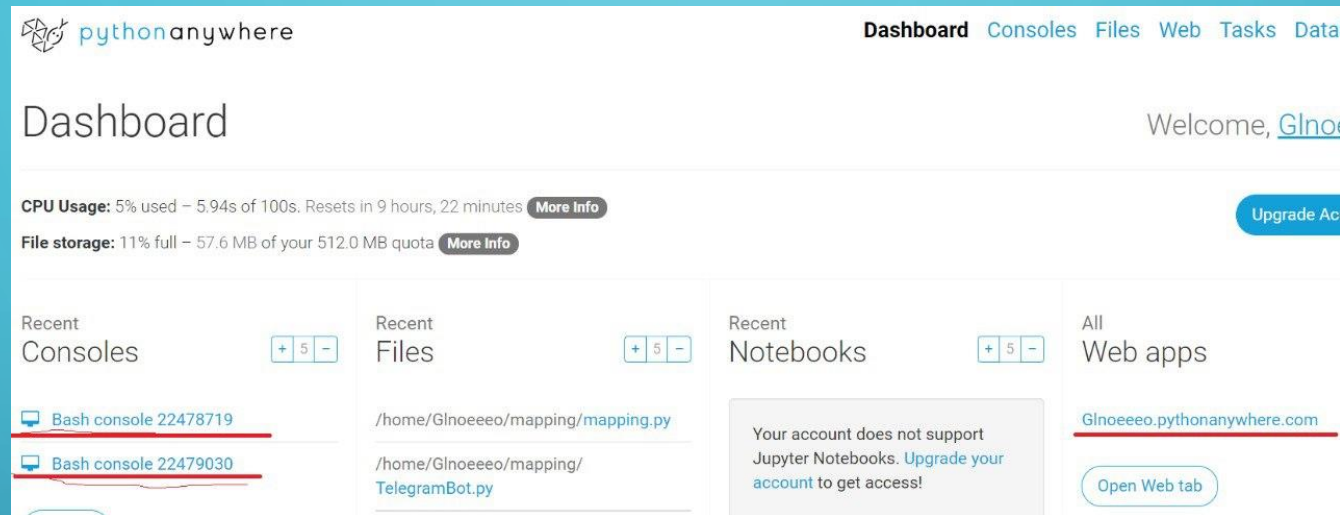
- **Send txt File** ➡ **Save File** ➡ “Use “/map” command.



TelegramBot Chat for Smart Car

NOTE: username must finish with 'bot,' e.g.'smartcar bot' or 'SmartCarBot.'

# SERVER IMPLEMENTATION



An online platform called the “Pythonanywhere.com”, It allows you to access server-based Python and Bash command-line interface from within your browser.

- Two Bash console: telegramBot.py @ mapping.py

# WORKING PRINCIPLE

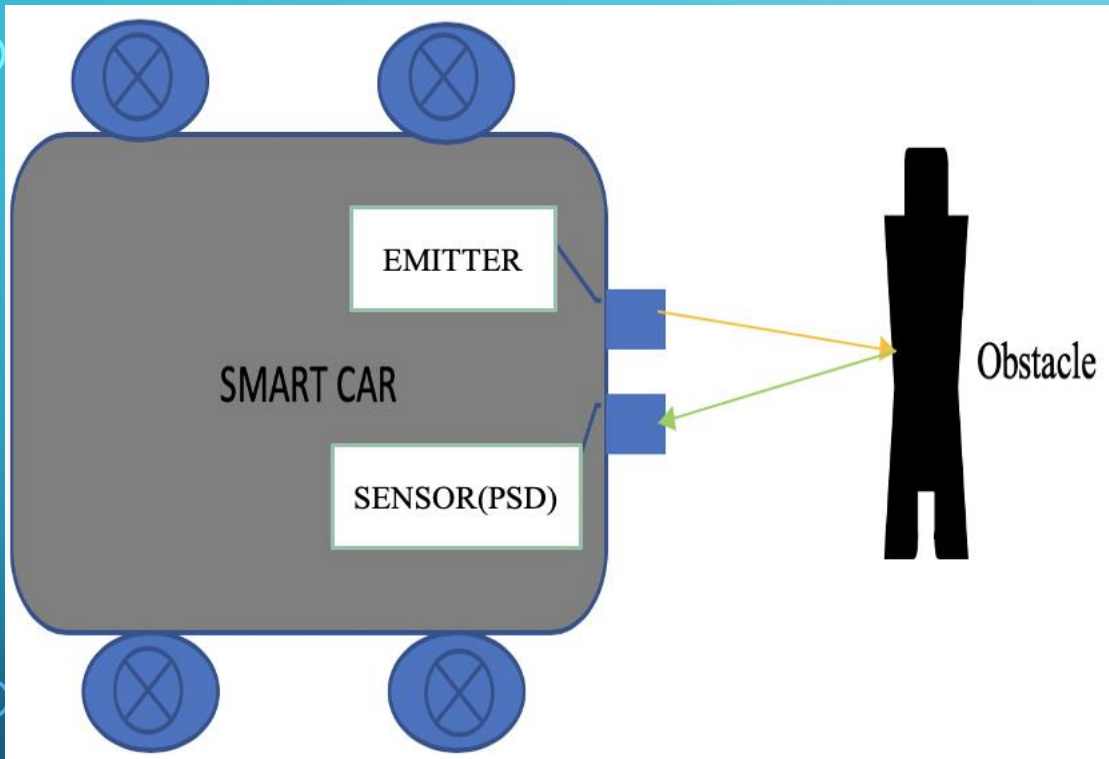


Figure 10. IR DISTANCE SENSOR.

NOTE: PSD – Position sensing device

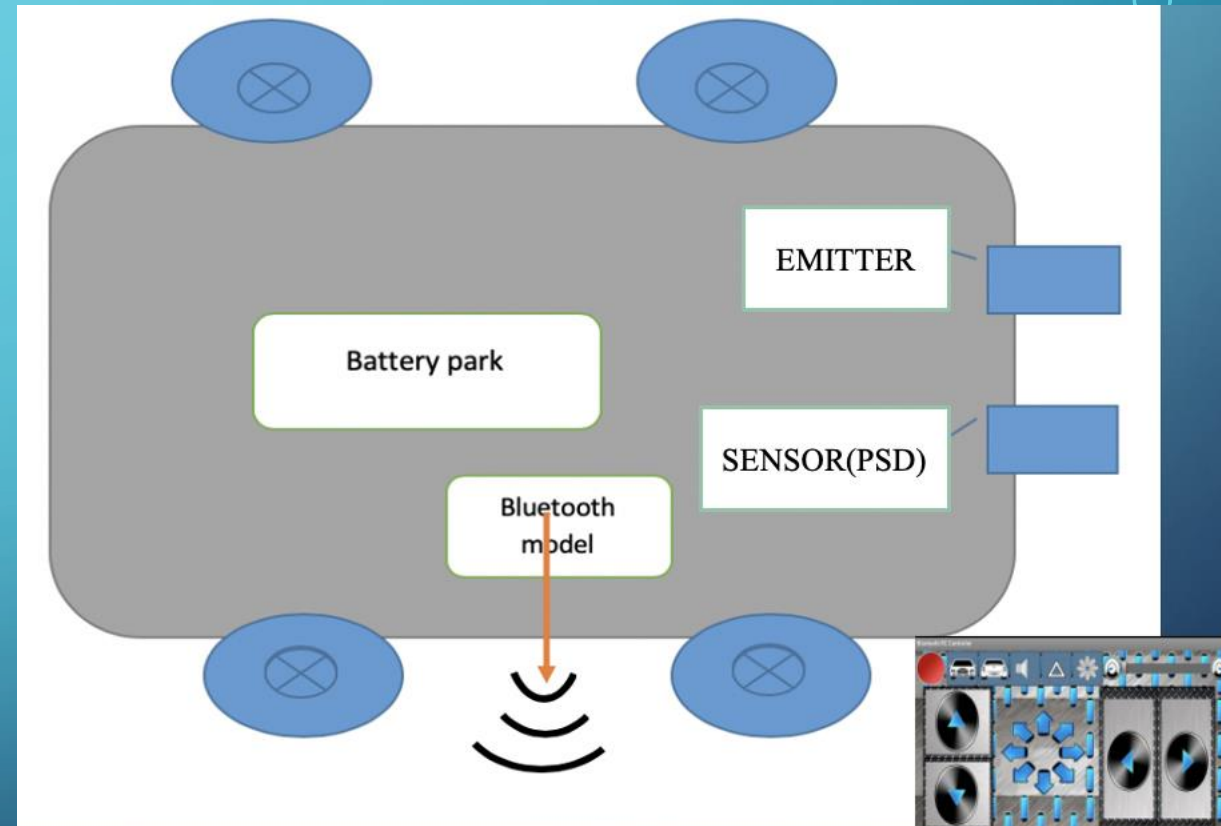


Figure 11. Bluetooth control.

# WORK PRINCIPLE

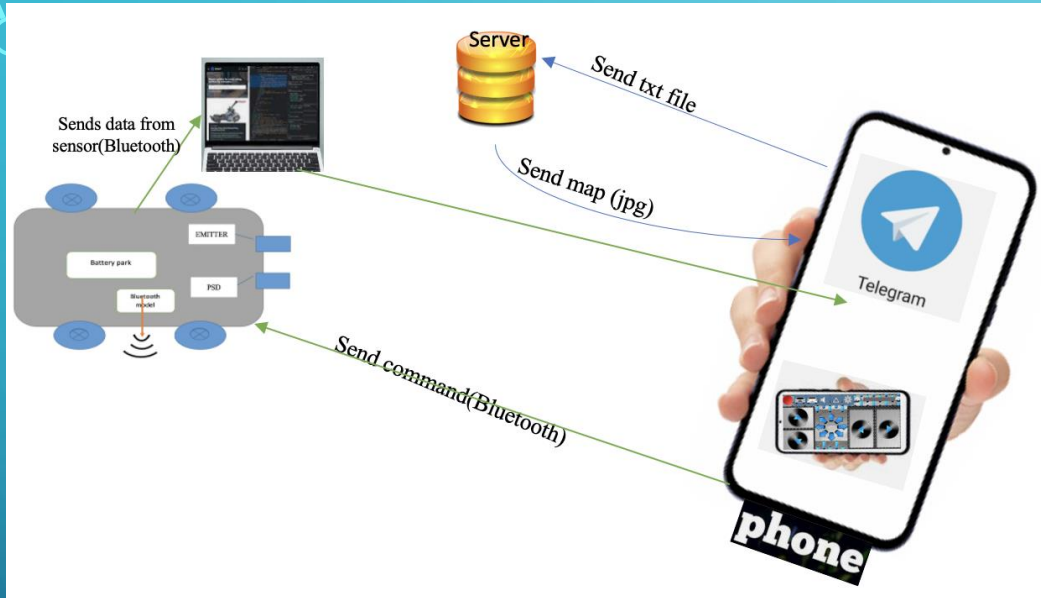


Figure 12. Smart Car control Scheme.

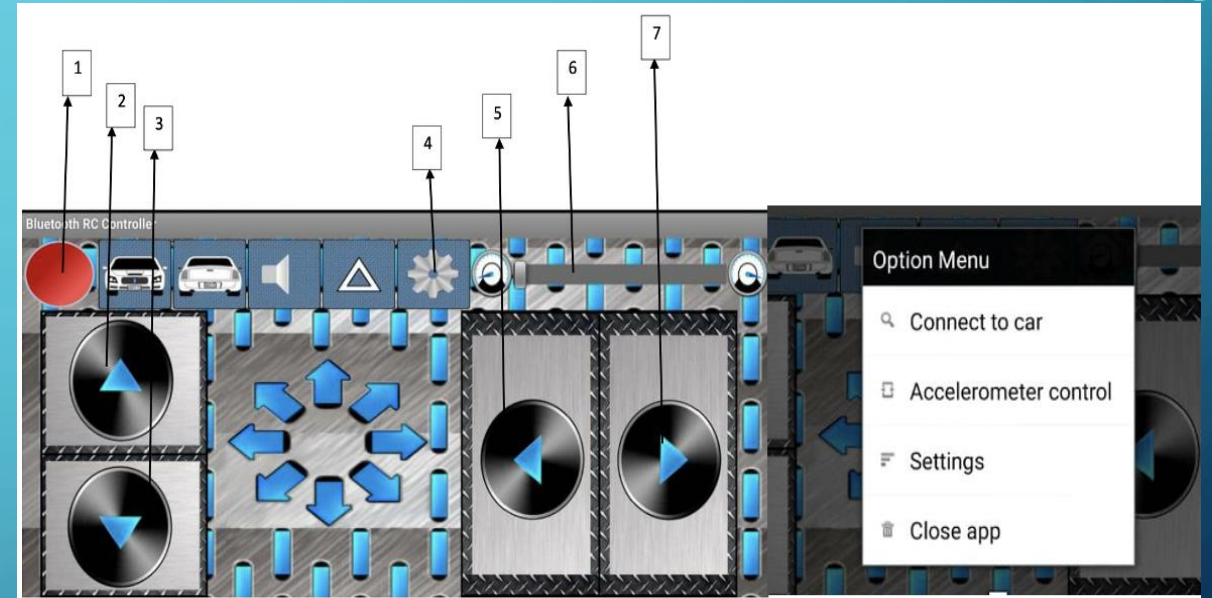


Figure 13. Bluetooth RC controller.



# CHOICE FILTER

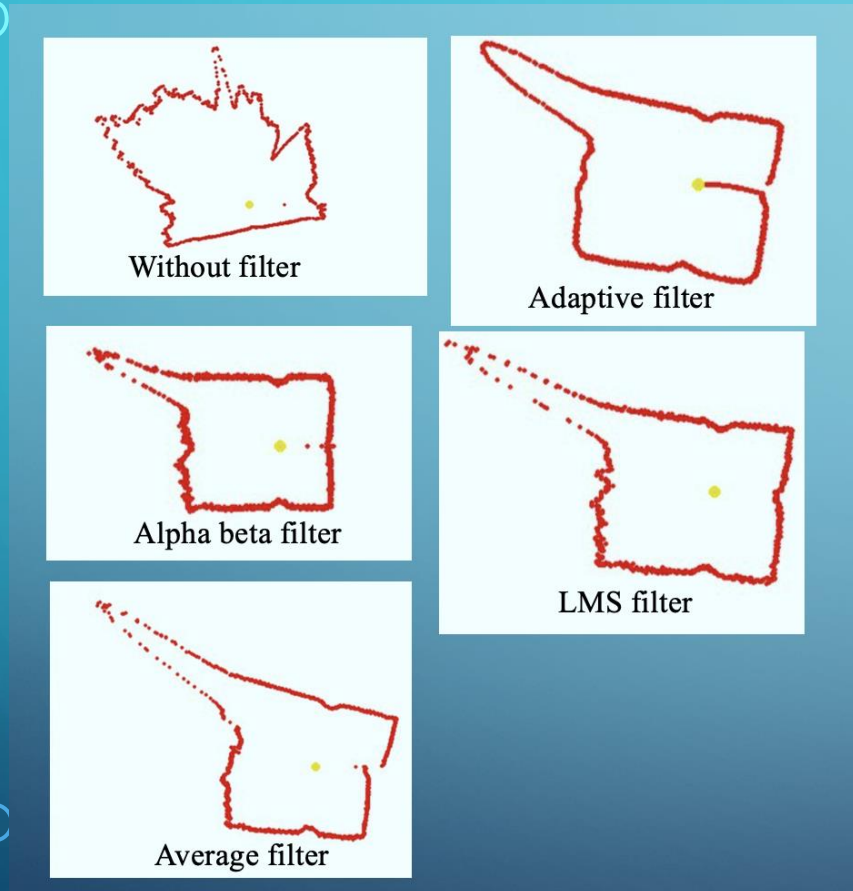


Figure 14 - Test filter maps

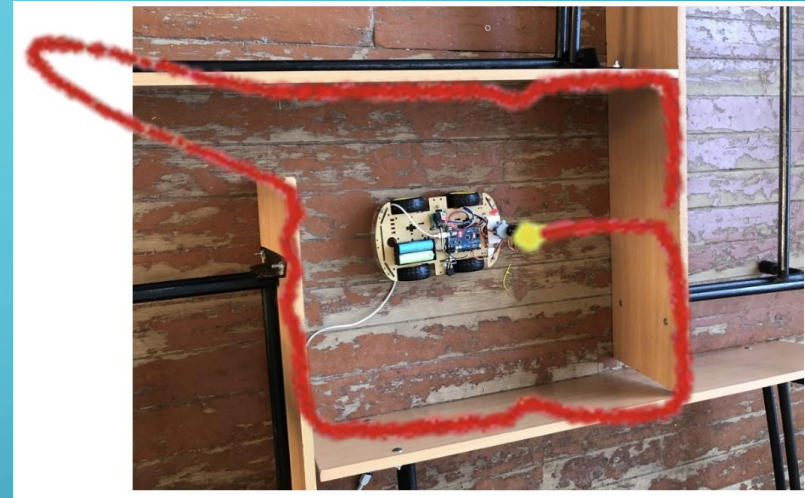


Figure 15 - Overlapping Adaptive filter

“Adaptive Filter” choice of filter for my project is placed over on the actual environment used for the project test purposes.

# BUILDING AN AREA MAP

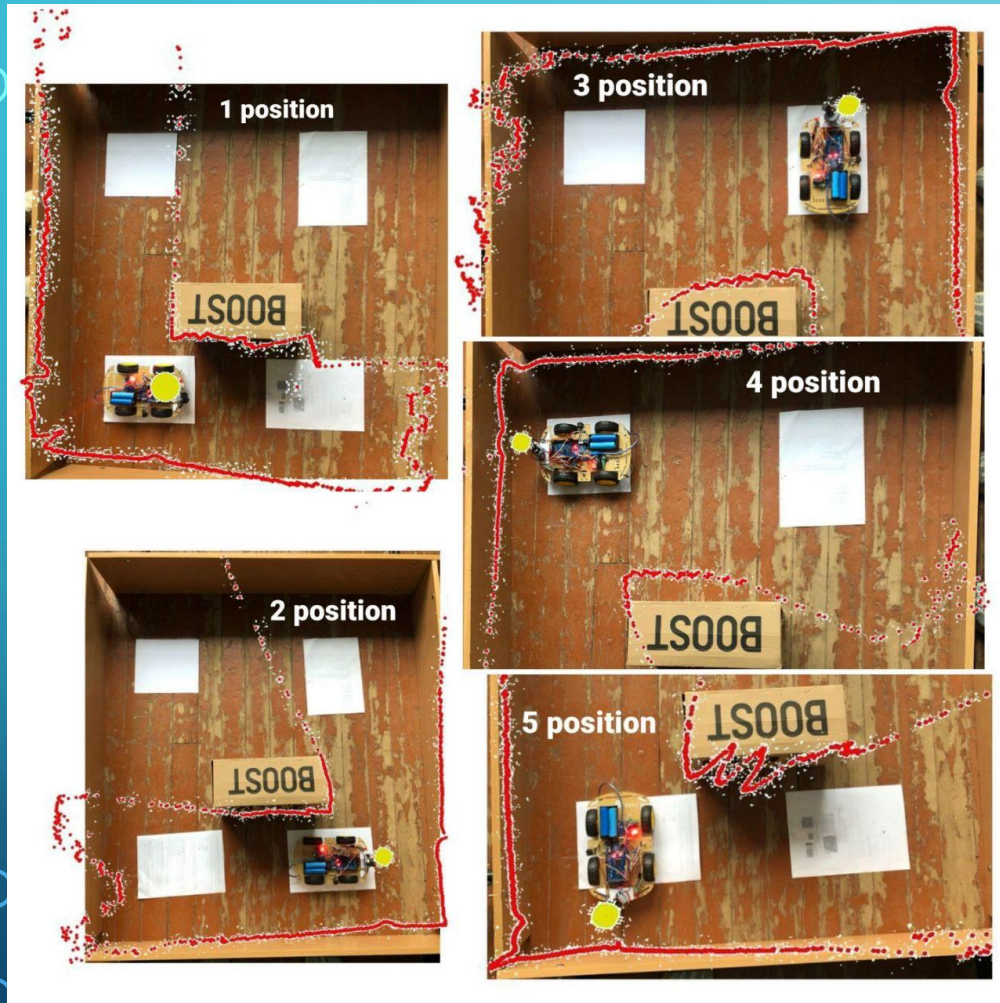


Fig. 16 - Overlapping all position map with real image

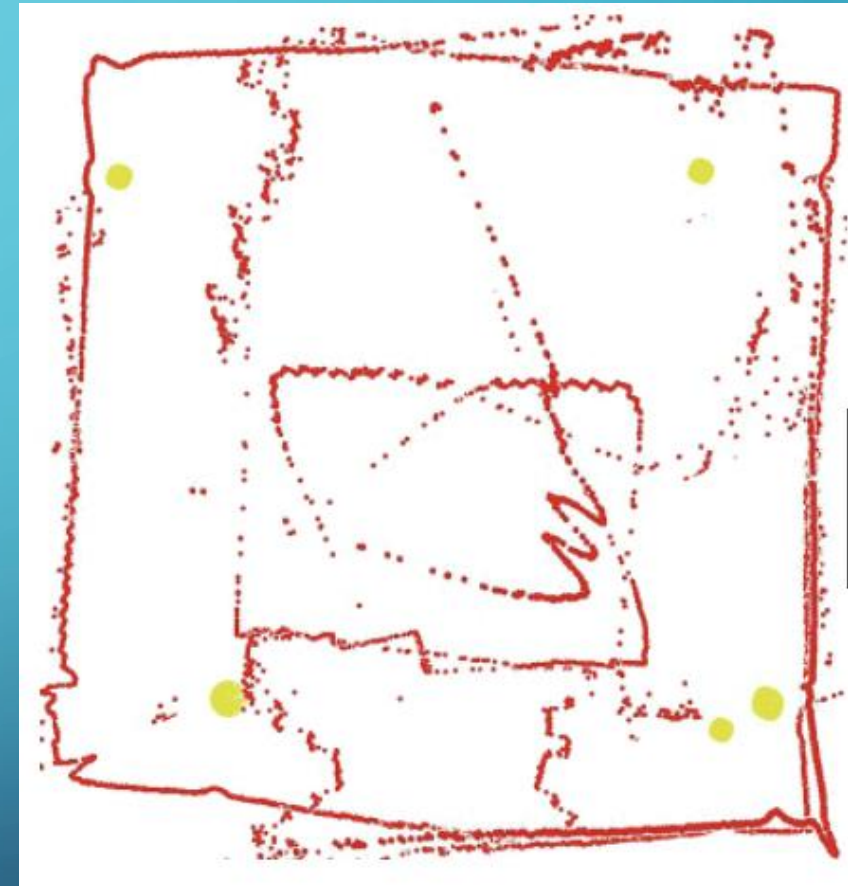
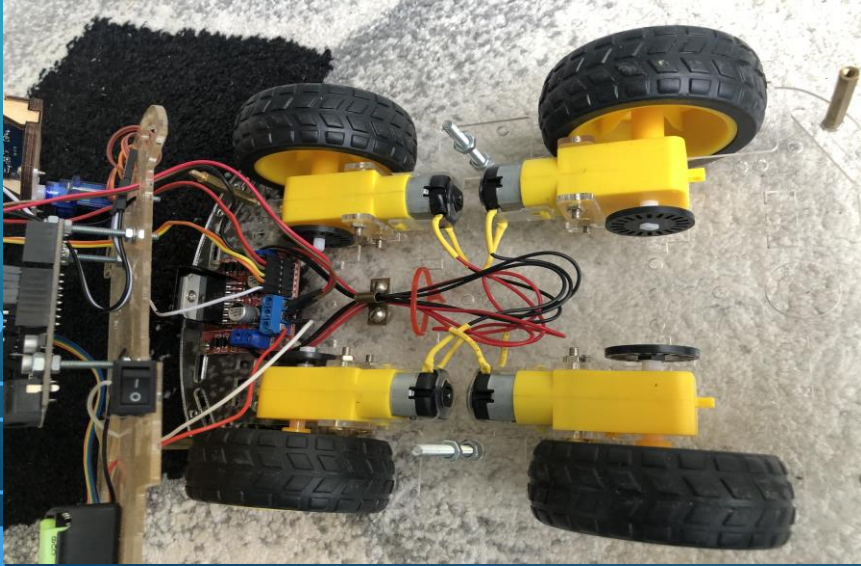
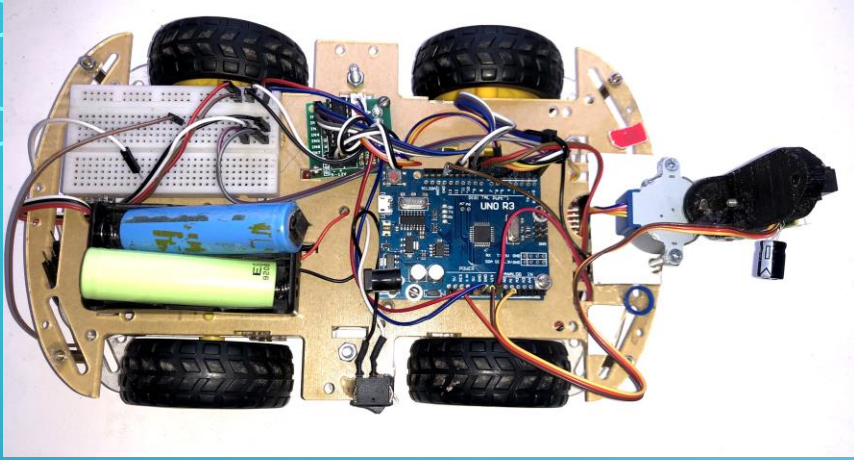


Fig 17 - Combining all position map



# ROBOT DESIGN



# CONCLUSION

After analyzing the methods and tools, I designed a prototype of a mapping system and a system for transferring data between the elements of the system.

To send data to the server and display a map of the area, a telegram bot was developed and launched on the server. A Pygame to build the map was used

As a result, all the tasks were achieved. A prototype of a mapping system has been developed, which creates a map of the area with good accuracy. In the future, it is possible to make improvements to the system when deciding an algorithm for simultaneous localization and mapping (SLAM), to that already for detailing objects in 3-D space.



The background is a blue gradient. In the corners, there are white line-art illustrations of circuit boards or neural networks, with lines and small circles representing nodes.

**THANK YOU FOR YOU ATTENTION**

**THE END**