Acoustic and Visual Telepresence Robot

By Avatar
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Overview

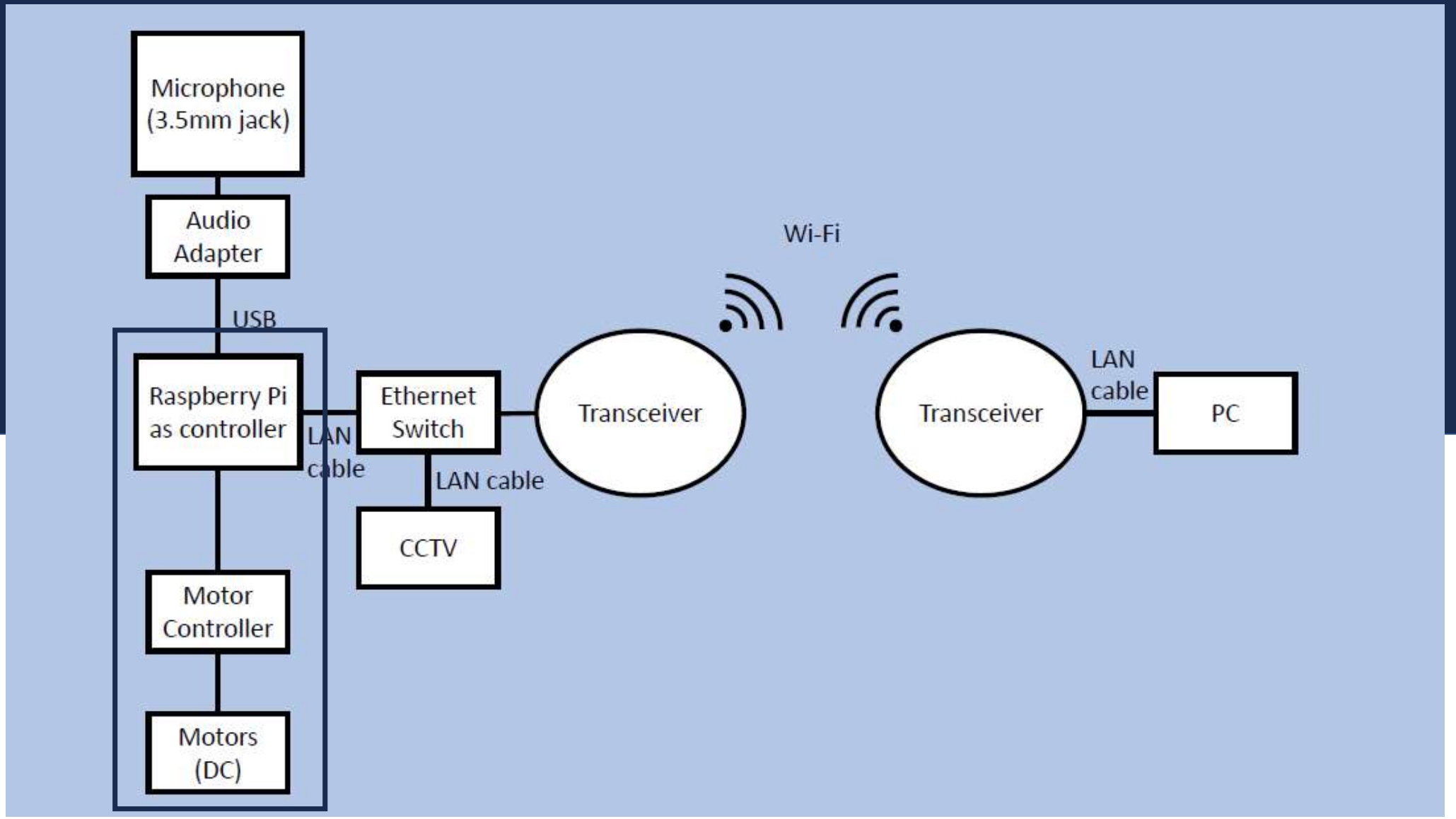
- Recap of Project
- Summary of Current Progress
- Upcoming Plans
- Updated Timeline
- Budget and Expenditure
- Individual contributions
- Q&A

Recap of Project

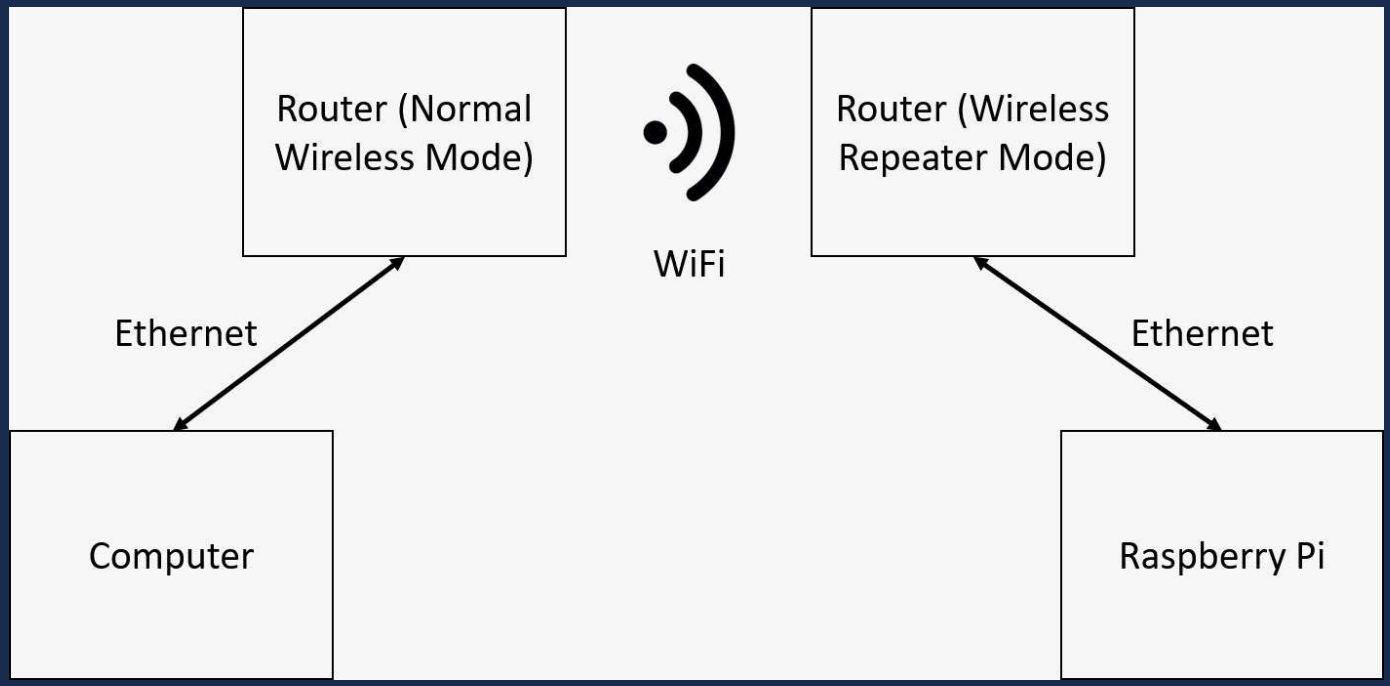
- Bimodal (visual and acoustic) telepresence robot for remote surveillance in disaster relief situations, military reconnaissance etc.
- Visual telepresence is common among existing robots and prototypes
- Binaural acoustic telepresence can aid accurate sound localization in low visibility situations

Current Progress

- Tested out if the RPI works
- Tested out the motor code with motor controller and car chassis
- Remote accessed the RPI
- Created web interface for the controlling of motors using html webpage and keyboard

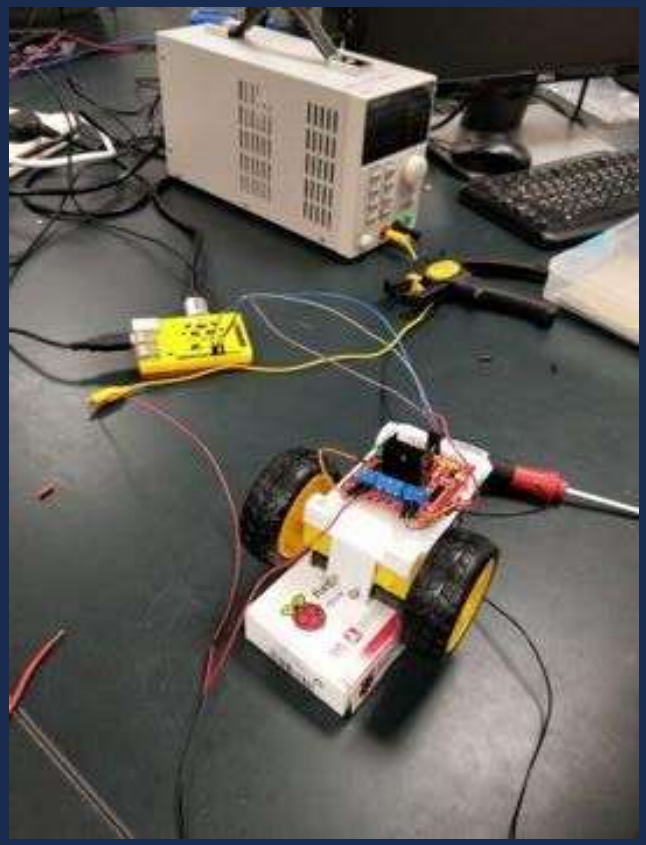

Microphone
(3.5mm jack)
Audio
Adapter
USB
Raspberry Pi
as controller
LAN
cable
Ethernet
Switch
LAN cable
CCTV
Motor
Controller
Motors
(DC)
Transceiver
Wi-Fi
Transceiver
LAN
cable
PC

Tested out remote controlling of the RPI using routers and managed to gain access to the RPI

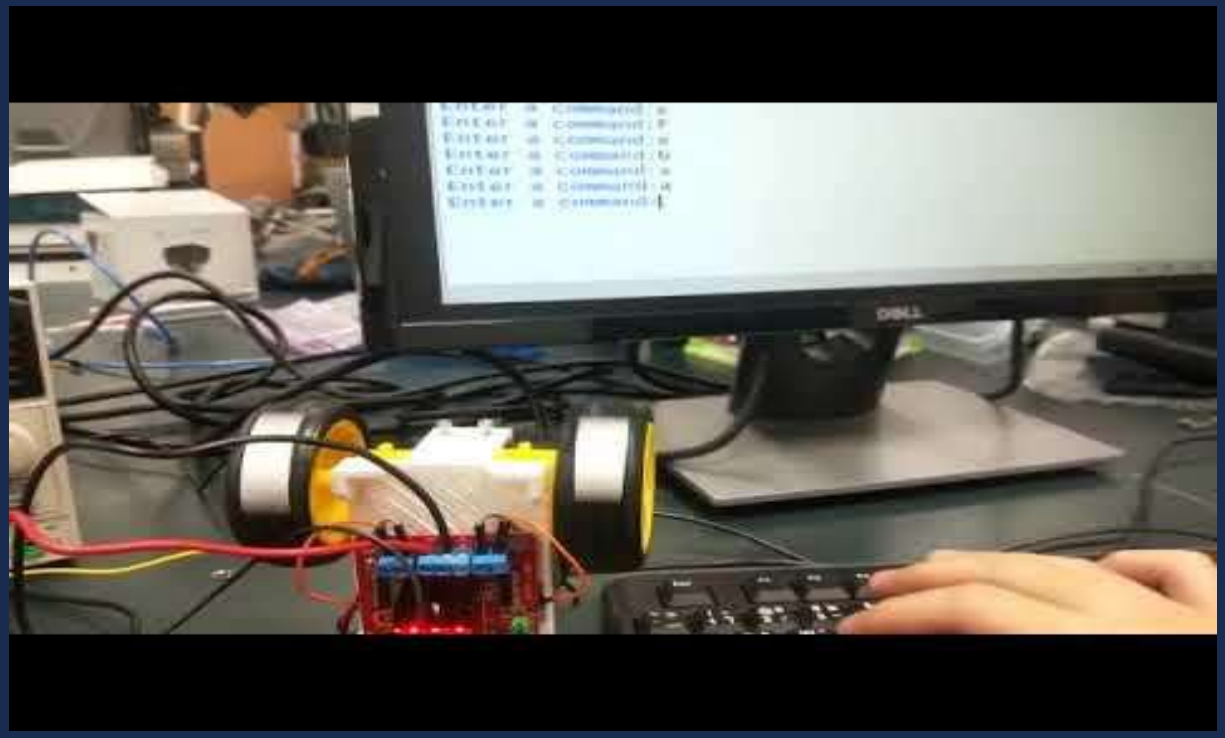


How we tested the motors

- Borrowed a car chassis from Tony to test out our code as our tank chassis has not arrived
- Modified the code to control the motors using the Raspberry Pi

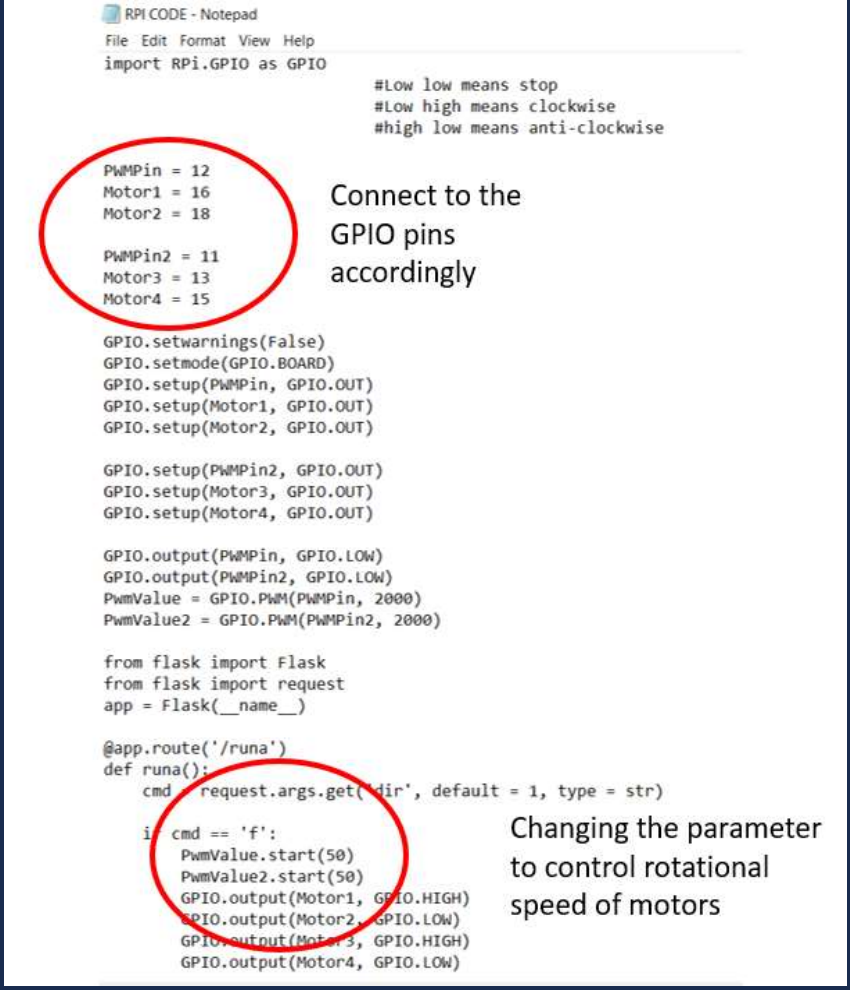


Controlling motors locally on RPI



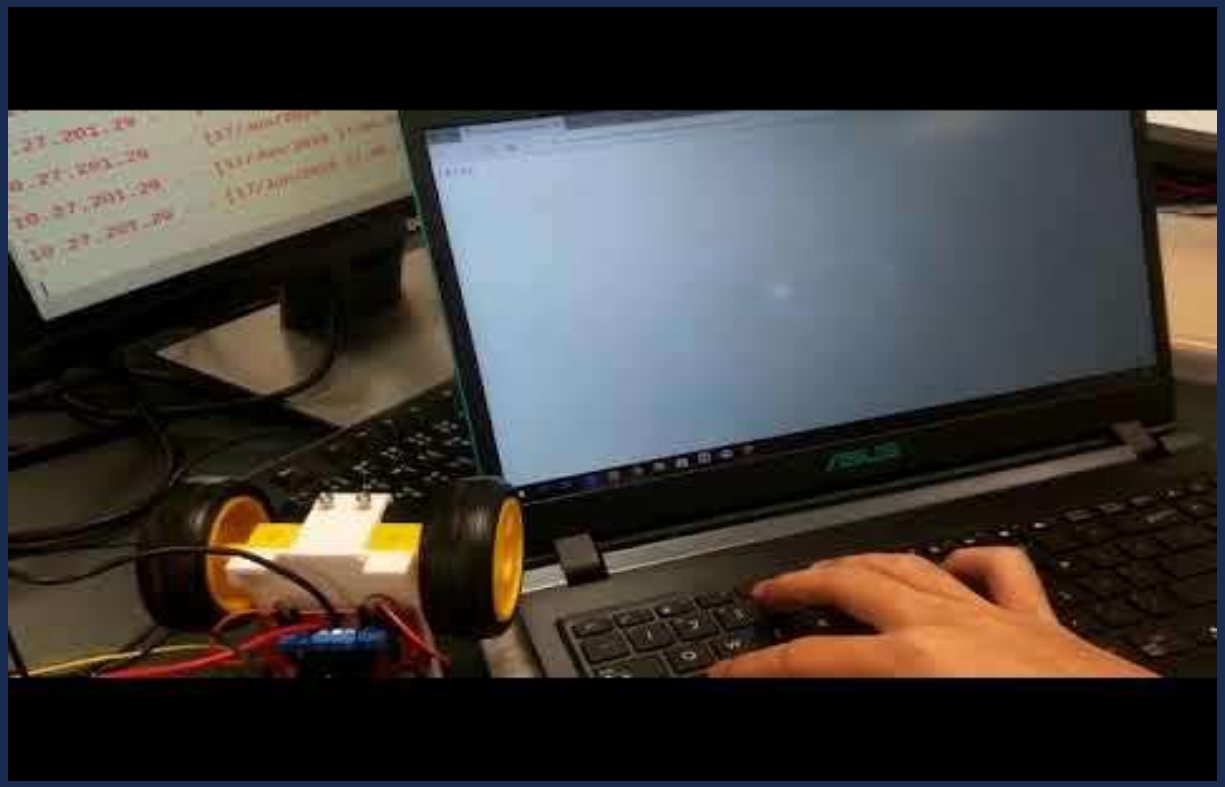
Codes we used

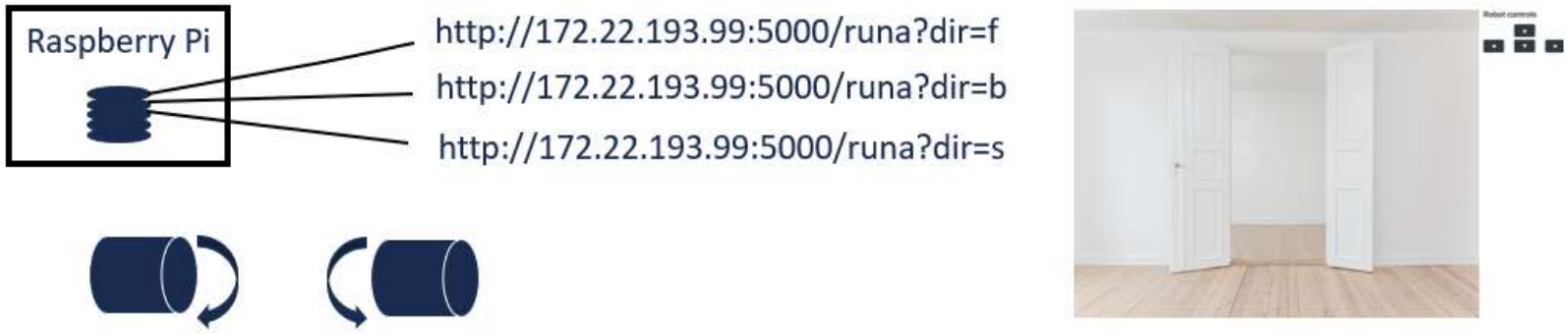
- 6 General Purpose Input and Output (GPIO) pins for 2 motors
- Changing parameters in PwmValue.start( ) to control rotational speed

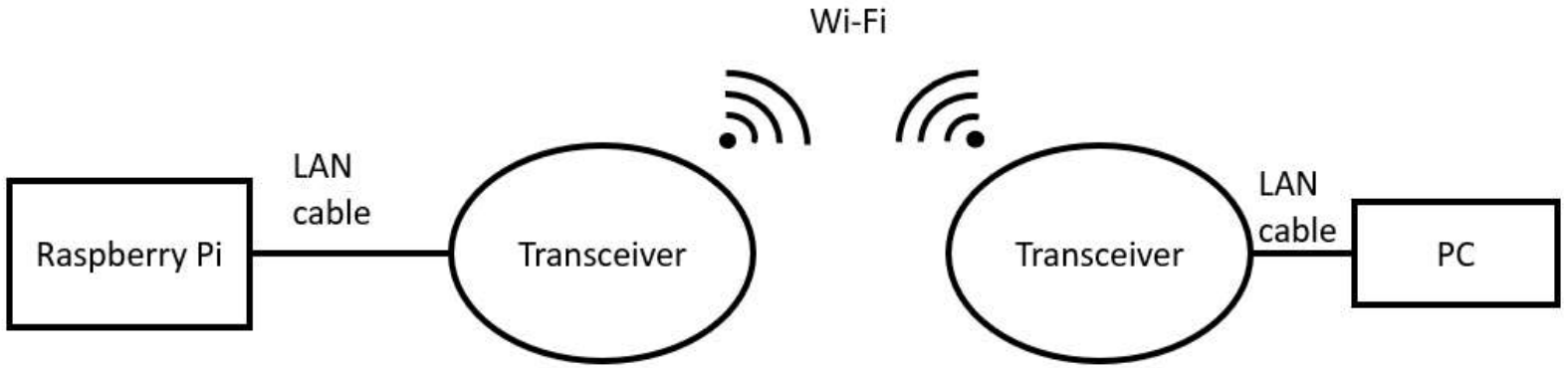


Controlling motors remotely via VNC Viewer

Controlling motors remotely through a web interface




Raspberry Pi
http://172.22.193.99:5000/runa?dir=f
http://172.22.193.99:5000/runa?dir=b
http://172.22.193.99:5000/runa?dir=s


Wi-Fi
Raspberry Pi
LAN cable
Transceiver
Transceiver
LAN cable
PC

Web Interface

- User can control the motors using any devices that has a web browser
- Ease of use

VNC Viewer

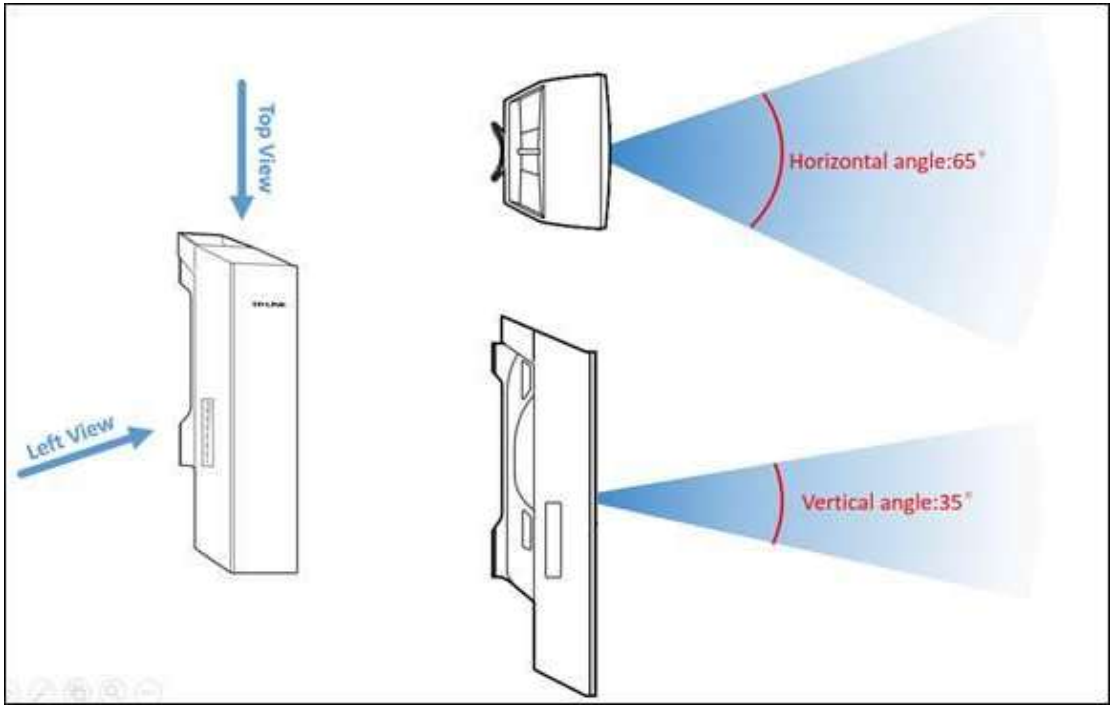
- Not all users have VNC installed

Upcoming Plans

- Prototype to rotate transceiver
- Inertial Measurement Unit (IMU)
- Implement buttons to control RC car/ tank

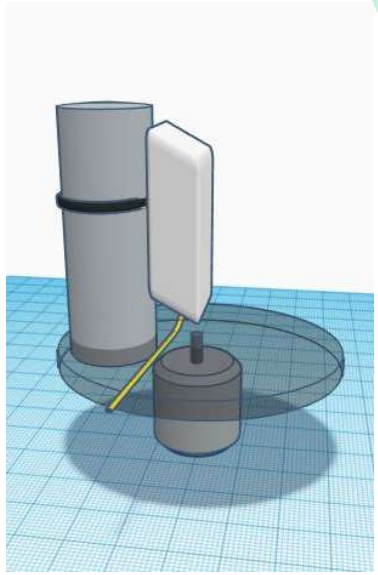
Problem with transceivers

- Directional
- Require maintenance of **line-of-sight** (LOS)



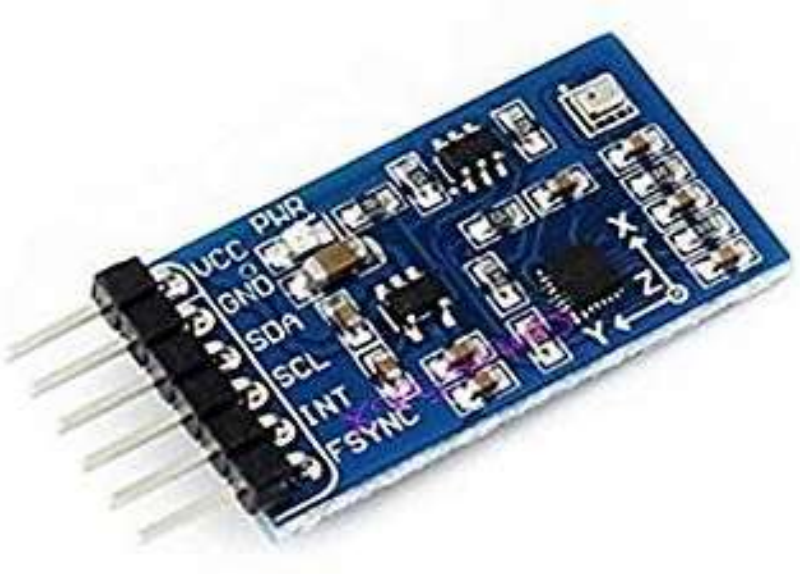
Rotating disc for transceiver

Purpose:
Since transceivers are only directional, we need to rotate the transceiver such that it is always aligned to the transceiver on the user's end



Inertial Measurement Unit (IMU)

Purpose:
Whenever the transceiver on the robot is not aligned properly with the transceiver on the user end, the IMU will compensate for the change by realigning it back to face each other. This allows for a stronger signal to be received since there is a clearer line of sight considering that the transceiver is only directional.



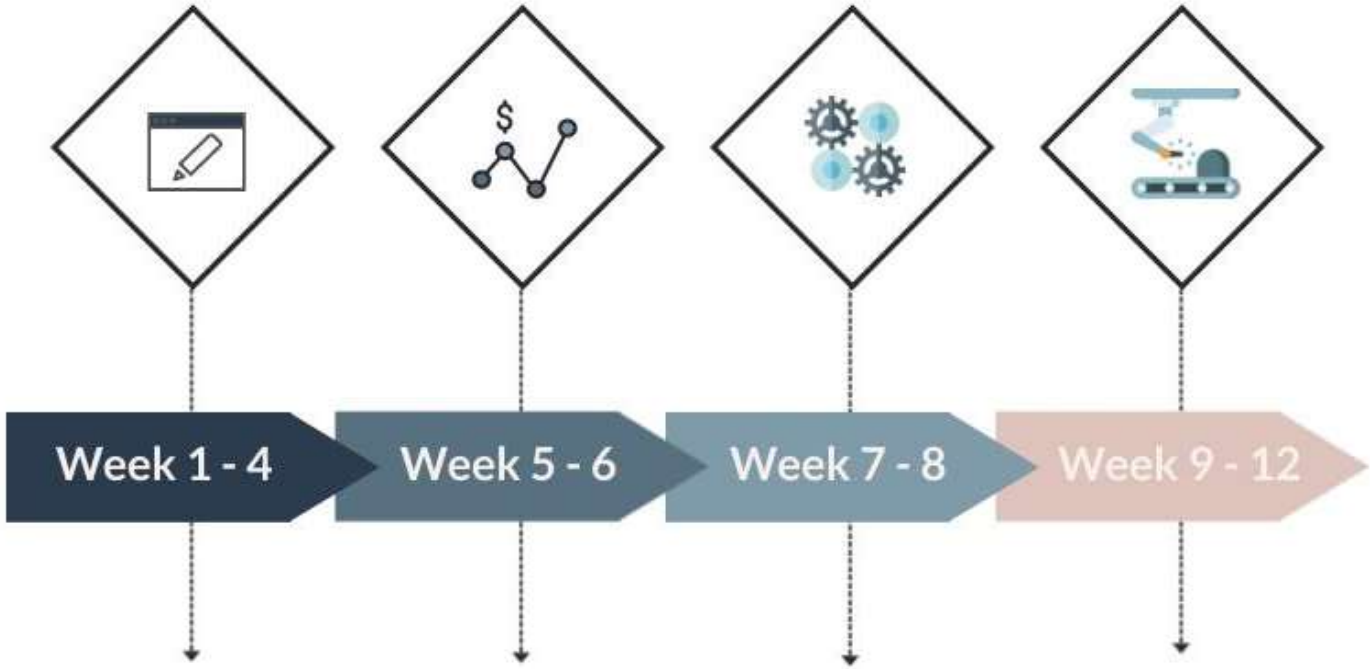
Making the web interface

Left:
Live streaming of video

Right:
Buttons to control movement of robot (left, right, forward, backward)

Project Timeline

- Updated version



Phase 1 Exploration and Design

May - Early June

Deciding on the project type and specifying the project we want to embark on

Phase 2 Procurement and Testing

10 - 23 June

Sourcing and buying necessary parts for our robot
Coding and putting the robot together

Phase 3 Development

24 June - 14 July

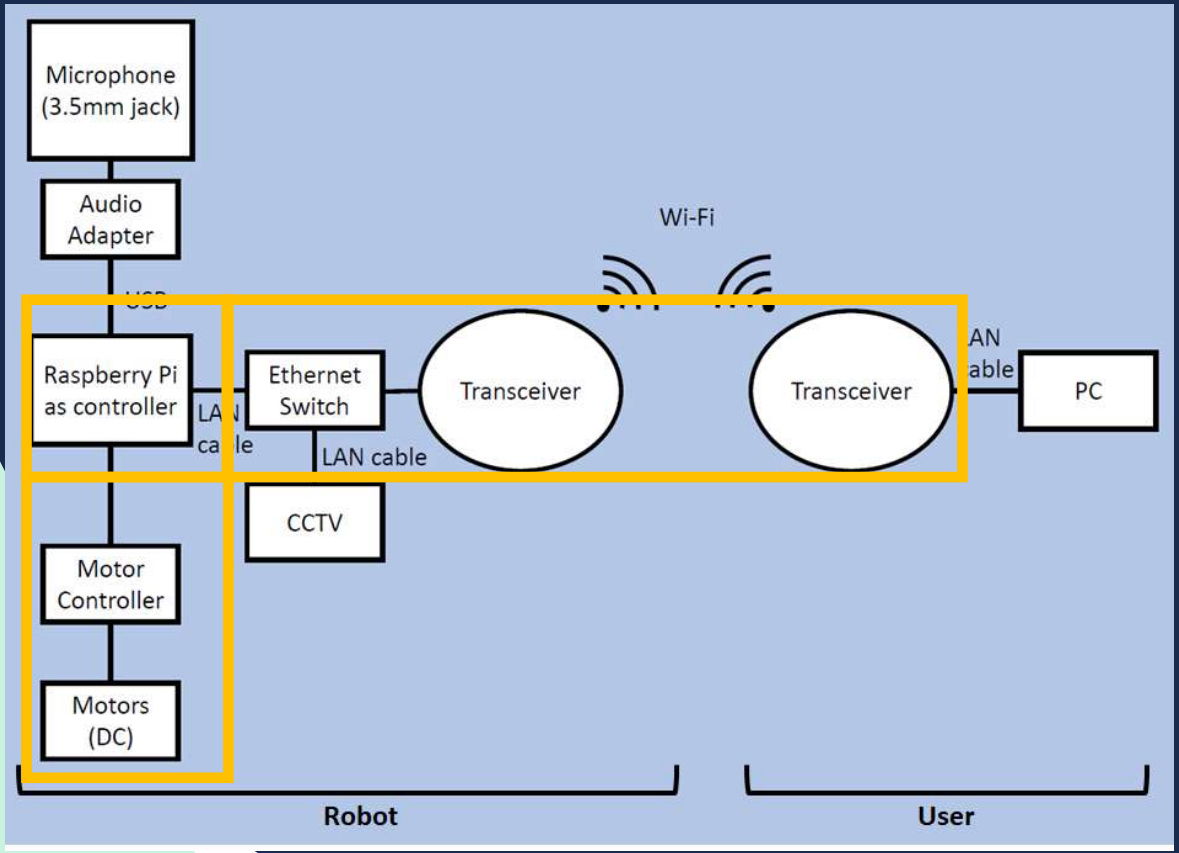
Developing the robot to ensure it performs its functions
Test remote controlling of robot

Phase 4 Refinement

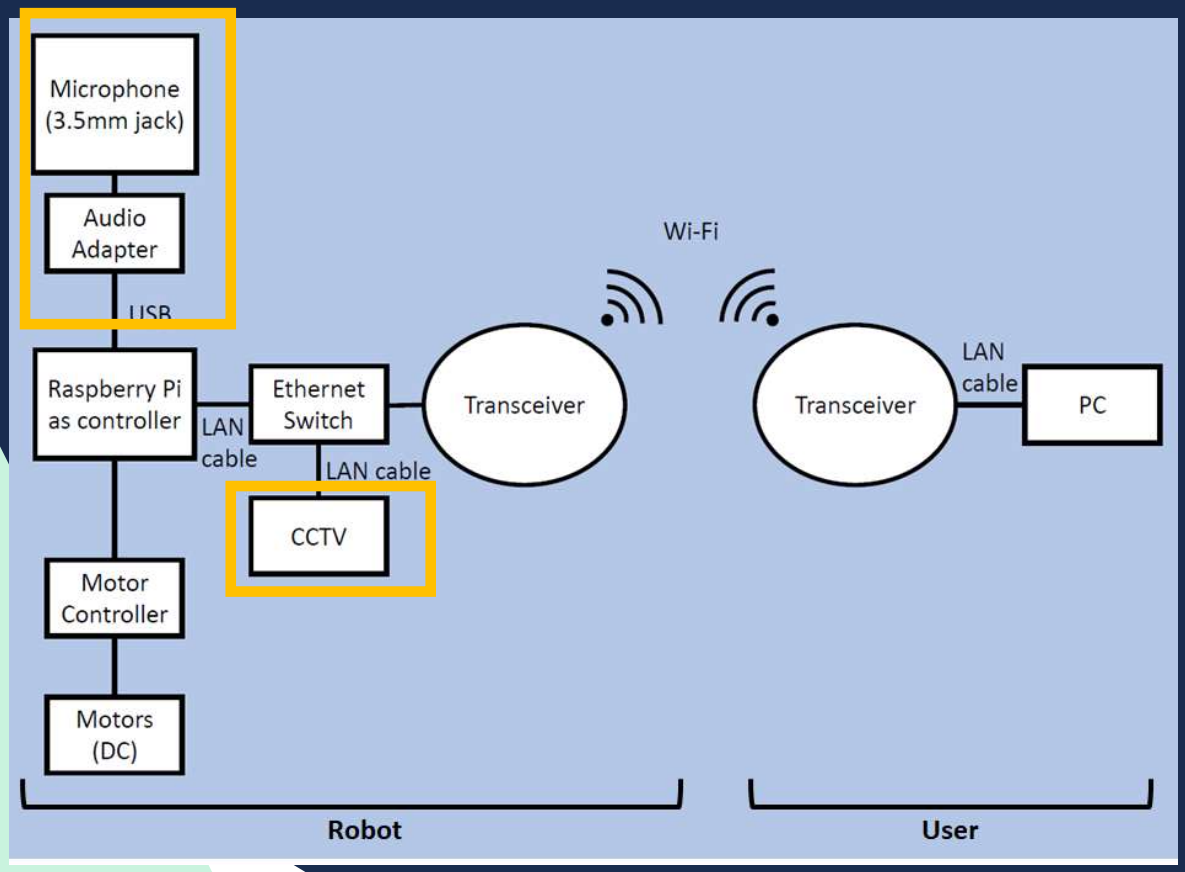
15 July - 31 July

Ensuring that robot works
Refining the robot to make it more efficient and useful

Current Expenditure



Component	Cost
2 x Transceivers (TP-Link CPE510)	302.00
1 x Ethernet Switch (TP-Link TL-SG1005P, 48V)	66.90
1 x Boost Converter ★	14.50
4 x LAN Cables (ORICO Cat6 Lan Cables 1M-BL)	19.60
1 x Tank Chassis (TS100) ★	178.53
2 x Motor Controllers (L298N Stepper DCMotor Driver Board)	7.98
2 x Raspberry Pi 3 (Model B+ SBC Computer Board)	110.42
1 x PoE HAT module (IEEE802.3af DC 5V 2.5A)	21.23



Component	Cost
1 x Camera ★ (4MP IP 1080P)	86.00
1 x Binaural Microphones ★ (SOUND PROFESSIONALS)	148.70
1 x Audio HAT module ★	29.55
1 x Inertia Measurement Unit (IMU) ★ (GY-BNO055 9DOF 9-axis BNO055)	16.62
Total	**1002.03**

Individual Contributions

Member	Completed or ongoing tasks	Future tasks (for next 1-2 weeks)
Jing Xuan Rachel	• Design of turntable for transceiver • Supported in development of the web interface	• Build rotating platform for transceiver (3D print disc, connect to motor & mount IMU) • Build the Tank • Soldering electronics
Ming En Reuben	• Develop web interface for controlling car motors	• Integrate Web Interface (Live stream video/audio with Robot's control) • Configure transceivers and test range (with obstacles) • Binaural audio streaming

Thank you and have a nice day!

Any questions?