Setup
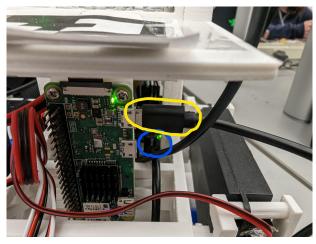
Installation
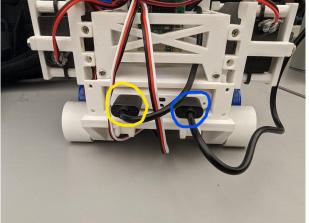
1) Download the Team 2 repository from Github on your laptop

   a) https://github.com/180D-FW-2022/Team2

2) Install these python packages using the "pip install" command: PyBluez, PocketSphinx

   a) Note: if Pybluez won't download for you through pip, enter these commands in your command prompt:

      i) git clone https://github.com/pybluez/pybluez

      ii) cd pybluez

      iii) python setup.py install

   b) If the above still doesn't work, try the command: "pip install pybluez2"

Setting Up the Vehicle

1) Connect the two USB cables from both Pi's to the battery in the vehicle housing

   a) If the battery is low (indicated by the LEDs on top of the battery), pull the battery out of the housing and connect it to an outlet via a micro-USB cable and charging block

   Note: The pictures below show the cable endpoints. Both cables connected to the power slot of the Pi's should be connected to the USB slots of the battery.

2) SSH into the Pi (username: pi password: raspberry) near the front using either the physical data port or WiFi

    a) In the command line, the command would look like "ssh pi@raspberrypi.local" for physical connections or " ssh pi@[ip_address]" for WiFi

        i) For ssh via WiFi, you must connect to the Pi physically first, type in the command "ifconfig", and note the IP address of the Pi as it is subject to change

3) If this is your first time connecting your laptop to the Pi via Bluetooth, follow these steps on your Pi below:

    a) Type in "sudo bluetoothctl"

    b) Type in "agent on"

    c) Type in "default-agent"

    d) Type in "scan on"

    e) Look for your laptop's MAC address

    f) Type in "scan off"

    g) Type in "connect [MAC]"

    h) Follow the steps on your laptop to accept the connection

i) Back on the Pi, if it asks whether or not the pin matches, type in "yes"

j) Type "trust [MAC]"

k) Type "exit"

Note: This will only have to be done once. On subsequent setups, simply power on your

Pi and connect to it through your laptop's Bluetooth settings.

4) On the Pi:

a) Move into the "Team2\Midterm Demo Version" folder

b) Type in the command "python3.9 Pi.py"

5) On the laptop:

a) Move into the "Team2\Midterm Demo Version"

b) Type in the command "python User.py"

6) The Pi's terminal should display "Accepted connection from [MAC]" and your laptop

should display a webcam feed. You can unplug your Pi from your laptop at this point if

you used SSH via a cable.

Setting up the Pi Camera

1) SSH into the Pi connected to the camera (near the back of the vehicle) and get the IP

address using "ifconfig".

2) Change line 8 of get_pi_video.py (in the Team2\Graphics_Engine_Main folder) to set the

variable camera name to the ip address found in step 1.

a) You can test if the camera is properly set up by typing "http:[ip_address]" (where

ip_address is the address found in step 1) into any browser. Make sure that your

computer is connected to eduroam (or more generally, the same network as the

Pi).

b) You can test if the program can correctly streaming the video by running get_pi_video.py. The live camera screen should show up on the window if everything is running properly. To quit the screen, press q.

Setting up the AR

1) Navigate to Graphics_Engine_Main and run "pip install -r requirements.txt"

2) Mount the camera to the tripod, set the tripod to its maximum height, and position the arena as close to the tripod as you can

    a) While the orientation of the camera relative to the arena does not matter, as it is corrected in software, we found it works best to put the tripod on the bottom edge of the arena (marked by the labels BL (bottom left) and BR (bottom right) in each corner).

3) Readjust the camera and arena such that all four corner markers placed in the arena are in full view of the camera. You can open the camera app to perform this operation.

4) Run main_server.py which will take you to a calibration screen. This step is to make sure all four corners are in full view of the camera. If the corner is detected by the program, it will be outlined on the screen in green. Once all are in full view, press q or esc.

    a) If the ground is a dark color, place a white piece of paper under each corner of the arena to make the detection of the markers easier.

5) The full game should be on view! To quit playing the game, press q or esc.

Note: A picture of the tripod, arena, vehicle, and extra blank papers is provided below to see how everything should be physically set up.

Gameplay

Game Concept

This game has the player controlling a tank in a simulated urban environment. The player must move the vehicle past buildings to maneuver around and find targets. When a target is found, the vehicle must be rotated and positioned to aim at it. The player must fire at the target and subsequently reload before finding and shooting another target. The game ends after all targets have been shot at.

Playthrough

1) Place the vehicle anywhere in the arena

   a) Note: the front of the vehicle holds the camera (a green square with a red LED light)

   b) Ensure that it is still connected to the laptop via Bluetooth (step 4 in "Setting Up the Vehicle")

2) Moving the Vehicle:

   a) To move the left motor, move the blue object on the screen. If the blue object is on the upper half of the screen, the motor will move forward. If the blue object is on the lower half of the screen, the motor will move backward. The same concept applies for the right motor, which uses the green object. Both objects can be placed simultaneously on the screen for the simultaneous control of both motors

3) Firing Commands:

   a) Speak "shoot" to fire the vehicle's turret

   b) Speak "reload to reload the vehicle's turret

   Note: The turret must be reloaded (this takes 5 seconds) after firing to fire again.

Troubleshooting

1) Battery Failure

    a) In the event of a battery failure, try powering the devices using the backup battery.

    Proper power supply should be displayed by blue lights on the top of the battery.

    b) If the battery does not power on, charge it through the micro-USB slot between

    the USB-A output ports.

2) Poor Driving

    a) The wheels attached to the servos may be too loose or mounted at an angle.

    Loosen the center wheels on each side with a small screwdriver and tighten them,

    making sure they do not spin freely and are parallel to the other wheels.

    b) Unreliable control may also result from confusion in the control video. Make sure

    any clothes or objects in the camera's view are not recognized as the blue or green

    gesture signals. Also be sure to select vivid blue and green objects that the system

    can identify easily.