Memo

To: Professor Pisano

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Team: 10: Shazamboni

Date: 3/17/2022

Subject: Second Prototype Test Report

1.0 Introduction

The second prototype testing for Team 10 Shazamboni was done on Thursday, March 3, 2022. There were four tests planned and completed.

The first test involved the integration of the ultrasonic sensors (HR-SC04 sensor) with the motor controls. It assessed the ability for the ultrasonic sensor to detect objects within 7cm of the sensor. If there was a positive detection, the motors would stop spinning. For the purpose of this test, the motors were set to the forward moving position and would stop once there was an object detected within 7cm of the sensor, and the motors would start up again when the object was no longer detected. Alongside the ultrasonic sensor integration, the motor controls to manually make the car move forward and backwards via pressing the keys ‘f’ for forwards and ‘b’ for backwards were tested.

The second test evaluated the websockets of a second Raspberry Pi paired via an ad hoc connection using a webcam. The live stream was displayed on the computer screen.

The third test involved checking the ad-hoc and socket controls. Using the script *controller.py*, a sender script that utilizes websocket, we tested if the Raspberry Pi would receive the correct directions.

The fourth and final test assessed the workings of the ShazApp’s joystick. When moving the app’s joystick, the joystick’s distance and degree values were received to a computer via a socket, and the information was displayed on the screen.

2.0 Equipment and Setup

2.1 Ultrasonic Sensor and Motor Controller

We used the same ultrasonic sensor configuration from the first prototype, albeit we further modified the wiring of the pinouts for the pi in order to test the second part of the test, the motor controller integration. We used the Raspberry Pi 4B for the main computer of this test. The HR-SR04 sensor was configured into a breadboard along with 330 Ohm and 470 Ohm resistors. We connected 4 pins on the Pi: Pi: VCC, GRND, TRIG, and ECHO. We configured a L298N motor shield connecting to two separate motors we got from the Sunfounder Toy Car. In terms of software, the Python script we used to test this integration was named *robot.py*, located on our

GitHub. We used our and our proctor's hands to test the ultrasonic sensor. The equipment was properly set up according to the test plan.

2.2 Sunfounder Webcam and Ad Hoc Network

We used a separate Raspberry Pi and the webcam we received from the Sunfounder Toy Car Kit. We connected the Pi to an outlet. Meanwhile, the *motion* framework available on Linux was used as the streaming platform. The livestream feature of the webcam was tested via the ad hoc network we set up. To view the livestream, the user has to visit the IP address of the Raspberry Pi. The ad hoc network was set up through the terminal following a guide.

2.3 Socket Motor Control

Using a sender script that utilizes websockets, we were able to send pre-determined packets from the computer to the Raspberry Pi which was connected to the motors. The motors were shown to move in different directions based on the values encoded within the packets.

2.4 ShazApp Socket Communication

To test the websocket functionality of our product, we set up a listening server on one computer and connected the cross platform app to the computer through Boston University's network using the IP address. When the joystick was moved, packets were shown to appear on the computer's server.

3.0 Measurements

2.1 Ultrasonic Sensor and Motor Controller

Description	Did it work? (y/n)
The motor can move forward.	Yes
The motor can move backward.	Yes
The motor stops if it detects an object at a distance of 7 cm.	Yes
The motor continues if the sensor does not detect an object.	Yes

2.2 Sunfounder Webcam and Ad Hoc Network

Description	Did it work? (y/n)
The Raspberry Pi interfaces with another device through WiFi	Yes
The motor can move forward based on the signal sent.	Yes
The motor can move backward based on the signal sent.	Yes

The Webcam streams footage.	Yes

2.3 Socket Motor Control

Description	Did it work? (y/n)
The motors can move in one direction on the signal sent.	Yes
The motors can move a second direction based on the signal sent.	Yes
The motors can move a third direction based on the signal sent.	Yes

2.4 ShazApp Socket Communication

Description	Did it work? (y/n)
JSON packets are streamed from one computer to another	Yes

4.0 Conclusions

Overall, the second prototype testing for the team was a success. Each test worked correctly the way that it was intended for. Every individual part of the project is working by itself so far. The next steps are to integrate each component together to create the final Shazamboni machine and system.

As with our first prototype testing, we demonstrated the work we completed thus far. In terms of progress with the deliverables on our Gantt chart, we completed all the objectives we needed to complete on our end for the first phase of the project. We also completed additional objectives of our project including our ad-hoc connections, and finally socket motor control and ShazApp socket communication. During the final weeks of the project, we will collaborate more with the ME team in order to successfully integrate the whole project and create a successful prototype that our client will be able to use effectively.