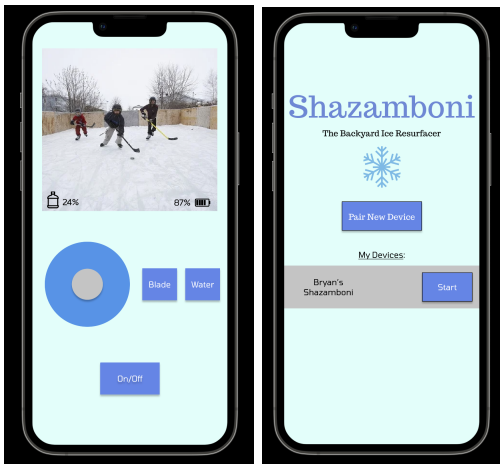
Boston University
Electrical & Computer Engineering
EC463 Capstone Senior Design Project

First Prototype Testing Plan

Shazamboni



by

Team #10
Shazamboni

Team Members

Katharina Golder kxgolder@bu.edu
Bryan Jaimes bjaimes@bu.edu
Robert Ling rling123@bu.edu
Yanni Pang yanni@bu.edu

November 16, 2021

Required Materials:

Hardware:

- Raspberry Pi 4 (with 64GB SanDisk SDHC card)
- Raspberry Pi 2
- HC-SR04 Ultrasonic Sensor
- 330 Ohm Resistors
- 470 Ohm Resistors
- SunFounder Smart Video Car Kit V2.0

Software:

- Python Scripts:
    - Motion Sensor Detection
    - Remote Control (Base Code)
- Smart Phone Application
    - UI Interfacing

Set Up:

There will be three tests done -- one measuring the ultrasonic sensors, the ShazApp demo, and the car test.

The first test involving the ultrasonic sensors will be set up into two parts: hardware and software. The hardware includes the configuration of the sensor, resistors, and Raspberry Pi connected to the breadboard. The ultrasonic sensor will be connected to 4 pins on the Raspberry Pi: VCC, GRND, TRIG, and ECHO. For testing purposes, the Raspberry Pi 2 will be used and connected to the monitor to display the results. We will run two ultrasonic sensors at the same time. The python script that will be used can be found in our Github named *ultrasonic_distance.py*.

The second test will be done demonstrating the App and its basic functionalities. This will include changing to different screens along with the functionality of buttons and a joystick.

Lastly, we will test the motion of the FunFounder Smart Video Car Kit V2.0. It uses the hardware that came with the kit along with the Raspberry Pi 4. Along with the Raspberry Pi 4, the hardware includes two DC gear motors, Robot HATS, a PCA9685 PWM Driver, a Motor Driver Module, and a battery. It was already assembled by our team. In terms of software, we will use code from the Github provided by the kit. This will be used for initial testing purposes since we will be altering the programs for use for this project. Due to time constraints, for the purpose of this test, the car will still be connected to the monitor.

Team 10: Shazamboni First Prototype Testing Plan

Pre-testing Setup Procedure:

Ultrasonic Sensor:

1. Connect Raspberry to monitor, power, internet, keyboard, and mouse
2. Run the python script *ultrasonic_distance.py*

ShazApp:

1. Open project in IntelliJ
2. Run app on Android device emulator

Smart Car:

1. Once assembled, connect the Raspberry to monitor, power, internet, keyboard, and mouse
2. Make sure you are in the correct directory *SunFounder_PiCar-V/remote_control*
3. Run the program by the following two lines:
   python3 manage.py migrate
   sudo ./start
4. Run the Client on the instructed website

Testing Procedure:

Ultrasonic Sensor:

1. Place a flat object (card) in front of each ultrasonic sensor
2. Move each card varying its distance from the sensor
3. See the measured distances for each ultrasonic sensor on the monitor (use a ruler to check approximate distance and accuracy)

Shaz App:

1. View home screen and tap on “Start” to view control screen
2. Move joystick around to show degrees and distance values
3. Tap on buttons

Smart Car:

1. Navigate the car by using the W, A, S, and D keys
2. Move the camera using the arrow keys

Measurable Criteria:

Ultrasonic Sensor:

I. The script should display the measured distances for each ultrasonic sensor every second.
II. The ultrasonic sensor should be able to detect the cards in front of them.
III. The correct distances from the sensor to the card should be shown on the monitor.

Shaz App

I. The simulator should be able to run successfully.
II. The user should be able to switch between the two screens.
III. The user should be able to move the joystick.
IV. Moving the joystick should display the degree and distance.

Smart Car:

I. The car can move forward.
II. The car can move backward.
III. The car can turn.
IV. The camera moves with the arrows.

Score Sheet

Ultrasonic Sensor:

Object	**Actual Distance (cm)**	**Distance Calculated on Pi (cm)**	**Percent Error**
Ultrasonic Sensor #1	4		
	8		
	12		
Ultrasonic Sensor #2	4		
	8		
	12		

Shaz App:

Description	**Did it work? (y/n)**
The simulator should be able to run successfully.	
The user should be able to switch between the two screens.	
The user should be able to move the joystick.	
Moving the joystick should display the degree and distance.	

Team 10: Shazamboni First Prototype Testing Plan

Smart Car:

Description	**Did it work? (y/n)**
The car can move forward.	
The car can move backward.	
The car can turn.	
The camera moves with the arrows.	

Hardware Pinout

Pi4/Pi2 Pin #	Usage/Description
18	Trigger/ Sends a sound wave for detection
24	Echo/Receives the sound wave back
2	Power/5V
6	GND/ The end of the loop