BUEngineering College of
BOSTON UNIVERSITY

Boston University
Electrical & Computer Engineering
EC464 Capstone Senior Design Project

Final Testing Plan

Shazamboni

by

Team #10
Shazamboni

Team Members

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Required Materials:

Hardware:
- Raspberry Pi 4 B (with 64GB SanDisk SDHC card)
- HC-SR04 Ultrasonic Sensor
- 470 and 330 ohm resistors
- 12V 24Ah LiFePO4 Battery
- 2 DC 12V 200RPM Gear Motors
- L298N Motor Driver Controller
- Arducam 5MP Camera for Raspberry Pi, 1080P HD OV5647 Camera Module V1 for Pi 4, Raspberry Pi 3, 3B+, and Other A/B Series
- 12V DC to 5V DC Converter

Software:
- Python Scripts
- Flutter / Dart
- Motion Sensor Detection
- Remote Control (Base Code)
- Motor Controller
- Camera Interfacing
- Ad-Hoc Connection

Set Up:

There will be two tests conducted – the first test will use the Shaz App to drive the Shazamboni. This will consist of connecting the Shaz App to the Shazamboni, starting up the machine, and driving it via a user interface. The user will be able to control the Shazamboni using the Shaz App's joystick: being able to maneuver the device forwards, backwards, and turning. The user will also be able to see the live stream video in the Shaz App.

The second test will consist of an ultrasonic sensor working to stop the machine when it is too close to obstacles. When the user controls the vehicle with the Shaz App, the machine will stop itself when an object is detected by the ultrasonic sensor.

Pre-testing Setup Procedure:

1. Driving Shazamboni with Shaz App:
1. Download the Shaz App
2. Place the Shazamboni of the ground

2. Ultrasonic Sensor testing with Driving:
1. Follow the steps in **Test 1: Driving Shazamboni with Shaz App**

Testing Procedure:

1. Driving Shazamboni with Shaz App:
1. Hit "Start" on the screen of the Shaz App when you see your device's name
2. Use the Shaz App's joystick to move the Shazamboni
3. See the live stream video on the Shaz App's user interface

2. Ultrasonic Sensor testing with Driving:
1. Place an object in front of the ultrasonic sensor while moving the device with the joystick (or nativate the Shazamboni to an obstacle)
2. Notice that the Shazamboni reverses direction and stops

Measurable Criteria:

1. Driving Shazamboni with Shaz App:
I. The live stream video is displayed on the Shaz App
II. The Shazamboni can move forward via the Shaz App's joystick
III. The Shazamboni can move backward via the Shaz App's joystick
IV. The Shazamboni can turn left via the Shaz App's joystick
V. The Shazamboni can turn right via the Shaz App's joystick

2. Ultrasonic Sensor testing with Driving:
I. The Shazamboni detects when there is an obstacle within 20 cm
II. The Shazamboni reverses direction when in an obstacle is detected
III. The Shazamboni stops after reversing direction when an obstacle is detected

Score Sheet

1. Driving Shazamboni with Shaz App:

Description	Did it work? (y/n)
The live stream video is displayed on the Shaz App	
The Shazamboni can move forward via the Shaz App's joystick	
The Shazamboni can move backward via the Shaz App's joystick	
The Shazamboni can turn left via the Shaz App's joystick	
The Shazamboni can turn right via the Shaz App's joystick	

2. Ultrasonic Sensor testing with Driving:

Description	Did it work? (y/n)
The Shazamboni stops when detecting an object within 20 cm	
The Shazamboni reverses direction when in an obstacle is detected	
The output of the script shows detection working	

<u>Hardware Pinout</u>

Pi4 Pin # (GPIO)	Usage/Description
12 (18)	Trigger/Sends a sound wave for detection (Sensor 1)
18 (24)	Echo/Receives the sound wave back (Sensor 1)
2	Power/5V (Sensor 1)
30	GND/ The end of the loop (Sensor 1)
38 (20)	Motor controller input 1 (Right motor)
26 (16)	Motor controller input 2 (Right motor)
32 (12)	motor controller enable A (Right motor)
33 (13)	Motor controller input 3 for (Left motor)
37 (19)	Motor controller input 4 (Left motor)
35 (26)	motor controller enable B (Left motor)