Sensible Solutions

Test Plan

We hope to test the individual function of each component in our system, and a final test of the entire system's intended functionality. For our test plan, we have redesigned our approach to create a simplistic, stream-lined document with which to consult for producing a better product. Our goal is to choose what we will be testing, explain how the test will be performed, and present the expected outcome.

Ultrasonic Sensors

Depth Sensor Reading Test:

Testing the function of a single ultrasonic sensor (distance readings).

How: Sending consistent ultrasonic pulses out from an individual sensor. Will also read the values received using the serial monitor.

Output: We will use a tape measure to read the current distance and look at the values received from the ultrasonic sensors. If they are within +/- an inch of each other, it is the indication the sensor is functioning properly.

Multiple Sensor Reading Test:

Testing the function of multiple sensors close to one another.

How: Our configuration for the sensors, as in how they will read, is a sequence and delay. They read one after the other, waiting for the previous sensor to trigger their reading. Using the serial monitor. We will test this configuration with 2 sensors to begin, then 3 and finally 4. As well, we are able to put different "blockages" in front of each sensor in sequence to check if they each react in the expected change of values.

Output: Utilizing the serial monitor, we can watch our sensor values to see if they are consistent with what the configuration of sensors is facing. We expect the outputs to be very different when blockages are used. When facing a wall, the values should be relatively close to each other.

Gyroscope

Function of the gyroscope (testing of the pitch, yaw, and roll):

How: The gyroscope uses a variety of devices internally to calculate certain values. We are able to use code to access these features to detect specific movements. To test the gyroscope we are able to monitor everything using a Python script. The test consists of moving the gyroscope every which way, in every direction, and using this script to draw it.

Output: The expected output can be monitored using the Python script. We are able to use the drawing feature to mimic the movements of the gyroscope. If the holder's movements are replicated on the screen, it shows the gyroscope is working correctly. As well, with the

front facing gyroscope movements, we are able to use the protractor to measure the angle outputs of the component and compare to the serial monitor readings.

Audio Feedback System and Trinket Communication

Audio Output Test:
Testing audio clarity.

How: Must have VS1053 connected with SD card containing voice files inserted. As well, must have the speaker attached to the Adafruit PAM8302A amplifier.

Output: The speaker plays a clear, distinguishable sound of a person's recorded voice.

Two Trinket Communication:
Testing bit transmission through a digital pin

How: We must connect the two trinkets through a single digital pin on either board, as well as a ground connection. A set of 8 bits will be sent across the digital pin, one at a time.

Output: We will be monitoring, through the Serial monitor, both the transmitting and receiving Arduino in this test. On the output, or "receiving Arduino" we will be looking for a mirror or backwards reading of the bits shown in the serial monitor for the "transmitting Arduino".

8 bit Message Trigger for Specific Audio Output:
Testing the use of 8 bit transmission to trigger specific audio outputs

How: We will keep the same connection between the two trinkets as was seen in Two Trinket Communication. In addition, we must connect one of the trinkets as was set up in the Audio Output Test.

Output: The expectation with this test is the 8 bits will transmit, 3 for obstacles and 5 for distance, correlating to specific audio clips based on these obstacles and distances. An example would be an input of "0b01100110" will correlate to an obstacle value of "3" and a distance value of "6". An obstacle value of "3" will output "stairs up in" and a distance value of "6" will output the audio clips "1.ogg", "point.ogg" "5.ogg" and "metres.ogg".

Integrated System

Ultrasonic Sensors and Gyroscope Integration:

Length and Height Measurement Test:
Test that the length and height values of each sensor are correct.

How: This is a difficult test to perform properly and will likely give approximations at the output. The first test will again be done by using approximations of the length and height. This requires two people: one to hold the device steady, the other to measure. Another option is to leave the sensor on a table and a single person can measure. The measuring

person will take the measuring tape, one end at the sensor, the other directly forward until you hit a blockage. This will be done again, but straight down from the sensor for the height measurement. Again, the values read from the sensors and gyroscope will be outputted to the serial monitor.

Output: If the values for the height and length measured by the measuring tape are similar to what is seen on the serial monitor, our integration has worked correctly.

Obstacle Detection:

How: Our implementation for this step requires multiple steps (using a serial monitor the entire time):

- Step 1: Find a distance value between each pair of sensors. To test the distance value, we may use the numbers we see for the height and length, as well as the Pythagorean Theorem.
- Step 2: Check the angle found between each pair of sensors using the distance value initially found.
- Step 3: Using these values, determine what each angle should approximately be to detect different types of obstacles.
- Step 4: Detect the obstacles.

Output: As we had steps for each test, we will again make steps for the expected outputs:

- Step 1: Compare the outputted (through serial) value for the hypotenuse to the Pythagorean calculated value. We expect them to be the same.
- Step 2: Using the same technique as step 1 except calculating the angle, we should see the same value for this calculation as well.
- Step 3 and 4: The values and outputs for the "obstacle detected" will be constantly checked and rechecked to make sure the angles determine the correct obstacle.

Adding Audio to the Ultrasonic Sensors and Gyroscope Integration:

Audio Output for the Specified Obstacle:

How: Using the 8 bit Message for Specific Audio Output configuration, we can wire the ultrasonic sensor and gyroscope configuration to the audio components. To test, we will measure specific obstacles and flat ground, in addition to the distance of the object from the user. This test should be quite simple, as all of the components in sound output for a specific obstacle have been measured and tested extensively.

Output: The expected output for this component is the audio clips for the obstacle being pointed at by the device in hand are correct. This means it will play the value of the obstacle as well as the distance the obstacle is from the user.