Electronic Social Distancing Machine

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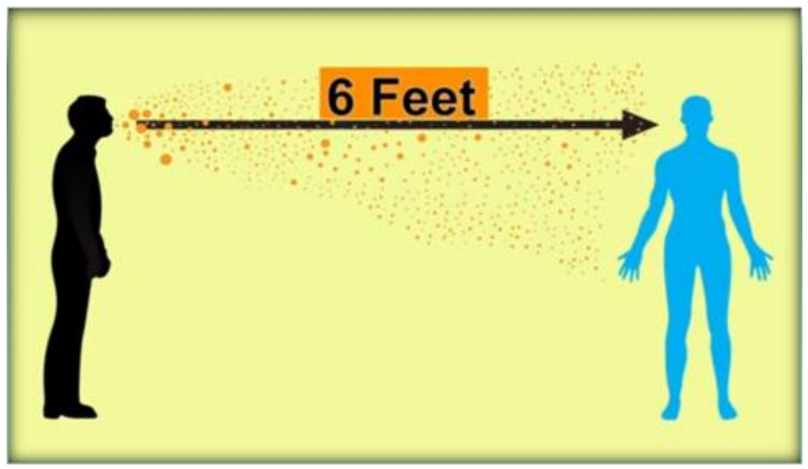
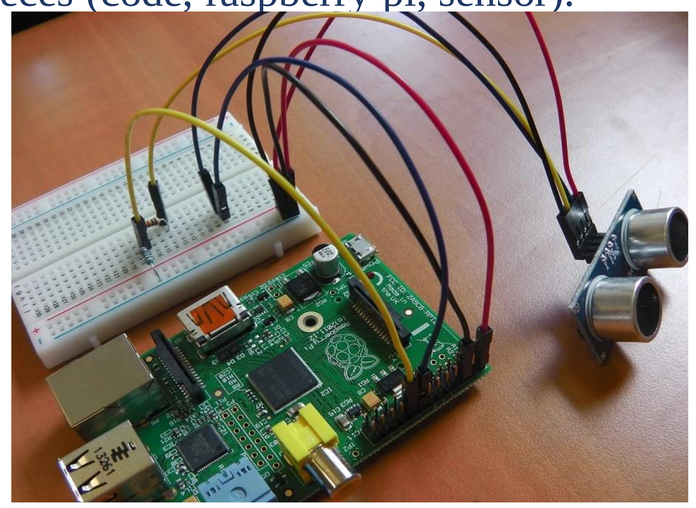
Abstract

Since we are in a global pandemic, the engineering project that was assigned to us was centered on protecting people from Covid-19. Our problem statement was to create a device that promotes social distancing by allowing a user that has our project know when they are within 6 feet of someone.



Introduction

We are assigned to make an electronic social distancing machine that can let others know if a person is within 6 feet of someone else. Our first approach was using a raspberry pi and attaching a sensor. At first, we did not know how to attach a sensor, write code, how to operate a raspberry pi, or how to connect all three pieces (code, raspberry pi, sensor).



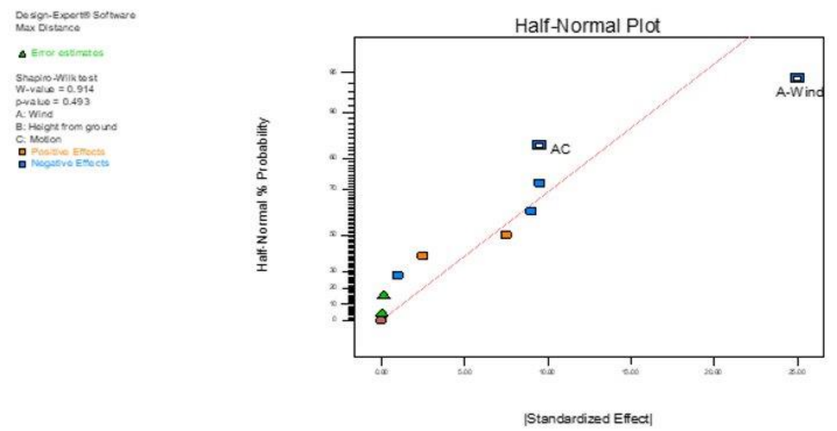
Materials and Methods

Materials
5PCS HC-SR04 Ultrasonic Distance Sensor
120PCS Breadboard Jumper Wires
REXQualis Resistor Kit
RuiLing 5-Pack 12x9.5mm DC 3V Active Buzzer
Eiechip Mini Breadboard Kit
Hook and Loop Fastening Cables
AIKENDO Running Pouch Belt Waist Pack Bag
BESTON Portable Charger
Raspberry Pi-3

Before we began our trials, we had to write Python code that made our HC-SR04 Ultrasonic Distance Center start measuring and collecting the distance measurements. Once this code was written, we were able to connect the sensors to the Raspberry Pi computer and collect the incoming distance measurements. The machine was tested for three specifications. The first test was figuring out how far the sensor was able to sense. The second test was to find the effect that user motion, wind, and height of the sensor had on the measurements. The third test measured the effect that reflective materials had on the maximum measuring distance.

Results

The results from our 2k factorial testing approved and disapproved some of our variables. Changing the heights of our sensor does not change the height. Motion and wind decrease the distance the sensor can read. We had a p-value that was lower than .05 which is significant in that it shows that that our results are not linear. This explains our significant lack of fit. We did this part of the 2k-factorial twice due to errors.



Conclusion

While building and designing our Electronic Social Distancing Machine, there were many challenges that had to be overcome. The first challenge was learning the Python coding language and writing the code for each piece of hardware. The completed code for the sensor and buzzer were unable to be integrated properly, so we had to plug our raspberry pi unit into a computer monitor, to view our measurements. Once our machine was functional, we tested the effects of wind, user motion, and the height of the sensor from the ground. After these trials, we were able to conclude that wind and user motion affected the measurements made by the sensors. The experiments also proved that our ultrasonic distance sensor could not measure distances up to six feet but only to about three feet.

References

[1] We accessed the following video for code and on directions on assembling the machine.

: Distance Sensor GPIO cont'd - Raspberry Pi and Python tutorials p.7 https://youtu.be/kqJ8WYQu68w

[2] The datasheet for the HC-SR04 Ultrasonic Distance Sensor.

: https://www.electroschematics.com/hc-sr04-datasheet/