

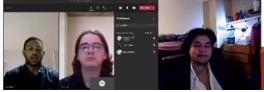
Portable X-ray Measurement Device

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Research – X-rays

Portable x-rays

- Technician distance
- Radiation
- Speed
- Efficiency
- Future technology



Sensors

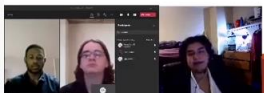
Ultrasonic

- Sends frequency over time
- Expensive



LIDAR

- Land mapping
- Application

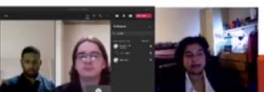


Housing Material

Some material that handles radiation well

Questions to someone who uses these machines

- Placement of device
 - On side of machine



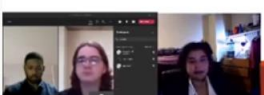
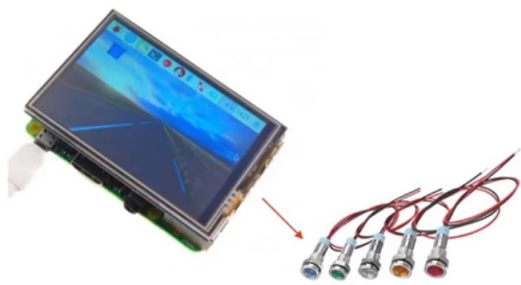
Material and Display

Material was going to be sheets of ABS

- Decided to 3D Print

Display

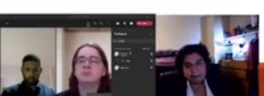
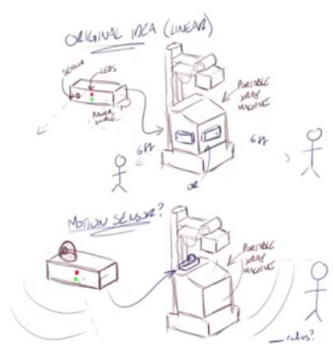
- Initially going to use a screen
- Switch to LEDs



Sensor Change

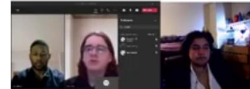
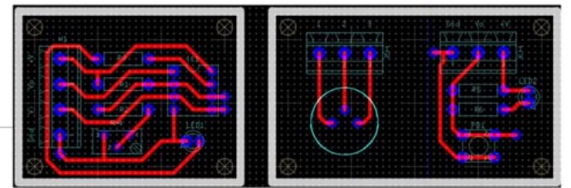
Linear with inclusion of motion sensor

- Motion helps linear



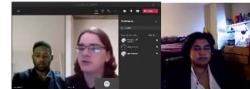
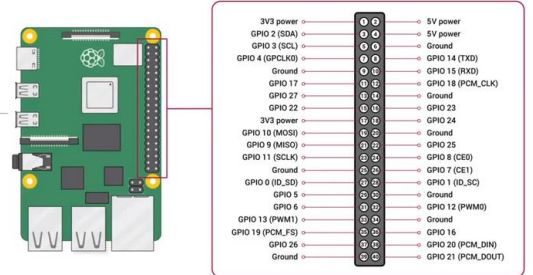
Building

- Two custom circuit boards
 - Voltage Sensor
 - Button and Motion inputs
- Print time
 - 15 Hours
- Circuits are held down with press fit connections
- Lid is held down with glue
- IR sensor sits in a press fit holder
- All wires soldered and then shrink wrapped



Wiring

- Notable pins
 - 5V pins for Distance
 - Pin 3 for Voltage Sensor Input
 - Pin 11 for Motion Sensor Data
 - Pin 16 for Button Data Input
 - Pins 22, 24, 26, and 28 for LEDs
- Wiring
 - Red = Power
 - Black = Ground
 - White = Data



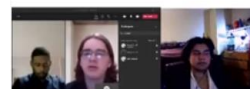
Coding

- Three sections of code
 - Importing libraries
 - Definition of variables and inputs/outputs
 - Logic section
- Inputs and Outputs referenced by GPIO number
- Logic comes from If/Else statements
- 3 Data inputs
- 4 LED outputs

```

1 #import required assets
2 from gpiozero import LED
3 from gpiozero import Button
4 from gpiozero import MotionSensor
5 from gpiozero import LineSensor
6 from time import sleep

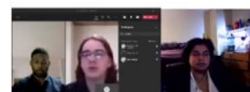
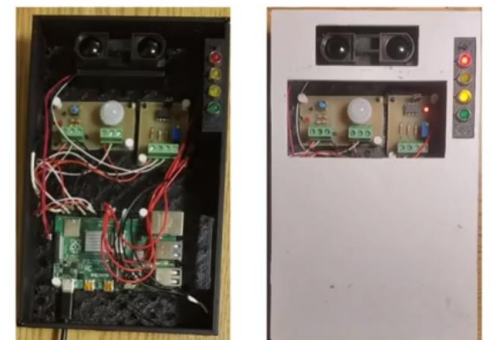
8 #Definition of Variables
9 #Three data inputs
10 button = Button(23)
11 vs_button = Button(2)
12 motion = LineSensor(17)
13 #Led declaration
14 red_led = LED(25)
15 yellow1_led = LED(8)
16 yellow2_led = LED(7)
17 green_led = LED(1)
18 #Variable for tracking power up status
19 on_and_off = 0
    
```



Final Housing

About same size

- Four different prints
 - Basic box
 - Plate with mounting points
 - Plate with walls and mounting points
- 5" x 8" x 1.875"



Conclusion

- Overall the device was a success.
- Programming was difficult due to the inexperience Python
- More compact design
- Infrared sensor was the right choice
- Label the LEDs
- Laser pointer
- ABS to PLA

