The Seriously Awesome COVID Detector

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Tinker Competition Entry

Introduction

The last year has proved two things to me. That I can never take anything for granted as life can completely turn upside down within the blink of an eye and that a worldwide pandemic seriously sucks. Setting aside our foolishness as a human race, COVID-19 has been quite an inconvenience to human life. Long gone are the days of unsanitary living when we would rub our eyes, mouths, and noses with whatever god-forsaken bacteria that reside on the door-handles, for we have now entered the age of cleanliness, where homo-sapiens disregard their own comfort for the sake of a brighter and safer tomorrow!....

Pfft, as if. If history taught us one thing, it's that humans will always gravitate towards convenience, no matter the situation. Want to shop? Do it online! Want to go somewhere? Order an Uber! Hungry? Disregard both your own health and the safety of the world and order some fast food! Truly, convenience always takes precedence in the pecking order, because humans hate hard work. This applies even during this worldwide pandemic, from mask-opposers to COVID-deniers, the true nature of humans is that of comfort. This fundamental flaw in human nature might actually be our saving grace. If KFC (No relation to the major fast-food chain) can sell literal toxic waste and profit through convenience, then surely scientists and the healthcare system can do the same! Long roundabout intro out of the way, my entry tackles the issue with COVID-detection and its convenience, mainly in public areas such as malls and hospitals, aiming to increase convenience both for the establishment and its visitors.

Methodology

COVID tests are quite a hassle, aren't they? You need to book an appointment, pay for the test, go to the site, have your nasal cavity violated then spend the next 20 minutes tearing up from the discomfort. For these reasons, along with shortages of test kits in certain areas, COVID tests aren't exactly a thing everyone takes every time they want to leave the house. Sure, periodically taking tests might be the safe thing to do during these times, but it's a major inconvenience to our daily lives. As such, we have adapted to only take them if symptoms such as fevers, which are far easier to detect, start showing up. I based this project on that very methodology. My project might blow your mind, so prepare yourself. The product I am to create is……

A thermometer. Yeah, that's it. It's not the normal run-of-the-mill thermometer, though. This project aims to eliminate the inconvenience of checking the individual temperatures of a large group of people, whilst cutting down on the cost of the large-camera thermometers

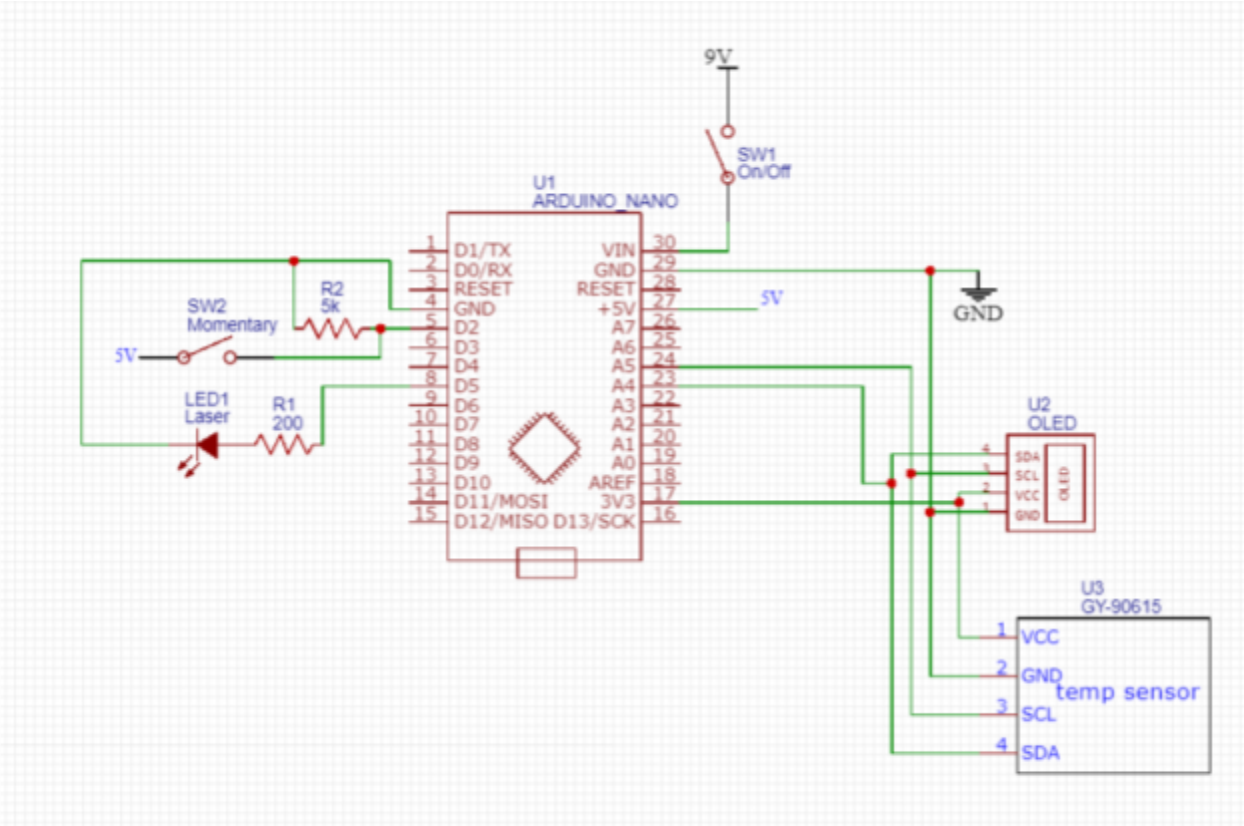
currently used in malls and shopping centers. This project can be boiled down into two major parts, at least for the prototype, and they are :

1. Temperature sensors, commonly used in thermometers and other temperature equipment. The one used for the prototype is a GY-906 Temperature Sensor, which uses Infrared lasers to detect temperature.
2. Rotary motors. For the prototype, I used an Arduino Servo-Motor, as the prototype itself is coded on an Arduino. The idea is that the temperature sensors and lasers would be attached to the servo and with one push of a button, the device measures temperatures at a 360/180-degree angle, depending on the servo type, and allows to measure multiple subjects instead of one.

The overview is not that impressive, I will admit. However, the idea of constant monitoring + multi-monitoring opens a door that eliminates inconvenience both on the side of the one being measured and the measurer. If you can be measured simply by walking in, without interruptions due to hand thermometers or camera detectors, being measured becomes far less of a hassle. On the other side of things, the ability to measure multiple subjects in one fell swoop allows users of the device to cut down both on cost and time that would have been lost through traditional, singular measurement devices that are currently being used.

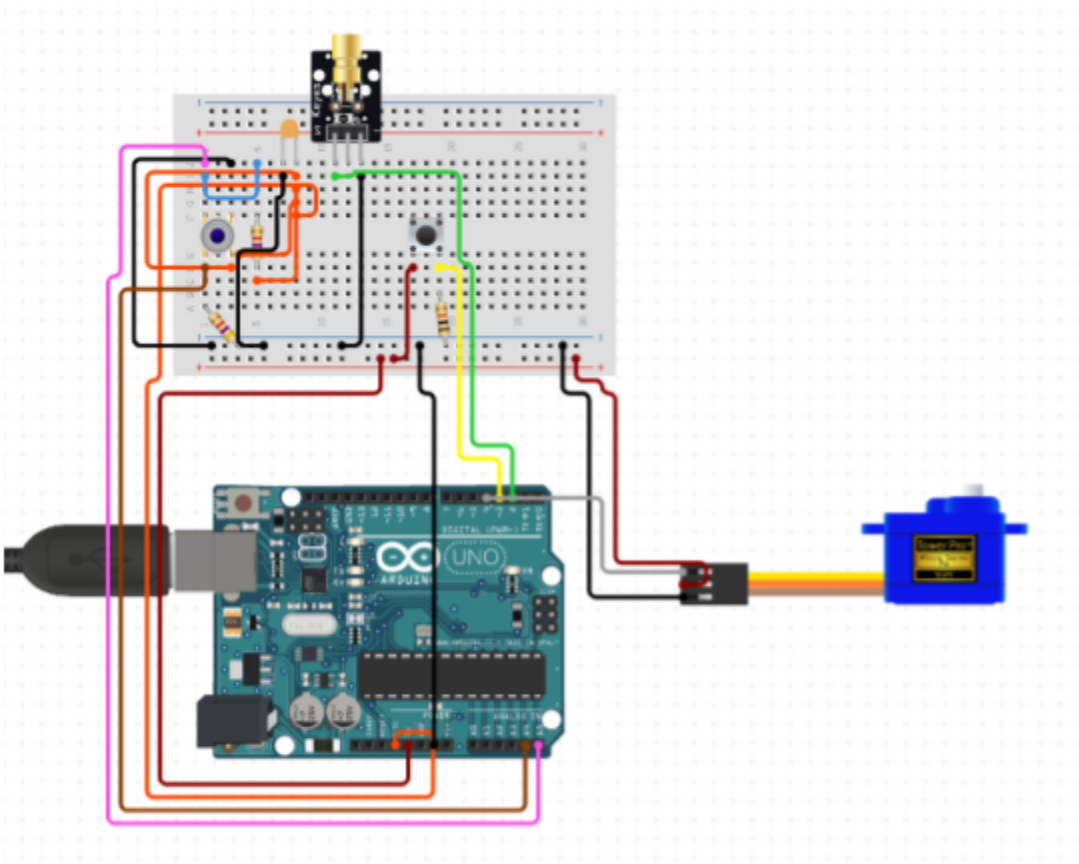
Whilst it is possible and very easy to use TinkerCad for Arduino Simulation, some components were missing, so I opted for a physical prototype, which I will document here.

Design for Temperature Sensor



Circuitry for the Temperature Sensor
(Please note the Above Design is not made by me. Credits in reference page)

The above circuitry is courtesy of Max Siebenschläfer (Credits in reference page). To sum it up, the temperature sensor is controlled by a momentary switch button and an on-off switch (The latter turns the device on or off completely, whilst the former is pressed when the temperature needs to be measured). My project functions differently, in that a single pushbutton will activate both the sensor and the Mini-Servo, meaning the device will measure temperature only whilst the servo is slowly spinning, in order to measure multiple subjects. The temperature is relayed onto the serial monitor, although an O-LED display, such as the one used in the above circuitry, can be used to show the temperature on the fly. My project does NOT use the above circuitry in full, but instead makes use of the temp sensor itself. (The circuitry was part of the inspiration for this project, as you will see below).



General Schematic for the prototype. Note that both the IR Sensor and Laser are to be mounted on the servo, however the schematic does not reflect that.

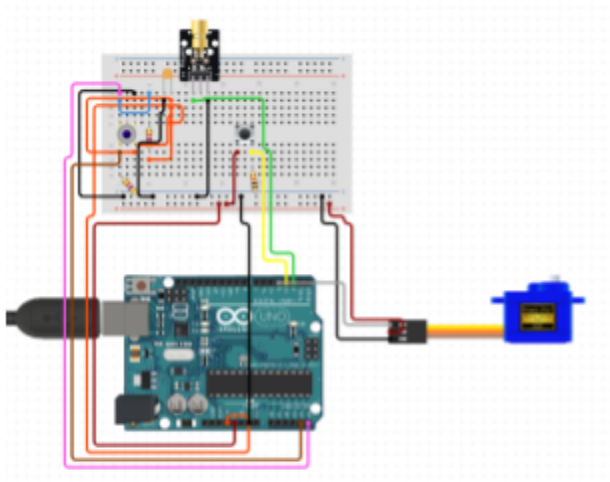
The above schematic was designed by me. Unfortunately, I do not have access to a GY-906 Temperature Sensor as shipping was far too late for the deadline, however, the main bulk of the project which includes the laser and servo was built. The idea of the schematic above is to mount both the Infrared laser in the IR Temperature sensor onto the servo, with the wiring mainly managed on an onboard breadboard. When the switch is pressed, the servo increments in 1-degree intervals every 20 milliseconds to measure temperature effectively (moving too fast would make the readings inaccurate). After moving 180 degrees, the servo pauses for 1 second before snapping back into its original position, ready to measure again.

Results

Code for the Project :

```
/*

*/

#include <Servo.h>; //The servo library is important for this project. It allows me to control the servo and use it.

int ServPin = 4;
int Button = 5;
int ButtonS = 0;
int Laser = 3;
int i;

//Above definitions are for the input pin numbers and the i variable used in the for loop below.

Servo ServM; //Defining the servo

void setup() {

   Serial.begin(9600);
   ServM.attach(ServPin); //Recognizing the Servo as attached
   pinMode(Button, INPUT); //Desginating Button (The button is attached to pin 5, hence its value) as an input, meaning the board recieves info from it
   pinMode(Laser,OUTPUT); //Designating the IR Laser (Attached to pin 3) as an output, meaning the board sends info to it.
}

void loop() {

 ButtonS = digitalRead(Button); //Reading info from the button. It will be in either a HIGH state, meaning it is pushed, or a LOW state, meaning it is not pushed


 if(ButtonS == HIGH) //This if checks if the button is pressed or not.
 {
  digitalWrite(Laser,HIGH); //Once the button is pressed, the Laser is set to a state of HIGH, meaning it is now on
  for(i = 0; i<=180 ; i++) // This for loop ensures that the Servo moves slowly, at increments, rather than quickly, for the sake of accuracy.
  {
   ServM.write(ServM.read() - 1); //Every 20 milliseconds the servo moves 1 degree counter-clockwise.
   delay(20); //Delay of 20 milliseconds
  }
  Serial.println(ServM.read()); //Prints position of servo to serial monitor. This is simply an observational add-on and not essential.
  delay(1000); //A delay of one second
  digitalWrite(Laser,LOW); //Laser set to state of LOW, turning it off
  ServM.write(ServM.read()+180); //Servo quickly sent back to original state. In this case, it does not move slowly.

 }

}
```

The schematics are basically what the prototype is physically



General Schematic for the prototype. Note that both the IR Sensor and Laser are to be mounted on the servo, however the schematic does not reflect that.

Future Work

Unfortunately, I did not have enough budget or time to make this project look cleaner. If some poor sucker on shark-tank or some large company named after a certain Brazilian rainforest were to invest serious money into this, the manufacturing process would go something like this :

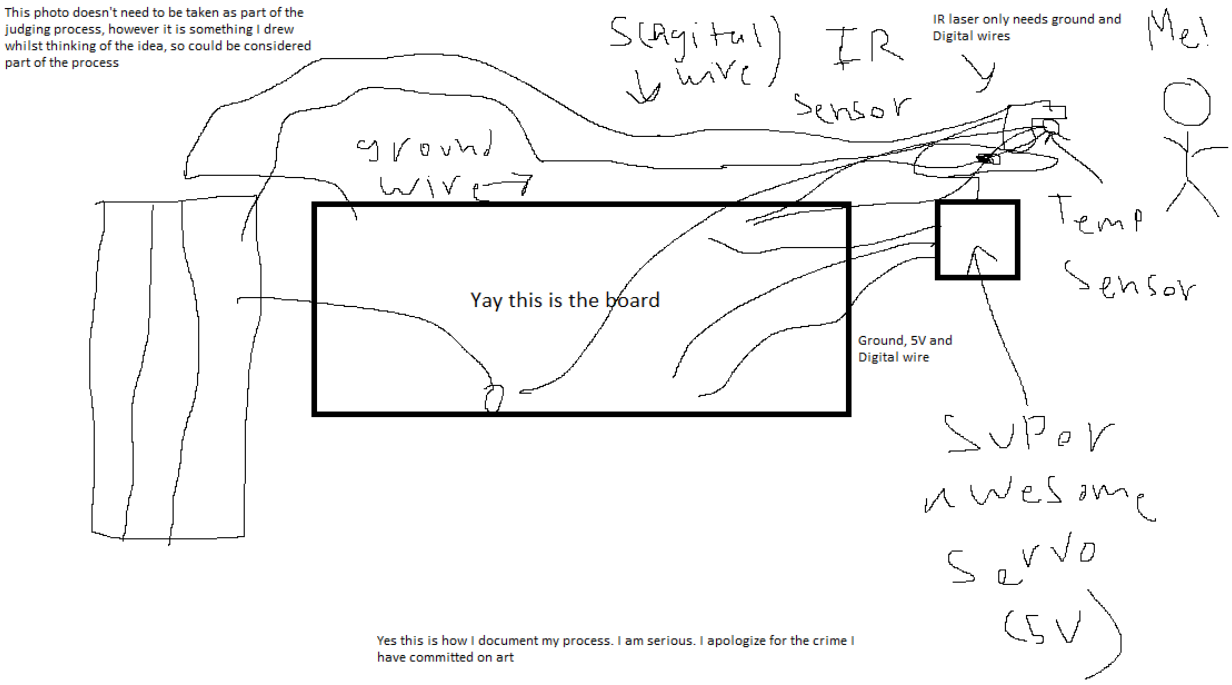
1. Invest in higher budget temperature sensors. Accuracy is key, but also efficiency. Temperature sensors that can keep up with speed would prove to be extremely useful in this process. The key is to balance both speed and accuracy, as we are not looking for a normal temperature sensor, but one that can handle moving.

2. Interface. As of now, the temperature readings would return to the serial monitor, meaning a laptop would have to be connected to it at all times - not a funny joke for pockets and wallets. As such, OLED displays that can handle some wear and tear would prove to be a worthwhile investment.

3. Research, research, research. As much as I want to break the doors down on the Nobel Foundation and demand my prize, this concept is nothing impressive at the moment. One could say it is akin to duct-taping thermometers to a ferry-go round and calling it a day. Imagine, though, if this project was upgraded to a whole new level. For example, what if the thermometer was installed on an infrastructural level. You enter a mall, no measurement in sight, when suddenly you are escorted off site and informed that you have a fever. How did they know? Then it turns out the thermometers were built into the walls, in such a way that they scan a 3D environment in space, accurately checking for temperature. Sure, this might not seem like the same project idea, but it all falls under the same idea of temperature measurement, one of the key symptoms of COVID-19 and other infectious diseases (Ha! You thought I forgot about the main goal of this project and its relation to COVID, didn't you!).

4. Convenience. The main goal of this competition is to improve life during this pandemic, but what we gain today might be useful tomorrow. Should another pandemic hit sometime in the distant future, we would want to be as comfortable as you can be with a raging murder-virus rampaging on earth. Being able to monitor your own condition and temperature without the inconvenience it brings would encourage more people to comply with lockdowns and help us bring it to a more speedy end.

Appendix/References



https://www.instructables.com/Arduino-Laser-Infrared-Thermometer/

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Circuitry reference. Instructables itself is also a huge help in inspiration.

https://forum.arduino.cc

Couldn't code without it

sorry this was 9 pages. Hope it was worth the read, even if it wasn't a stellar project