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Smart Jacket for Social Distancing

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I. INTRODUCTION

Every year millions of people get infected by contagious disease or face surgeries. There are many infectious diseases spreading around the world so taking precaution is very important.

People having infectious diseases or who face surgery must sit at home but if a situation arises where they have to go outside, alone, then it is mandatory for the patient as well his/her relatives to be cautious, also people who don't have any disease but have to go in contaminate zone or someplace where they need to maintain social distancing, they also need to be cautious so they can do their work without worrying about surrounding. The Smart Jacket is the solution for both of the above scenarios. Smart Jacket enables people, with mild contiguous disease, or patients, who recently faced surgery, to go outside with simple precautions. Even at crowded places, where patients need to maintain social distance, or at contaminated zones, where healthy people have to maintain social distancing, both of them can use the Smart Jacket so they can do their work without worrying about surroundings or themselves.

II. MOTIVATION BEHIND WORK

In today's time everything is fast-paced, but in its contradiction infectious/contagious diseases are also increasing at a fast rate, with increasing population, Surgeries are also increasing. In such a situation, it is not always possible to look after an ill person and be physically present with him/her, and it is also possible that an unavoidable situation might arise when an ill person has to go outside. In such a scenario, whenever an ill person has to go outside, it is mandatory to be cautious and take care of the ill without being present with him/her. The solution is Smart Jacket.

III. RESEARCH GAP

Smart social distancing jacket came with the motive of awareness and carefulness. Initially Smart Jacket was used only for the purpose of Covid precautions. As we all know about covid-19 virus and what it had done to all of us and how it had changed the way of your living. During lockdown and post lockdown where social distancing was mandatory to keep ourselves safe from the virus, Smart Jacket helped to maintain social distance in crowded places like offices, malls, markets etc. Smart Jacket helped us as well as everyone around us to be aware about social distancing with the help of proximity sensor, and alarm system. Whenever someone came close, the alarm system would turn on. But this was the only function of the Smart Jacket, and it had no other advantages. Now, as the Covid surge has come down, Smart Jacket with proximity sensors have become obsolete.

IV. PROPOSED SOLUTION

We have a proposed solution for this obsolete Smart Jacket. With the proposed solution Smart Jacket will not only help in any another pandemic, if it comes, but it will also help any person who has contagious disease or someone who recently faced surgery or also a healthy person who has to go to a contaminated place or someplace where they need to maintain social distancing and they can do their work without worrying about social distancing. We have added some medical parameters now in the jacket to make it even more smarter. In this new Smart Jacket there are 3 ultrasonic sensors which will be used for measuring distance on the left, right and back side from the person wearing the jacket.GPS, GSM, buzzer and temperature sensor are also used along with Arduino which will be used as a controller to be interfaced with all the above modules. All of these sensors are used for specific reasons and make the Jacket more smarter. The roles of all these sensors are further explained in proposed work.

V. PROPOSED WORKING

There are 3 ultrasonic sensors mounted on the jacket which will be used for measuring distance of an object on the left , right and back side from the person wearing the jacket. Ardunio will be used as a controller which will be interfaced with all the modules like GPS,GSM, temperature sensor , ultrasonic sensor , etc.

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Arduino will send a command to the ultrasonic sensor and receive a response which will be then converted to distance by programming. Arduino will check all the 3 distances of objects in front of it and confirm whether any distance is below threshold or not. If distance is below threshold then arduino will send Signal to buzzer in a specific pattern for alerting a person about an object. There will be a switch on jacket for emergency situations which can be used to send alerts to specific mobile numbers in the form of text messages. Arduino will keep checking for that switch trigger signal and when it is received arduino will immediately take coordinates from the GPS module , read the person's body temperature from LM35 and create a message for Sending. Once a message is formed the arduino will send AT commands to GSM module for sending Message. In the end, by using the GSM module, the arduino will send the temperature and current location of a person wearing a jacket to a specific predefined mobile number.

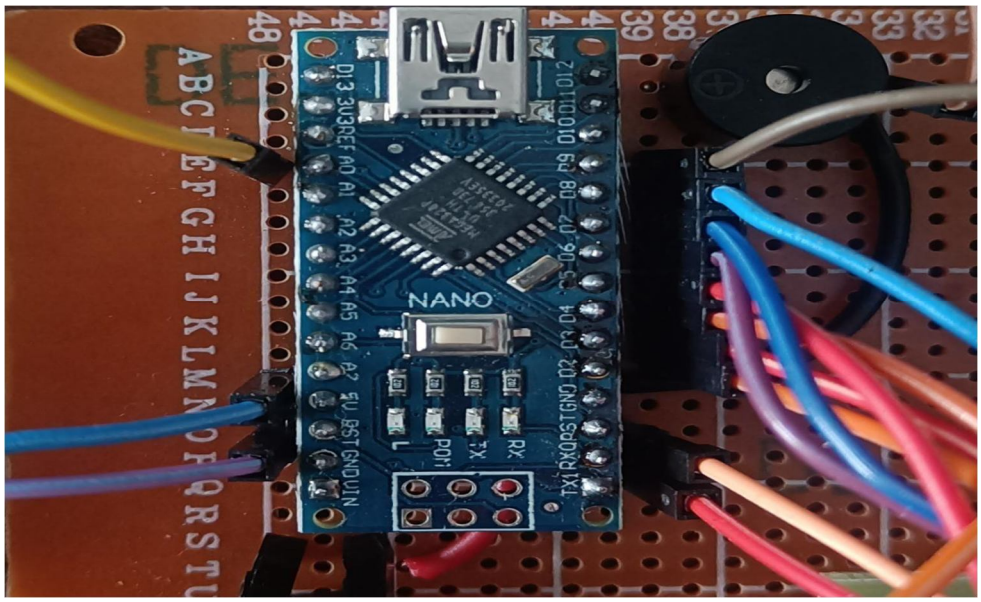
VI. WORK DONE

Initially Smart Jacket was solely for the purpose of Social Distancing, We picked up from that point and innovated to make the Smart Jacket more smarter. We started by making the circuit diagram on online software. Once the circuit diagram was ready, we purchased the components. Then we connected all the components as per circuit diagram. There's a voltage regulator and a GSM module at the input side, from which the current and power is flowing towards the Arduino, GPS, Ultrasonic sensor, and temperature sensor. Then we tested the circuit by initially keeping distance measurement of ultrasonic sensor for 5 cm, then we tested for 15 cm, then 30 and then 1m. For prototype, we have kept it at 15cm

VII. DESIGN CONSTRAINT (HARDWARE)

A. Arduino Controller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.



To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

B. Ultrasonic Sensors

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

1) Using IO trigger for at least 10us high level signal,
2) The Module automatically sends eight 40 kHz and detects whether there is a pulse signal back.
3) IF the signal is back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

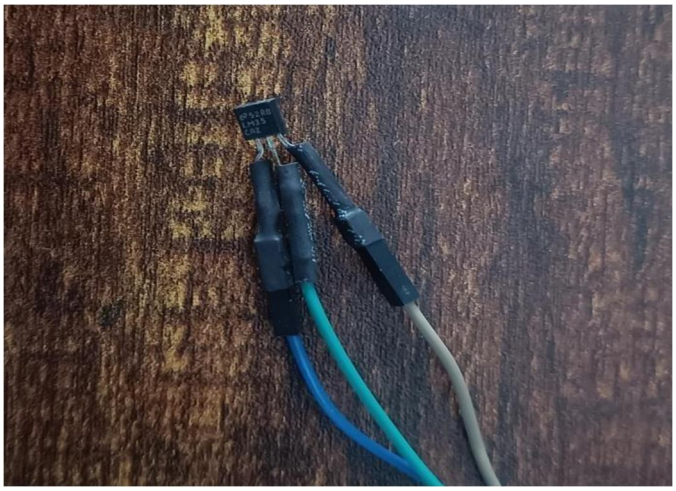
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Test distance = (high level time×velocity of sound (340M/S) / 2.



LM35 Precision Centigrade Temperature Sensor

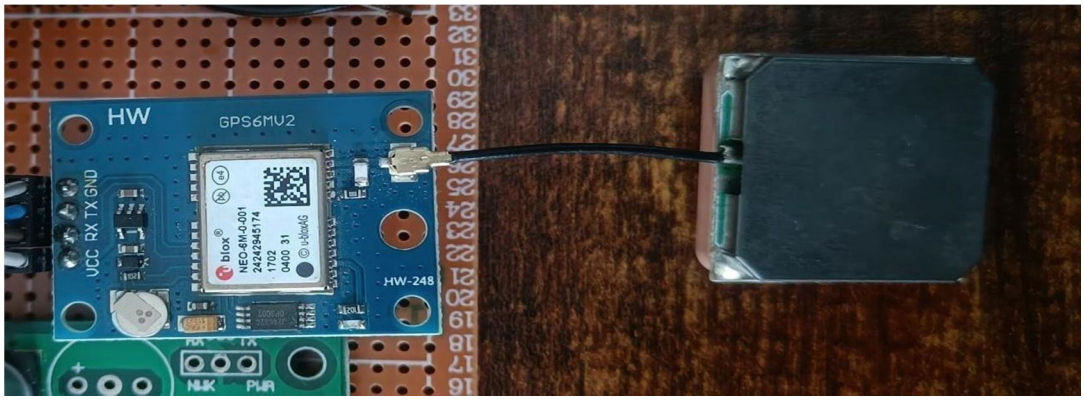
The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly- proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self- heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.



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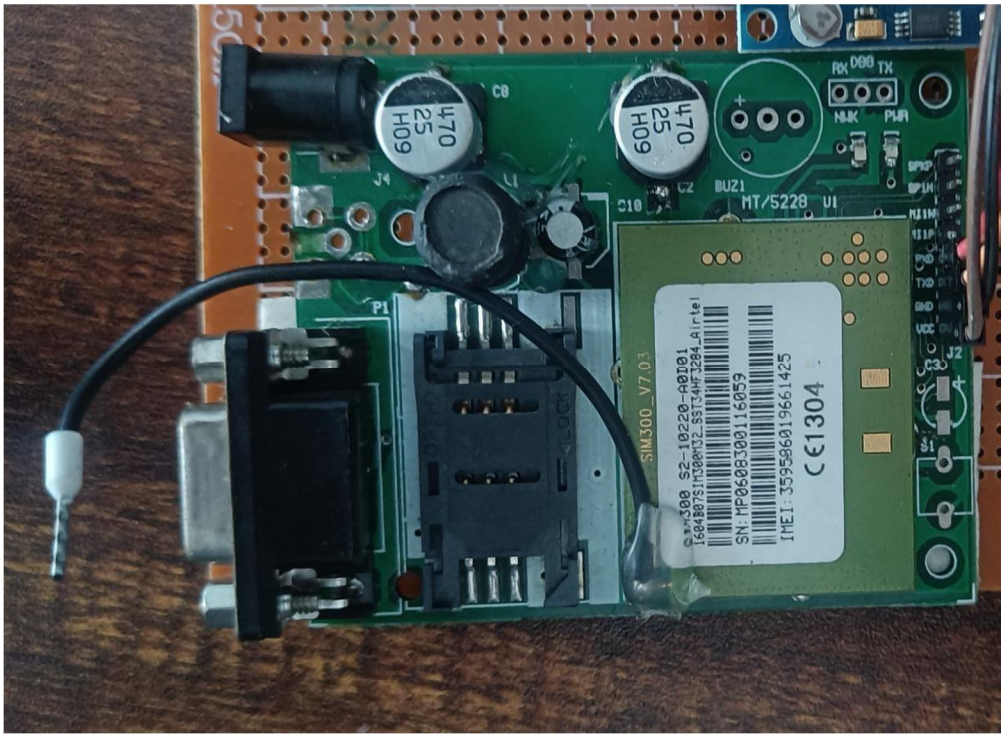
GPS Module

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x
12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix (TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.



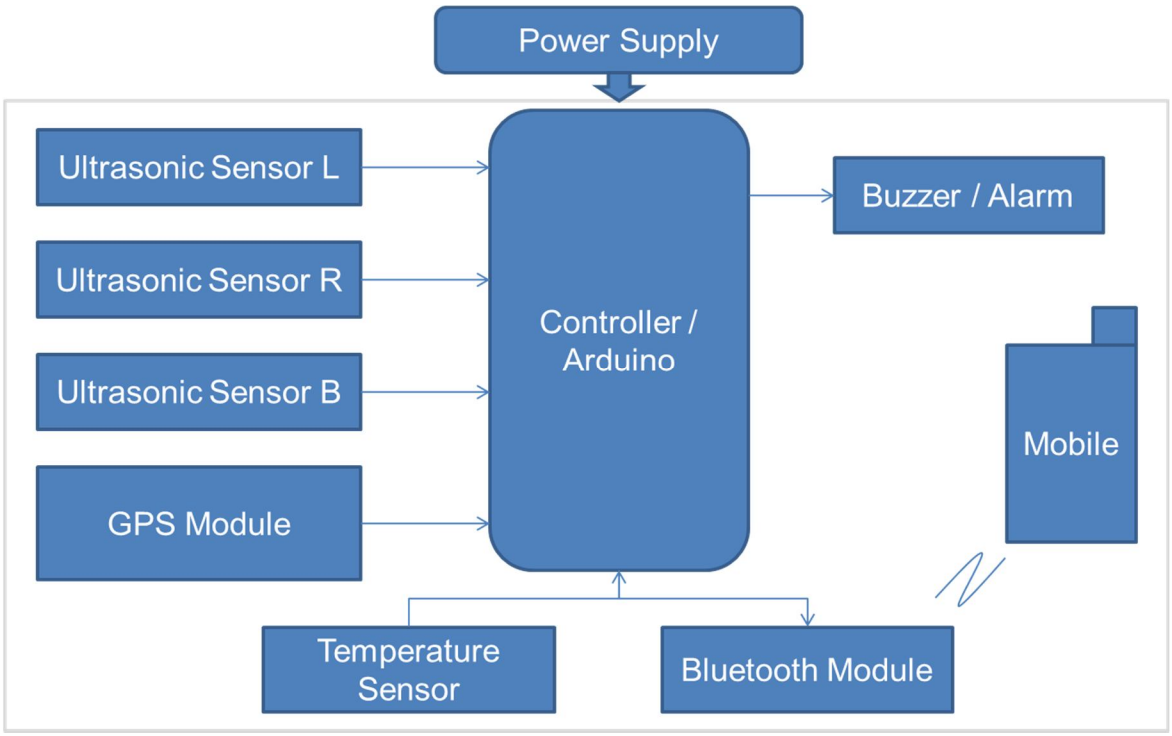
8.5 GMS Module

SIM800L GSM/GPRS module is a miniature cellular GSM modem from Simcom, which can easily interface with any microcontroller to give the microcontroller GSM functionality, and allows for GPRS transmission. This module connects the microcontroller to the mobile network to make or receive phone calls, send or receive SMS (text messages), and connect to the internet using GPRS, TCP, or IP. Another advantage is It supports quad-band GSM/GPRS network, which means it can work anywhere in the world.

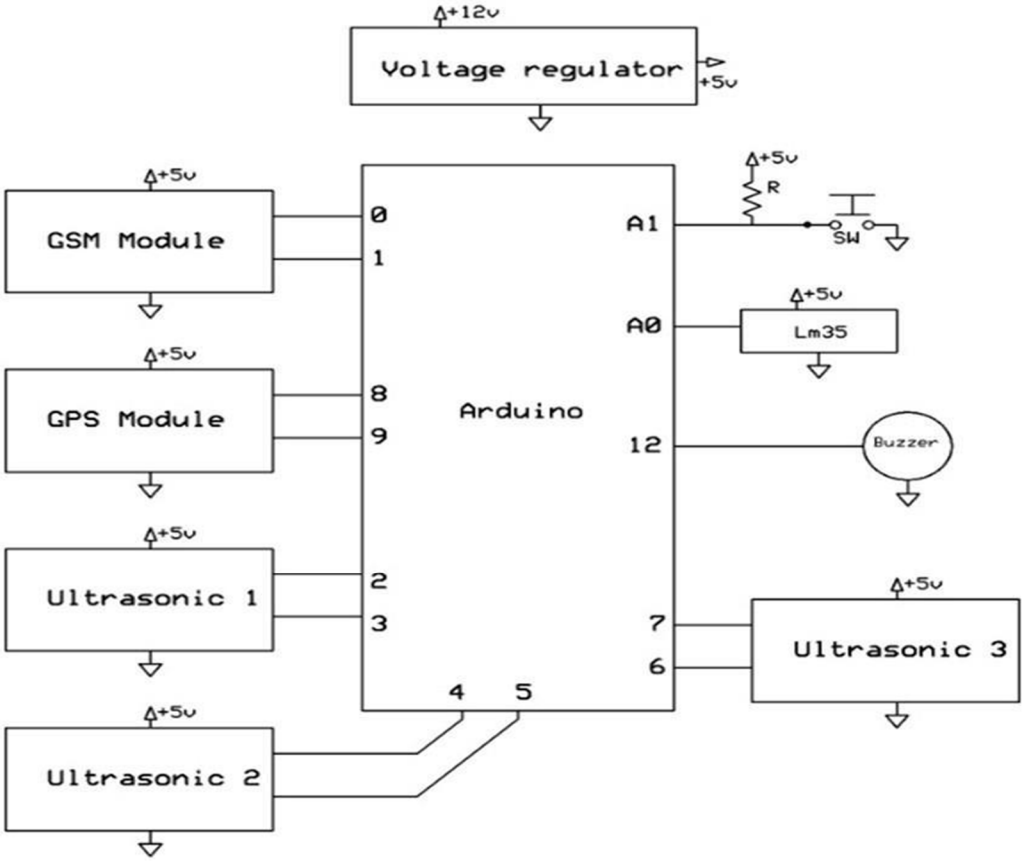


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VIII. BLOCK DIAGRAM

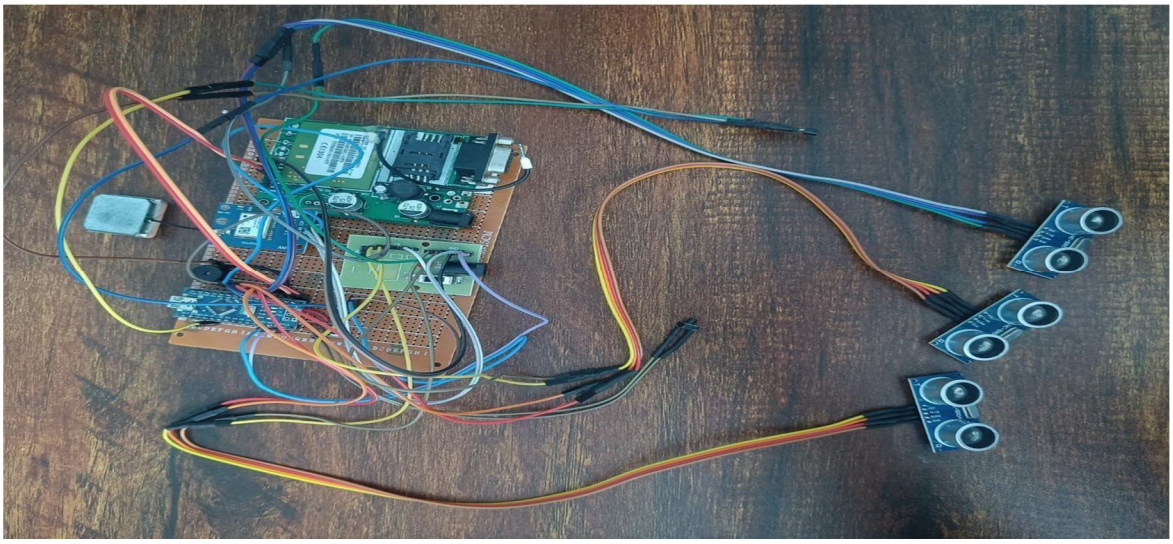


IX. CIRCUIT DIAGRAM

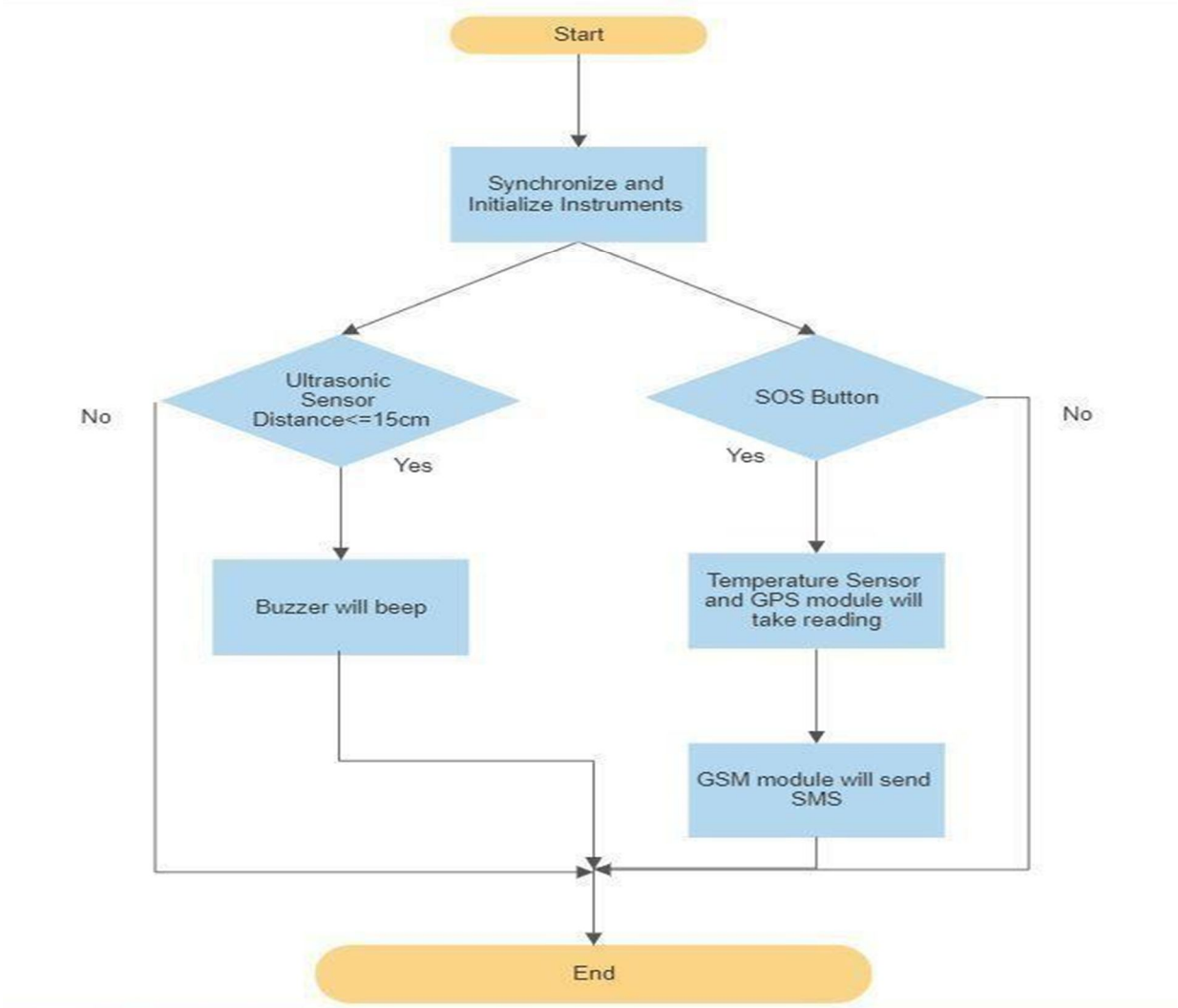


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X. WORKING CIRCUIT



XI. FLOWCHART



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Societal Relevance

People who need to maintain social distancing can wear this jacket to be aware of their surroundings. There will be a buzzer which will alert the user when someone will be in the range of sensors. The jacket also includes a temperature sensor that will measure the body temperature. In case of emergency there will be a switch that will send notification using the GSM module. This jacket can be worn in public places like public transport, malls, railway stations, airports. This jacket is for both diseased and healthy people.

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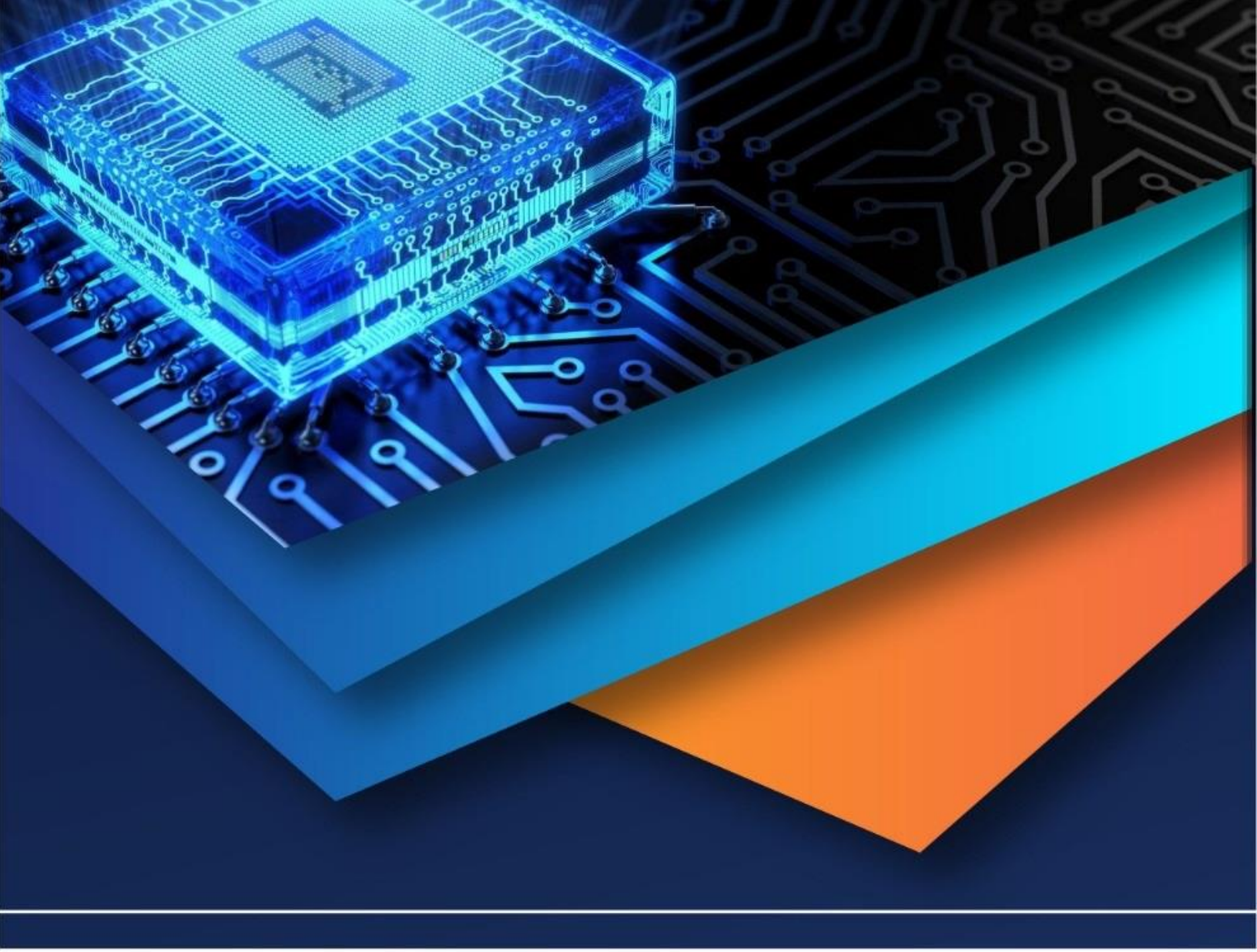
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