A

PROJECT REPROT ON

FACE MASK REMAINDER SYSTEM

Submitted by
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CERTIFICATE

This is to certify that the Project entitled "**FACE MASK REMAINDER SYSTEM**" submitted by **Mr. Gaurav Vijay Topre (ROLL NO. :10303320181137210017)** is record of Bonafide work carried out by them under my guidance in the partial fulfillment the requirement for the award of Degree of B. Tech. in Electronics and Telecommunication Engineering course of Dr. Babasaheb Ambedkar Technological University, Lonere (Dist. Raigad) in the academic year 2020-2021.

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I.   ACKNOWLEDGEMENT

II.   ABSTRACT

The year 2020 came up with never before pandemic situation of Novel Corona Virus, the spread of this started from china travelled all over the world. Various countries-imposed lockdown to restrict the spread of virus with this lockdown health advisories of these countries also made mandatory the use of face mask. Hence, we planned for designing a remainder system for human beings which will remind them about their face mask every time when they step out of their doors.

Overall functioning of this system is based on motion detection and then the display and beep support which will help us in taking our face mask with us every time. As we seen earlier that machines are making our life easy in this situation too, we will make our task easy with the help of machine.

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CHAPTER ONE

1.1 INTRODUCTION

Our human body temperature is high than all the normal objects around us so on the basis of temperature we can easily distinguished. We are using same principal to design this system the motion detector we are using here will detect the human body movement on the bases of its comparatively high body temperature and will send that signal to controller.

We can surely say that face mask is the *garment of the year* it sounds quite weird but its true face masks and hand sanitizer are the only things which can help us to protect ourself from corona virus. Here we are designing a system which will do work of alarm for us but this alarm will not remind us of time but it will remind us about our face masks. Now a day's automation is playing a vital role in each and every sector so this is small step towards automation in human behaviour of forgetting things.

Surely here the system is made for reminding us about our mask but we can surely use this for other things too by making certain changes in it. Here the second major role is played by our display system which gives us the statistics of our available masks and those alerts which will help operators also for operating system smoothly.

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1.2 HISTORY

History of this system is not that old, because its compulsion started in 2020 and that's why we feel need of building this system. Face mask remainder is a new way of automating human behavior, the components we used in building this system are well known to us the major functioning of this system is based on passive infrared sensor abbreviated as PIR sensor invented by Marcel Zublin in 1981 and 16x4 LCD display which came in to play for displaying messages which was invented by George H. Heilmeier in year 1960. The face mask protection was introduced by French biologist, microbiologist and chemist Louis Pasteur who proved presence of bacteria in the air, which made more people pay attention to the design of modern masks in year 1861. In 1899 French doctor created mask six layered gauze and sewed it on the collar of a surgical gown.

Retrospective investigation by Chinese authorities have identified human cases with onset of symptoms in early dec 2019. While some of the earliest known cases had a link to a wholesale food market in Wuhan, some did not. Till this is history and after this all we are doing are in present world.

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1.3 LITERATURE REVIEW

The Novel corona virus outraged in November 2019 in Wuhan, China first case of COVID -19 was found there. Soon the virus spread throughout the world, according to reports of various well known health organization including World health organization had included face masks in their guidelines for protection from Corona virus. Recently the lockdown which was imposed everywhere was loosen and people are allowed to go to their offices and work but many surveys showed that majority of people not wearing mask and the reason they are giving for that is that they forgot their face mask. Many cities and countries had made it compulsory and started charging fines on those who failed to wear masks. Though many are fined with huge amount multiple times still they are continuously failing to carry their mask with them again the reason was same.

Some digits are shown in table below about covid-19 Patient counts.

Table.1.1 Patient Count in India

	Number of total Patients	Number of deaths	Number of recoveries	Recovery Percentage
Nov-2020	93,09,871	135,752	8717709	93.63
Dec-2020	10,286,310	149,018	9881732	96.06
Jan-2021	10,501,236	152,117	10123652	96.40

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1.4 NEED OF DESIGNING THIS SYSTEM

The main idea behind deigning and making this remainder system was the data which was disclosed by Pune Municipal corporation and Akola Municipal corporation. Pune is a metro city where as Akola is town but the data which was disclosed and was about number of people fined for not wearing face masks while going to their work and for other daily works. Times of India published an article which was on based on the different reason forwarded by people when they were asked about why they are not wearing face mask though it was made compulsory by administrative bodies. Let's have a look at following data published by Municipal corporation.

Number of People fined for Not wearing Masks in PUNE
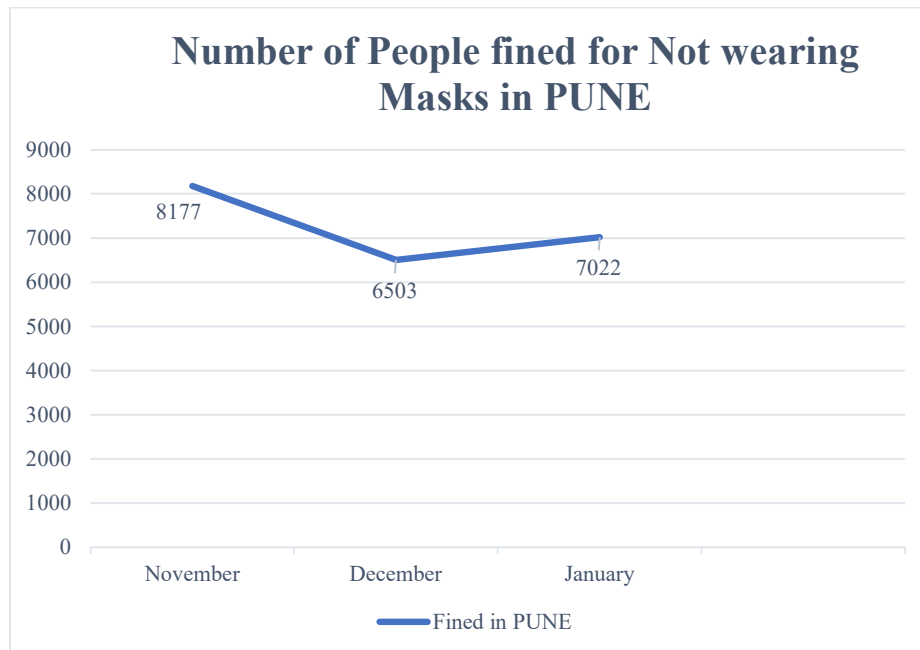
Fig.1.1 Number of people fined in Pune City

By above data it can be concluded that the number of people fined are not negligible now let's look as what is the reason behind this

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Fig.1.2 Survey on different reason for not wearing mask

This was the main idea why we selected this topic for our project.

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CHAPTER TWO

2.1 WORKING METHEDOLOGY

2.1.1 Block Diagram

Diagram given below shows us schematic form of our general arrangement of the parts or components of a complex system or process, such as system components or circuit.
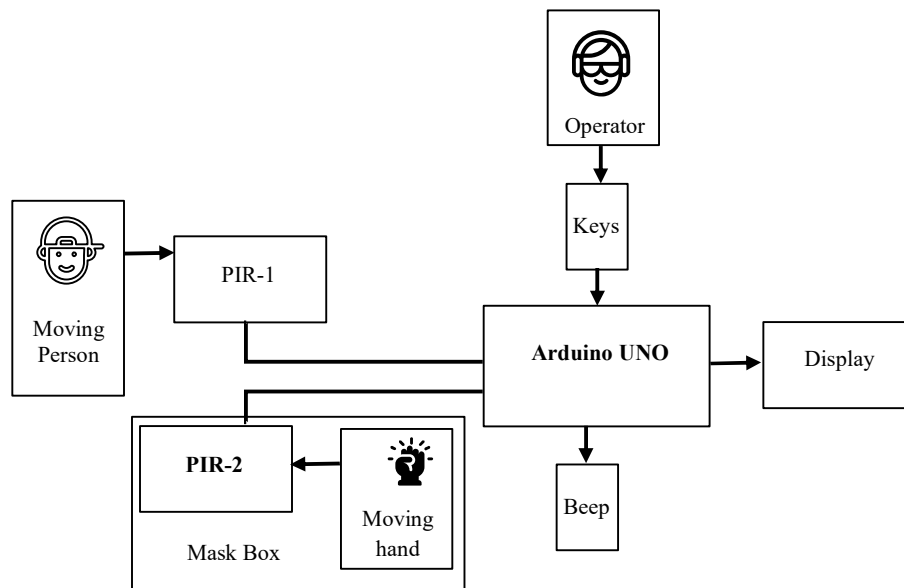
Fig.2.1 Block Diagram of face mask Remainder System

2.1.2 Working

As the main moto of this system is to remind outstepping person about his/ her face mask. Here we will do that using a beep. It will be job of system operator to put 'n' number of masks in mask container (box), let's say maximum capacity of container is of 100 (n=100) masks then t operator will enter same amount to the system using 4 x 4 keypad mounted there. In this initial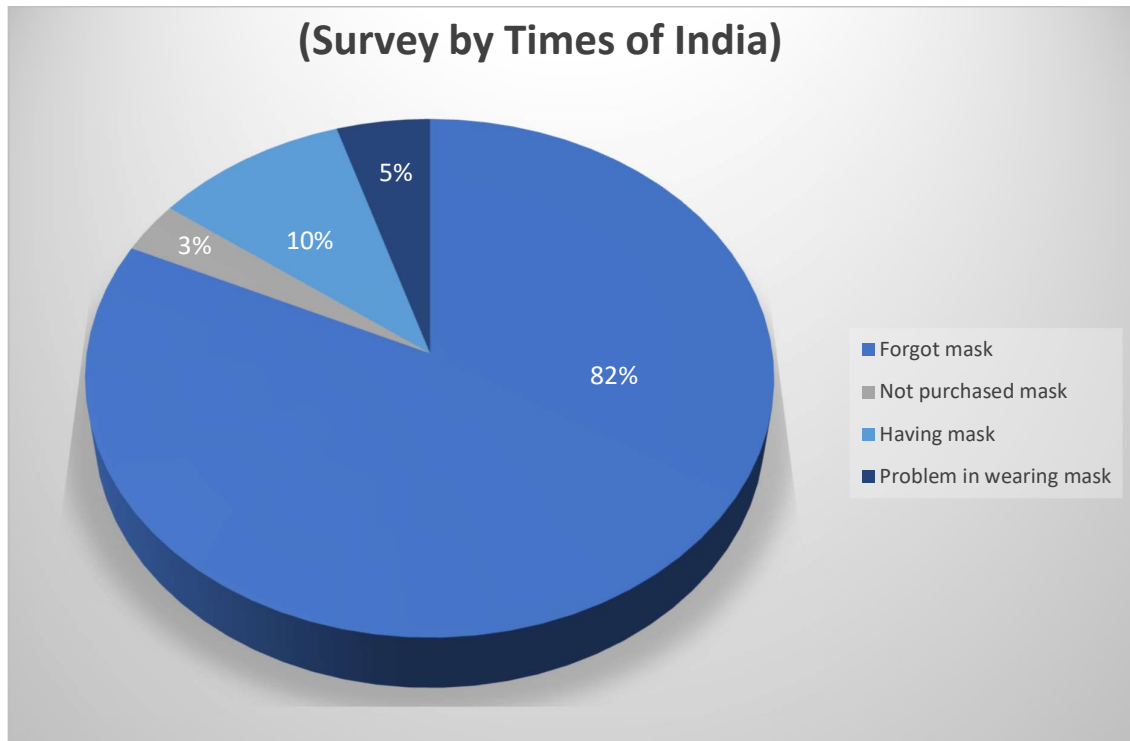ization the maximum number of masks will be saved in system and time passes and decrement in masks present in container starts this saved count will reduce one by one. Till this we can say is the initialization of system.

Fig.2.2 Message- MAX masks

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Now once operator initialize system by putting masks and entering number of masks the real task starts, we are having PIR sensor installed to detect the motion of moving object here let's say outstepping person. Every time when a person passes in front of the sensor that will sense its motion and will send the same signal to Arduino Uno. That signal will enable the buzzer and will beep the buzzer and simultaneously will display the warning message on the LCD screen. Now with some delay LCD will display message advising moving person to pick up mask for him if he's not having his own.
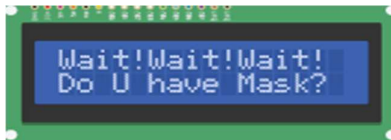
Fig.2.3 Message- WARNING

Fig.2.4 (a) Message-If..yes
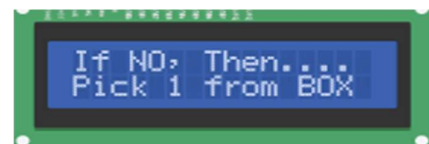
Fig.2.4 (b) Message-If..No

Third step is of decision making for our system, if the person is not wearing his mask then as per the advice given by LCD display, he will pick one mask for him from mask container where we have installed our second PIR sensor, if this sensor detects the motion of hand (which is picking up mask from container) then it will send the signal to Arduino which will decrement the total count which was till now present on LCD display by one. This cycle will continue till the last mask of the container as soon as the container became empty, the pop-up message will display on LCD warning about system is out of mask.
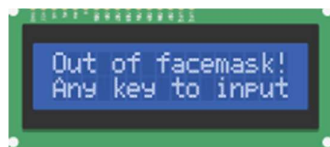
Fig.2.5 Message- Out of mask

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At this point our PIR sensor-1 stops detecting motion till the operator again fill the container with face mask and enter the same number on keypad.

In case, by human error if operator enters the number greater than 100 on keypad then system will not accept that entry and will be displaying invalid number message.

Fig.2.6 Message- Invalid Entry

2.1.3   Circuit Diagram

Figure shown below is circuit diagram of system which we constructed on Tinkercad.
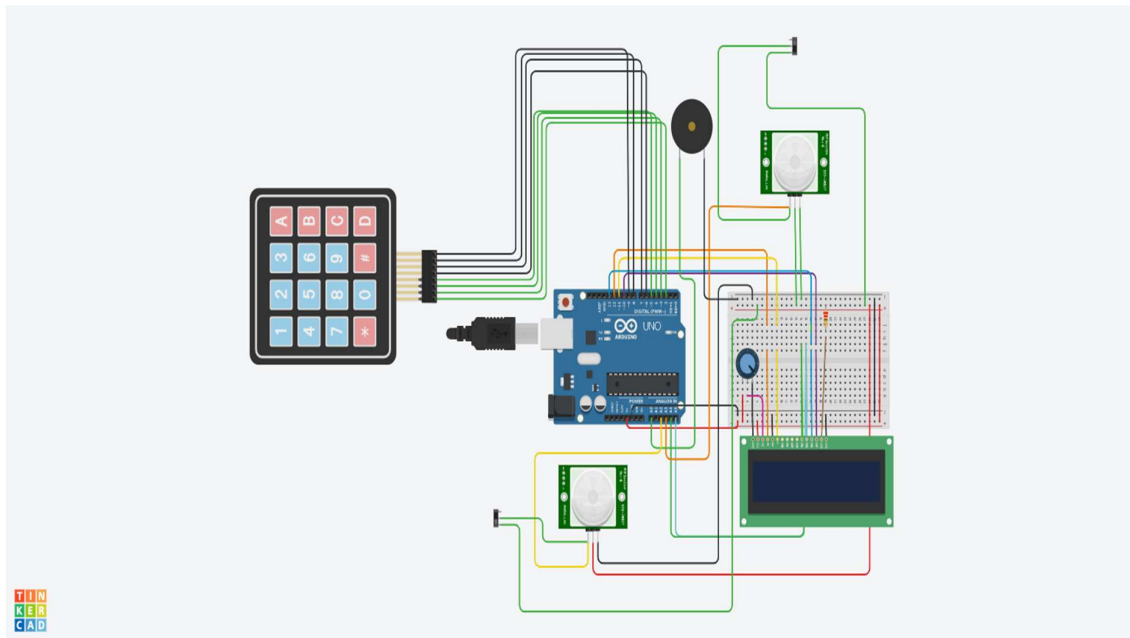
Fig.2.7 Circuit Diagram of Face Mask Remainder System

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CHAPTER THREE

3.1 COMPONENTS USED

We used following components while simulating our system on online platform Tinkercad.

    i.   Arduino UNO

    ii.   Bread Board

    iii.   Multiple Jumper Wire

    iv.   Programming Cable

    v.   PIR Sensor - 2

    vi.   Potentiometer

    vii.   220-ohm Resistor

    viii.   Keypad (4 x 4)

    ix.   Buzzer

    x.   LCD Display (16 x 2)

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3.1.1 Arduino Uno

The Arduino UNO is an open-source microcontroller board based on the Microchip *ATmega328P* microcontroller and developed by Arduino.cc [3]. The board is equipped with set of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits. The board has 14 digital I/O pins (Six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (integrated development environment), via a type B USB cable [4]. It can be powered by the USB cable or by an external 9V battery, though it accepts voltage between 7-20 V. It is similar to the Arduino Nano and Leonardo[5][6]. The hardware reference designed is distributed under a creative common's attributions share alike 2.5 license and is available on the Arduino website.
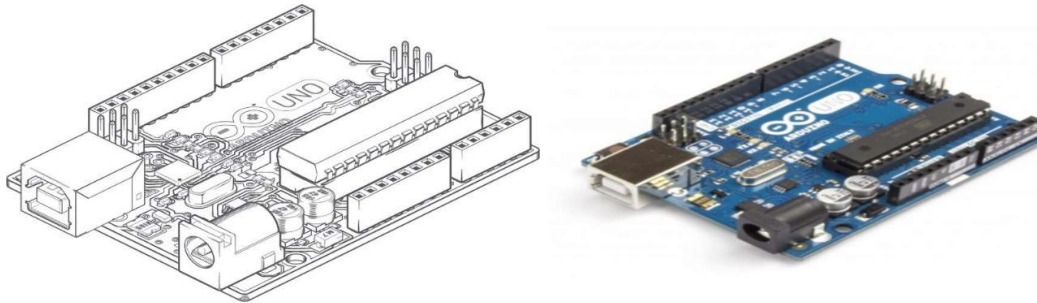
Fig.3.1 Arduino Uno

Below given table describes the pin configurations of Arduino Uno.

Table.3.1 Pin configurations Arduino Uno

Pin Category	Pin Name
Power	V_{in}, 3.3V, 5V, GND
Reset	Reset
Analog pins	A0-A5
I/O Pins	Digital pins 0-13
Serial	0(Rx), 1(Tx)

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External Interrupts	2, 3
PWM	3, 5, 6, 9, 11
Inbuilt LED	13
TWI	TWI
SPI	10(SS), 11(MOSI), 12(MIISO), and 13(SCK)
AREF	AREF

3.1.2   Bread-Board

A breadboard is construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wood used for slicing bread. In the 1970s the solderless breadboard became available and nowadays the term "breadboard" is commonly used to refer all of these.
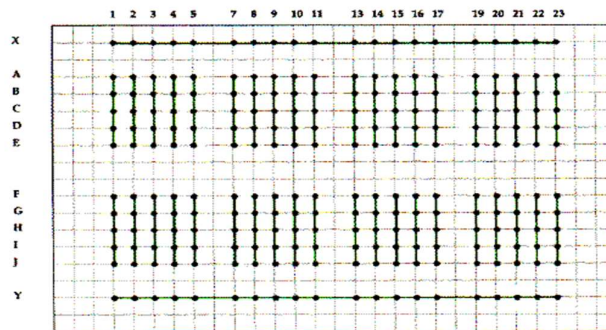
Fig.3.2 Bread Board

Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototype and experimenting with circuit design. For this reason, Solderless breadboard are also popular with students and technological education. Older breadboard types do not have this property. A stripboard and similar prototyping printed circuit boards, which are used to build semi-permanent soldered prototypes or one offs, cannot be reused. A variety of electronic system may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPU).

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3.1.3 Jumper wires

Jumper wire is an electrical wire, or group of them in a cable, with a connector or a pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuits, internally or with other equipment or components without soldering.
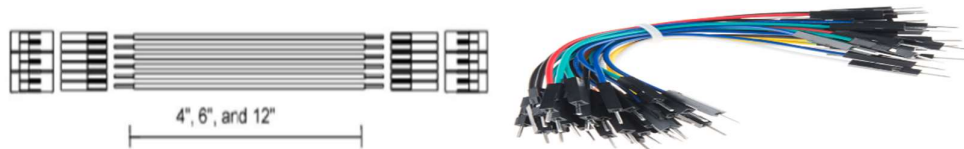
Fig.3.3 Jumper wires

3.1.4 Programming Cable

One of two standard USB connectors, are the USB Type B connector (Technically known as "Standard B" connector) is roughly square in appearance with squarish protrusion on the top. Type B ports are found on many USB non-host devices, such as Arduino Uno, etc.

Fig.3.4 USB type B

3.1.5 Potentiometer

 A Potentiometer is three terminal resistors with sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. We used SINGLE TURN pot.

Fig.3.5 Potentiometer

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Table.3.2 Potentiometer Electronic Symbol

Electronic Symbol	
	(IEC Standard)

The measuring instrument is called potentiometer is essentially a voltage divider used for measuring electric potential(voltages); the component is an implementation of the same principle, hence its name.
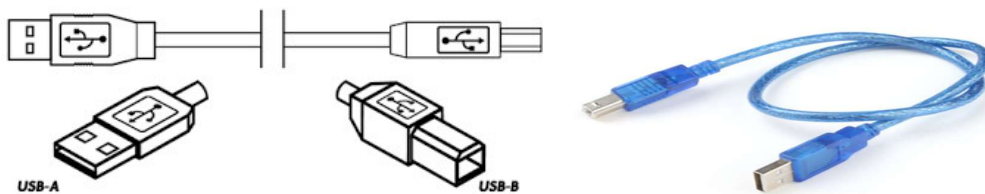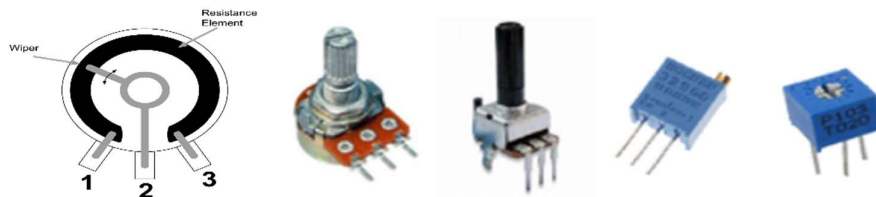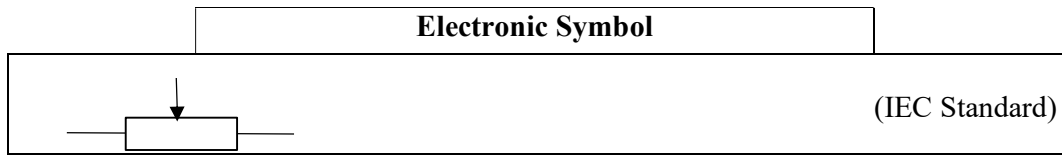
Potentiometer are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometer operated by a mechanism can be used as position transducers.

3.1.6 Resistor 220 ohm

A resistor is passive tow terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage level within circuits, resistors are used to limit current flow, to adjust signal level, bias active elements, and terminate transmission lines among other uses are used to limit current flow, to adjust signal level, bias active elements, and terminate transmission lines among other uses.

Colour code is RED, RED, BROWN, GOLD.

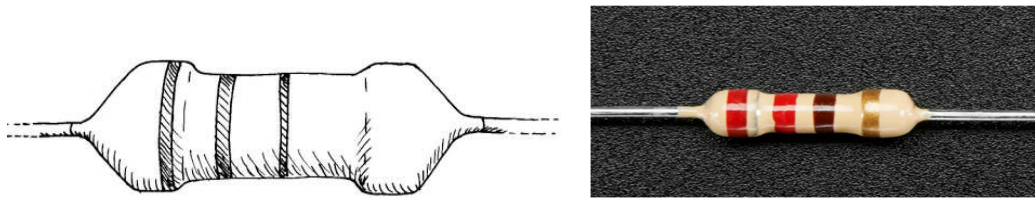**Fig.3.6 Resistor**

Features of 220-ohm ¼ watt resistor
- ➢ Resistance: 220ohm
- ➢ Tolerance: 5%
- ➢ Power rating: ¼ Watt

Applications of 220-ohm ¼ watt resistor
- ➢ Voltage limiter
- ➢ Current Limiter
- ➢ DIY projects requiring impedance matching

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3.1.7 Passive Infrared Sensor (PIR)

The PIR sensor is an electronic sensor that measures infrared (IR) light radiating for objects in its field of view. They are most often used in PIR based motion detectors. PIR sensor are commonly used in security alarms and automatic lightning application.

PIR sensor detects general movements, but do not give information on who or what moved. For that purpose, imaging IR sensor is required.

PIR sensor are commonly called simply "PIR", or sometimes "PID", for "Passive Infrared Detector". The term passive refers to the fact that PIR device do not radiate energy for detection purpose. They work entirely by detecting infrared radiation (Radiant Heat) emitted by or reflected from objects.
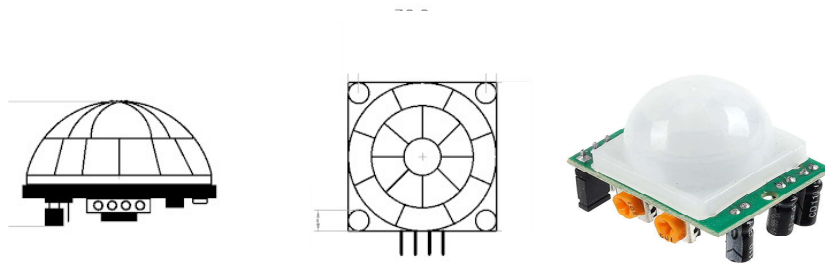
Fig.3.7 Passive Infrared Sensor

Operating Principle: - All objects with temperature above absolute ZERO emit heat energy in the form of electromagnetic radiation. Usually, this radiation isn't visible to human eye because it radiates at infrared wavelength that it can be detected by electronic devised that is designed for the same purpose.

Range of PIR: - Generally it is 10 meters but we used range of 6-8 feet.

Angle between two arms of PIR is 108.6 degrees

Pin configuration of passive infrared sensor is as explained in table below.

Table.3.3 PIR sensor pin configuration

Pin Number	Description
Pin 1	VCC (5V to 12 V)
Pin 2	Output (Motion detection signal)
Pin 3	Ground/ negative connection

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3.1.8 16 x 2 LCD display

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16*2 LCD display is very basic module commonly used in circuits. The 16x2 translates a display 16 characters per line in two such lines. In this LCD character is displayed in a 5x7 pixel matrix. There are 6 pins for contrast, 8 for data and remaining 2 are called background display pins.
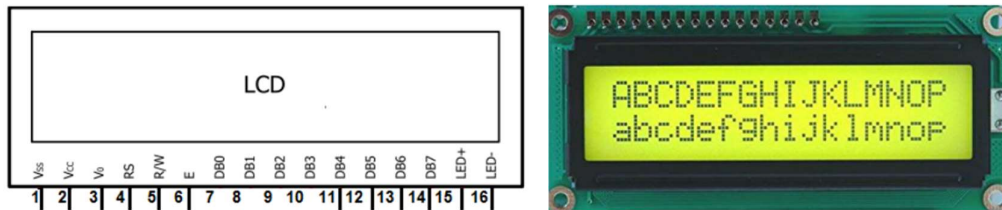
Fig.3.8 16 x 2 Liquid Crystal Display

Pin configuration of LCD display (16 x 2) is as given in table below.

Table.3.4 LCD (16 x 2) pin configuration

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12	Pin 13	Pin 14	Pin 15	Pin 16
GND	VCC	VD	RS	RW	E	D0	D1	D2	D3	D4	D5	D6	D7	5V	GND

3.1.9 Buzzer

Buzzer or beeper is audio signalling device. Which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzer and beepers include alarm device, timers and conformation of user input in this system we are applying the later one.

Fig.3.9 Buzzer

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3.1.10 Keypad 4 x 4

Keypad 4x4 is used for loading numeric values into the microcontroller. It consists of 16 buttons arranges in a form of array containing four lines and four columns. It is connected to the development system by regular IDC 10 female connectors plugged in some development system's port.

Fig.3.10 Keypad (4 x 4)

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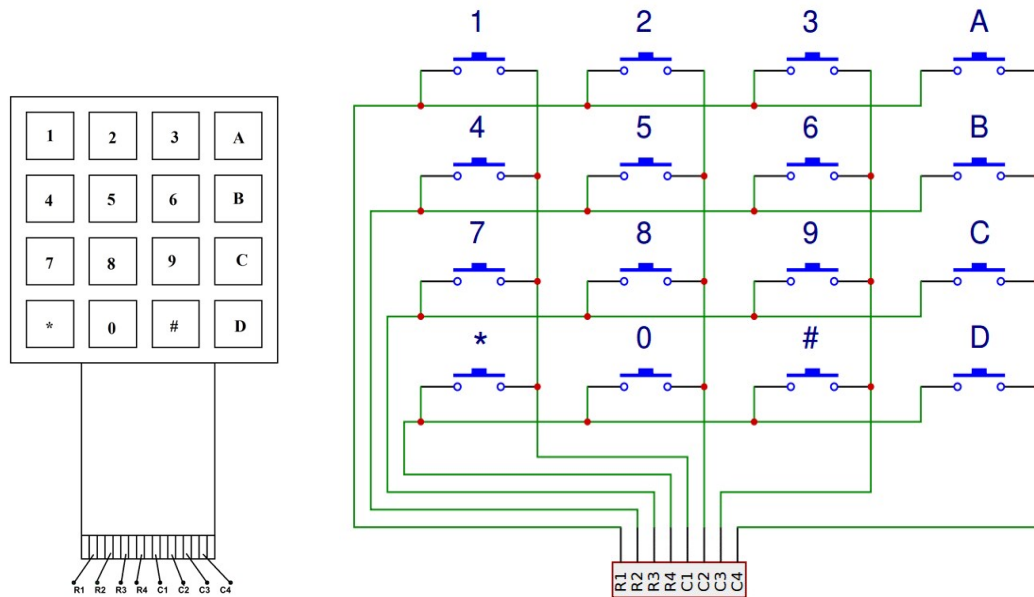Dr. Babasaheb Ambedkar Technological University, Lonere.

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CHAPTER FOUR

4.1 CODE

Programmer needs to install two libraries at the beginning of code

1) Liquidcrystal.h
2) Keypad.h

Liquidcrystal.h is for LCD display and keypad.h is for keypad.

In our overall code we are making use of four while loops and some if loops, in void setup we will setup our LCD display and in void loop we will play with loops and will setup keypad buttons according to our requirement.

4.2 IDE USED FOR ARDUINO PROGRAMMING

The Arduino Integrated Development Environment is a cross-platform application that is written in function from C and C++. In is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards. It is available for free on Windows, macOS, Linux which has a recent release on 16 June 2020 which was version 1.8.13. It has LGPL or GPL license which support C and C++ languages.

Fig.4.1 Arduino IDE

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4.3 TINKERCAD

TINKERCAD is a free, easy-to-use app for 3D design, electronics and coding. It's used by teachers, kids, hobbyists, and designers to imagine, design and make anything. Tinkercad is free simulation platform for Arduino circuits and have many components available to their library. Kai Backman the creator of Tinkercad who was former engineer at google first created it for designing purpose and then moved forward in circuit.

Fig.4.2 Tinkercad

Link of simulation of this system is given below

https://www.tinkercad.com/things/humIxETeE0B-face-mask-remainder-system-using-arduino/editel?sharecode=G3WSGaL86iPqyxj3ZJ9m24kE6-Uigg5zglc3UPOLuNk

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CHAPTER FIVE

5.1 ADVANTAGES OF THIS SYSTEM

- ➢ The main advantage of this system is that we will not forget our mask anymore.
- ➢ Use of two PIR sensors enable us to reduce number of contacts with keypad which may cause in spreading infection.
- ➢ Machines helps us in improving performance the same will be seen here the counting system using LCD and PIR sensors will keep accurate count of masks present in container.

5.2 EXPECTED WAYS IN WHICH SYSTEM CAN BE WRONGLY MANIPULATED

- ➢ Putting hand in mask box and not picking up mask from it.
- ➢ Entering false amount of mask at initialization step.
- ➢ Giving false motion signals to PIR sensors.
- ➢ Not following advices which were displayed on LCD screen.

5.3 PLACES WHERE WE CAN USE THIS SYSTEM

- ➢ Educational Institutes
- ➢ Police stations and Administrative Buildings.
- ➢ In housing societies.
- ➢ In Corporate offices.
- ➢ In temples.

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CHAPTER SIX

6.1 FUTURE SCOPE

The current design we are having is made for face mask remainder but we can surely make a design a prototype for sanitizer remainder which will remind every entering person to sanitize his hands and things he is carrying.

Using same building principle, we can also develop:

> ➤ Automatic Sanitizing Machine.
> ➤ Attendance System.
> ➤ Vaccination counting machine.

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CONCLUSION

The main issue that many of the people are getting fined as shown in survey they will not get finned and the most important thing this system will help citizens in keeping their face masks with them. We human being having natural tendency of forgetting things of our daily use now mask being one of them. So, this system is smart solution to our human tendency.

The system we designed is with simple PIR sensor and it is in budget so that it can be installed at every office and housing society

We were successful in developing this system from scratch which will help some people for not getting infected with this fatal virus. Though many surveys are showing that the danger of Corona is now about to extinct and different vaccines are being developed throughout the world but we still need to stick with basic guidelines by governing bodies, wearing Face mask is at their top.

The future advancement in this system can help us more by reminding us about sanitizing our hands every time before entering home.

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