Detection of Covid-19 Symptoms using Arduino

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Abstract--- The Coronavirus COVID-19 pandemic is the defining global health crisis of our time and the greatest challenge we have faced since World War two.

Scientists first identified a human Coronavirus 1965. It caused common cold. Later that decade, researchers found a group of similar human and animal viruses and name them after the their crown like appearance.

Seven coronaviruses can infect humans. The one that causes SARS emerged in southern China in 2002 and quickly spread to 28 other countries. More than 8000 people were infected by July 2003 and 774 died. Signs and symptoms include respiratory symptoms and include fever, cough and shortness of breath. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome and sometimes death. To prevent the spread of Covid -19 various measures have been taken.

In our project we use automatic hand sanitizer with Ultrasonic sensor that uses ultrasonic sound waves to detect the object which saves time and produces better results. It can reduce the risk of spreading infections between coworkers. This allows for minimal contact with other surfaces and has stronger bacteria killing agent than average hand soap. The temperature is detected using Ultrasonic sensor HC-SR04 and Infrared thermometer MLX90614. This contactless temperature detector does not need to be operated by a human hence reducing the chance of getting infected. A pulse oximeter is a painless and reliable way for clinicians to measure a person's blood oxygen levels, this is done by using MAX30100.

Keywords--- Arduino UNO board, MAX30 sensor1, MLX9061 sensor, Ultrasonic sensor

I. INTRODUCTION

The COVID-19 pandemic has proven to be more than just a threat to our health: it's become a disruption of our way of life, affecting, to the way we love, to what is considered essential work. How are we to think about and live amidst this "new normal"? the answer for this question is, we have to take care by ourself. this project helps us to track our temperature and oxygen level detection with contact less and automatically drop of hand sanitization. The main objective of this project is to stop the spread of covid-19 infection from one person to another and to detect the symptoms quickly.

- Firstly, automatic hand sanitization allows for minimal contact with other surfaces and has stronger bacteria killing agent than the average hand soap.
- Secondly, contactless Thermometer does not need to be operated by a human, hence reducing the chance of getting infected.
- Thirdly, according to survey Covid-19 patients are found with lower oxygen rate and that's where a small device called Pulse Oximeter plays an important role. For early detection of COVID-19 pneumonia pulse oximeter plays a vital role.

II. LITERATURE SURVEY

[1]. In [1], the paper mainly says about the hospital grasped infections, which is about 2 million Patients per year and also says that it is 8th leading cause for deaths annually in USA. It also says that handwashing is important and also effective with proper hand washing steps, but washing with soap and water is time consuming for peak hours in hospitals. This paper also showed the effectiveness of the alcohol-based hand sanitizers, which reduced infection rates by whopping 30%. They used hand sanitizers with 60 to 70 percent ethanol or isopropanol for reducing significant number of pathogens. The patients were also given about ounce containers of hand

In [2], the paper says about the infection caused by drug resistant micro-organisms which causes increase in death rate and also complications, the multidrug resistant bacteria include Methicillin Resistant Staphylococcus aureus (MRSA), Extended Spectrum Beta-lactamase (ESBL) producing bacteria, Multidrug Resistant Pseudomonas aeruginosa (MDRP), which are very common worldwide.

Several antibiotics have increasing multidrug bacteria isolation rate, even personal protection equipment (PPE) can't be effective in isolation rate of MSRA. Hence, they emphasize about the use of alcohol-based hand sanitizers since the alcohol-based hand sanitizers had negative association with MRSA isolation rate, which means that hand hygiene is very important in hospitals.

In [3], the paper says about emergence of the novel Coronavirus (SARS-CoV-2), which has caused unexpected challenges to health of the people of this world, the paper also aims at reducing the transmission rate of the disease.

The paper explains about the virus structure and how is it different from that of the bacterial structure, which means that virus has single stranded or double stranded RNA or DNA encapsulated in capsid and virus can replicate only in presence of a host and described as living entities. Bacteria also has almost the same structure including DNA or RNA along with Cell. Membrane and can replicate without a host. The paper also gives a complete comparison between hand sanitizers and soap, foam vs gel, and it says that high concentration of ethanol can reduce the amount of virus particle present in the hand and hence proves the effectiveness of alcohol-based hand sanitizer.

[2]. Several projects on indoor quality monitoring are available in the literature, particularly, infrared temperature sensors have been used for numerous applications in diverse research fields. Various IoT architectures for indoor monitoring that incorporates open-source technologies for processing and data transmission and microsensors for data acquisition.

A thermometer that uses infrared sensors to detect temperature without contact is designed is proposed by [4]. The proposed system incorporates an MLX90614 temperature sensor to collect human or object temperature and an LCD to display and alarm when over-temperature. This system must be placed in the forehead for a few seconds to get the body temperature, to alarm once the set value is exceeded. A real-time human body surface non-contact temperature monitoring system for optical rehabilitation therapy has been proposed by [5]. The system error is less than 0.2 and the response time is less than 0.1s considering 0-60cm distance range.

A non-contact liquid security identification system has been developed by [6] using a non-contact infrared thermometer. The system incorporates an MLX90614 sensor and an STM32F107 microprocessor. The authors claim that the system meets the requirements of high reliability, low-cost, low power consumption, real-time response and the demands of the non-contact liquid security identification system.

A study on the potential of infrared thermometry and thermal imaging for monitoring plant water stress in a commercial sugar beet field by comparing canopy temperature data acquired from a conventional thermal camera with a

cost-effective infrared sensor (MLX90614), both mounted on a rotary-wing unmanned aerial vehicle (UAV) was conducted by [7]. Results indicated that the lightweight canopy temperature system was robust and reliable.

In conclusion, several applications using infrared temperature sensors has been done in the past, however, no one of the solutions provide an IoT architecture approach [3]. Chechias in [9], The major challenge is of the accuracy,

validity and integrity of measurement data with other devices. Thirdly, the usability and the experiences of the user with the device and its friendly supporting software play vital role in continuing regular and long period use of wearable tracking devices. The use of Internet of Things (IoT) and its e-Health applications in the Tele-medicine health system leads to seamless flow of information between doctors and patients, thus making healthcare cost effective and improving the quality of patient's treatment.

Pramila in [10], Being a long-range wireless technology, various conditions of the patient's health is detected quickly and timed interventions as per the collected data leads to save the life of the patient. Due to costly healthcare and higher waiting time in hospitals, the in-home patient monitoring system concept have emerged in the recent years. This system acquires data of body parameters through biosensors, wearable devices and smart textiles and transmits it to the central node server securely with the use of Cipher Text Policy Attribute Based Encryption method. In turn, the collected data is shared to the hospitals via the respected server for further treatment. Various alarming systems are used to alert the ambulance during emergency. This method is very beneficial for elders and chronic patients who require continuous monitoring.

M. S. S. P in [11], The main challenge that this paper has overcome is to make elders equipped for growing new International Journal of Pure and Applied Mathematics Special Issue 250 technologies and to increase familiarity towards Smartphone, computer, etc. IoT based Smart healthcare with the help of smart devices improves the healthcare monitoring effectively by reducing the inefficiency of existing healthcare system. Smart devices with new and upgraded technologies enhances accuracy of the data for collection, real-time accessibility of patient's condition, integration of collected data intelligently by maintaining the integrated data smartly through cloud service, etc.

Jaiswal in [12], IoT and cloud computing plays a vital role in present tele-monitoring health system. This system keeps track physiological parameters of patient through collection of data from body sensors using my Rio. The doctor's healthcare is improved and displayed on a webpage where doctors and patients are able to access and communicate each other without physical presence.

Gómez in [13], Internet of Things with smart devices reduce complexity and complications in the health monitoring system. The involvement of mobile technologies and smart devices in health monitoring system have caused a huge impact on the world. The full-fledged utilization of M-health and E-health applications in the present world makes people aware in improving and maintaining the good quality of life. Apart from regular

monitoring of patient's condition through M-health systems, the main objective is to educate them about health by recommendations of healthy eating habits and effective fitness routines for improving their quality of healthy life

III. INCIDENT

29 May 2020
Over thirty countries and multiple international partners and institutions have signed up to support the COVID-19 Technology Access Pool (C-TAP) an initiative aimed at making vaccines, tests, treatments and other health technologies to fight COVID-19 accessible to all.

21 May 2020
Compared with only using COVID-19 confirmed deaths as a measure of impact, rapid mortality surveillance generates daily or weekly counts of mortality data by age, sex, date of death, place of death and place of usual residence.
Tragedy struck Maharashtra's Palghar district on Friday morning when 13 Covid-19 patients under treatment at a hospital's intensive care unit died in a blaze incident.
The fire broke out in the ICU on the second floor of the four-storeyed Vijay Vallabh Hospital at Virar shortly.

IV. PROPOSED WORK

The automatic sanitizer dispenser solves the problem on two levels. One, it eliminates the need of soap and water for sanitization of hands. Two, it minimizes the touch points and thus achieving effective sanitization. The infrared or non-contact thermometer clearly offers a distinct advantage over contact measurement due to its ability to determine accurately the target object's temperature without any physical contact. Pulse oximeter provide feedback about the effectiveness of breathing interventions, such as oxygen therapy and ventilators. The main objective of this project is to stop the spread of covid-19 infection from one person to another and to detect the symptoms quickly. Firstly, automatic hand sanitization allows for minimal contact with other surfaces and has stronger bacteria killing agent than the average hand soap. Secondly, contactless Thermometer does not need to be operated by a human, hence reducing the chance of getting infected. Thirdly, according to survey Covid-19 patients are found with lower oxygen rate and that's where a small device called Pulse Oximeter plays an important role. For early detection of COVID-19 pneumonia pulse oximeter plays a vital role.

V. BLOCK DIAGRAM
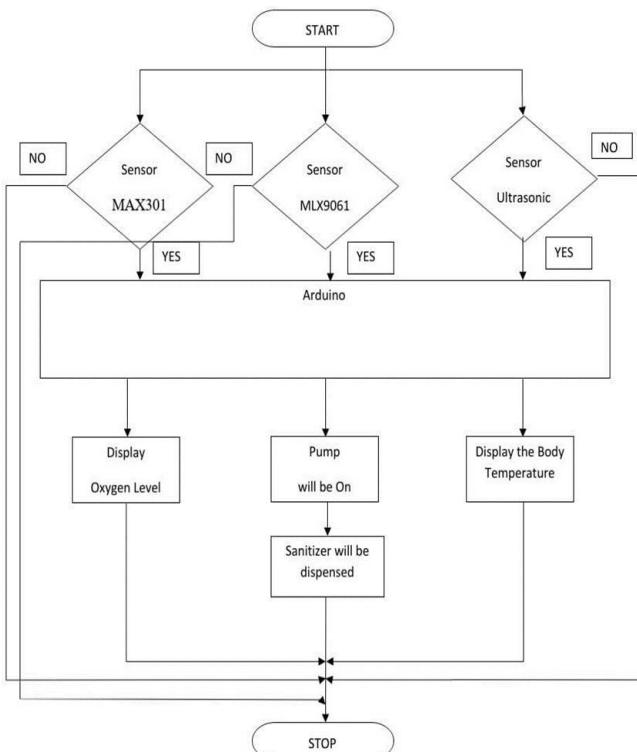
VI. METHODOLOGY

STEP1: detection of temperature without contact
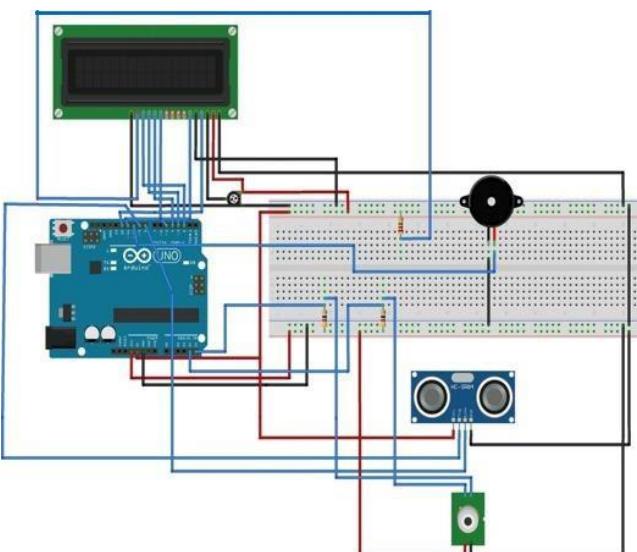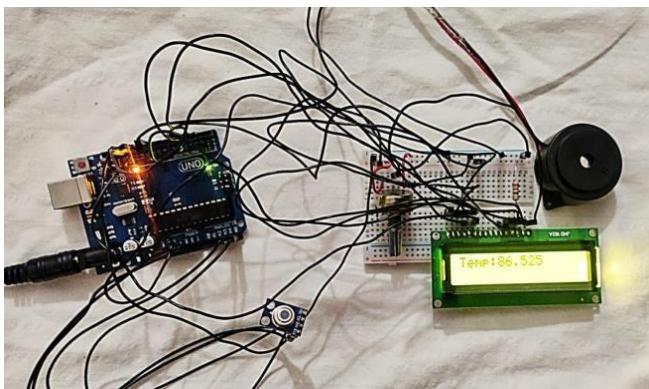
STEP2: automatic and contactless hand sanitizer

STEP3: oxygen level detection

Max30100
oximter with LCD
electroniclinic.com
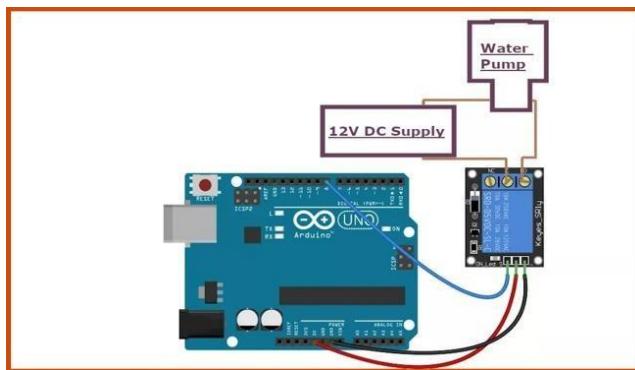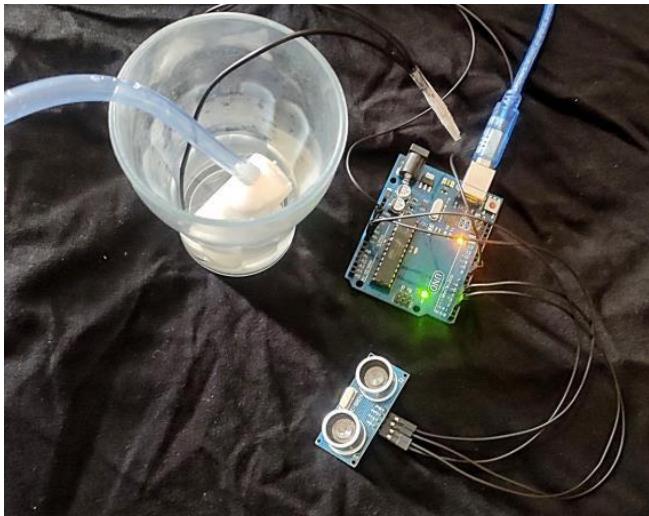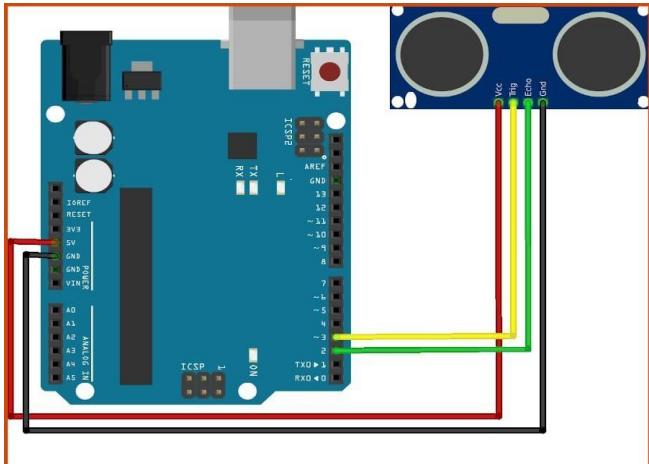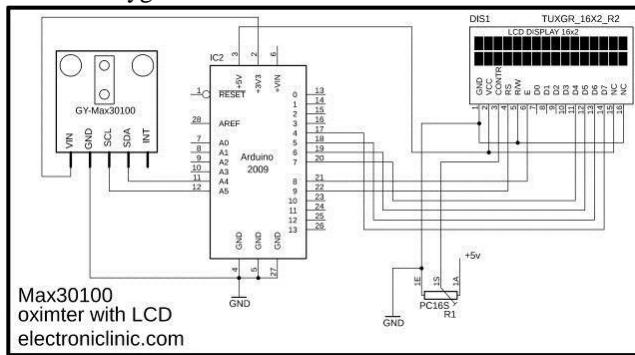
The following components are used:

1. ARDUINO UNO

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button. Input/Output Pins: Digital Pins 0 - 13Analog Pins: A0 – A5Power: Vin, 3.3V, 5V, GND Serial: 0(Rx), 1(Tx)

Arduino Uno Pinout Diagram
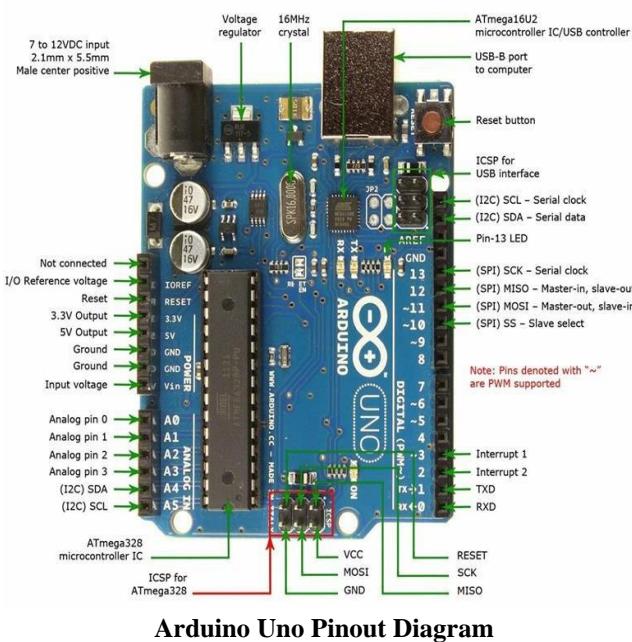
2. ULTRASONIC SENSOR HC-SR 04

An ultrasonic sensor measures the distance between its transmitter and an obstacle in front using ultrasonic sound waves (operational at 40 KHz) beyond the human audible sound wave range. The transmitter element sends out the ultrasonic wave which is reflected from the target and is picked up by the receiver module. Using the time-of-flight principle and the known speed of sound (~340 m/s), the distance between the sensor and the target is calculated.


Ultrasonic Sensor HC-SR 04
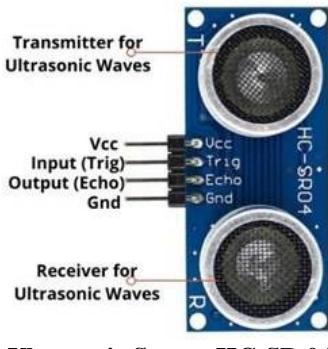
3. 2 CHANNEL RELAY MODULES

2-Channel 5V Relay Module is a relay interface board, it can be controlled directly by a wide range of microcontrollers such as Arduino, AVR, PIC, ARM and so on. It uses a

low-level triggered control signal (3.3-5VDC) to control the relay. Triggering the relay operates the normally open or normally closed contacts. This module contains two relays

that are electrically isolated from the controlling input. The relays can be used to switch higher voltage and current loads than a microcontroller can traditionally accomplish.
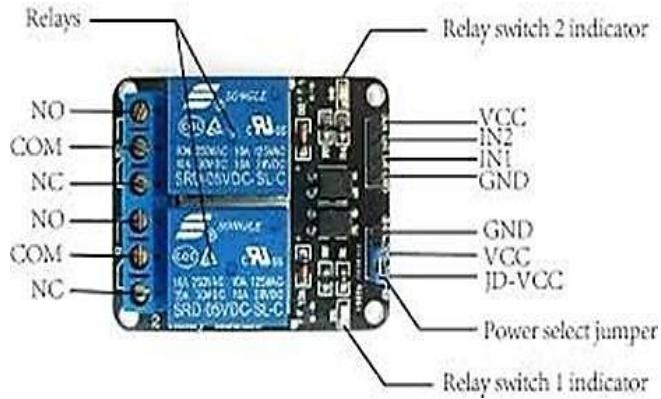

2 Channel relay module pinout

4. MLX 90614 IR TEMPERATURE SENSOR

MLX90614 is an IR Temperature sensor for non-contact temperature measurements. It has an I2C Interface to communicate with microcontroller. Here we use Arduino Nano as microcontroller. This temperature sensor can measure the temperature without touch the object. It has 0.5 degree Celsius over a wide range of temperature.
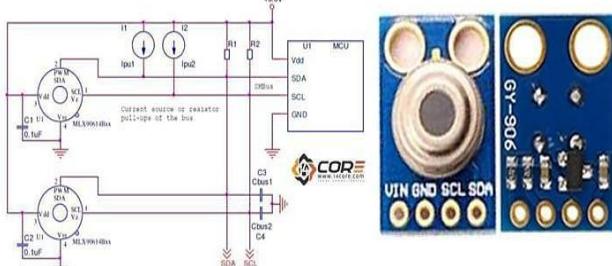
MLX90614 IR Temperature Sensor Circuit Diagram 5. MAX 30100

The MAX30100 is an integrated pulse Oximetry and heartrate monitor sensor solution. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse Oximetry and heart-rate signals. The max30100 sensor is a Pulse Oximetry and heart rate monitor which is used to check the health of a person with any condition that affects blood oxygen levels, such as: Heart Attack Heart failure Lungs Cancer Asthma etc.
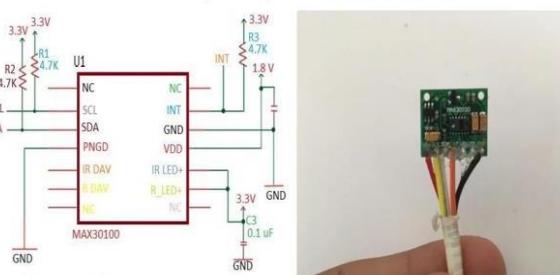
MAX30100 Pulse Oximeter Circuit Diagram66

VII.   SOFTWARE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

• Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.

• It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

• It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.

• The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.

VIII.   ADVANTAGES

Advantages of automatic hand sanitizer:

1. Automatic:

The first and foremost advantage of an automatic sanitizer dispenser is that it provides a truly touchless experience. There is no hassle of pressing a button or a handle (as in the case of foot-operated ones). These dispensers have ultrasonic sensors that release the sanitizer once you keep your hands below the nozzle. It's fast, safe, and simply more efficient.

2. Easy to use:

For every appliance, the ease of use is what determines its feasibility. While choosing a sanitizer dispenser, you will want something that will be easy to use, unlike the manual ones.

3. Delivers a standard dose:

One of the biggest advantages of an automatic hand sanitizer dispenser machine is that it offers a standard amount that is enough to clean both hands.

These standardized doses are usually sprayed on the hands, which causes minimum to no wastage, unlike manual ones, which releases extra sanitizer at times.

4. Eliminates a contact point:

Manual hand sanitizers require pushing the pump to release sanitizer. Touching the pump can spread a lot of germs, as people with dirty hands also use it.

With touchless hand sanitizer dispensers, there is no common contact point, which means less or no germs will be transferred from one person to another.

5. Modern appearance:

Contactless hand sanitizer dispensers usually have a sleek and stylish design. They also add a modern appeal to places they are installed in.

If you install a contactless hand sanitizer dispenser at your workplace, then you are indeed giving a high-end vibe to your environment.

Advantages of Contactless temperature:

1. Measurements can be taken from a distance for hot surfaces and objects or for food service purposes where items should not be touched or contaminated. They are excellent for surface measurements

2. Measurements can also be taken of moving parts.

3. Infrared thermometers operate well for a variety of applications

4. Memory and advanced measurement functionality is available

5. They are compact, lightweight, and easy to use

Advantages of pulse oximetry include: 1.monitoring oxygen saturation over time.

1. Alerting to dangerously low oxygen levels, particularly in newborns

2. Offering peace of mind to people with chronic respiratory or cardiovascular conditions.

3. Assessing the need for supplemental oxygen.

4. Monitoring oxygen saturation levels in people under anesthesia.

5. Indicating dangerous side effects in people taking drugs that affect breathing or oxygen saturation

IX.   APPLICATIONS

The applications of automatic hand sanitizer dispensers. An increasing number of public locations and private institutions have been incorporating touchless technology.

1. Public places.

The model is great to use in your household, office, hotels, restaurants, shopping malls, etc. The next best thing about the product is its massive capacity of 1200 ml that is ideal for long term usage without the need for frequent refilling.Public washrooms were permeated by automatic technology.

Touch-free technology has become a formal part of modern washroom facilities.

2. Hospital setting.

The advances of hygiene such as that automatic sanitizer dispenser can be considered as one of the more silent victories of public health and continues to be an important disease prevention strategy, even in this "modern" era when the "gospel of germs" has waned in popularity.

Applications of Contactless Temperature using MLX90614 sensor:

1.Temperature Measurement of moving objects. 2.Industrial Thermal Gun.
3.Human Body Temperature Measurement. 4.Home/Office Temperature Control.
5.Livestock Monitoring. 6.Movement Detection.

Applications of pulse oximeter:

The pulse oximeter has already found a number of clinical applications outside of the operating room, such as monitoring during patient transport, respiratory monitoring during narcotic administration, and evaluation of
home-oxygen therapy.

X. OUTCOMES

The automatic hand sanitizer device proposed in this paper is ultimately expected to contribute to contactless hand disinfection in public places and virus infection prevention. Additionally, it is economical and eco-friendly by decreasing waste emissions. Using a MLX90614 infrared non-contact temperature sensor and LCD screen we measure temperature in °C and °F.

Each object emits infrared waves, depending on its heat. We can detect their temperature. The pulse oximeter observes a rapid measurement of oxygen saturation level in your body without using needles or taking a blood sample. The measured amount shown on the screen reflects the saturation of your red blood cells with oxygen.

XI. CONCLUSION.

The novel of COVID-19 spread so rapidly, that it has changes the rhythm of globe.After we over come of this pandemic, we should be prepared with the advanced technology for that we have to install these sensors.
This pandemic is not a new in Human history . We have to admit that COVID-19 has shown example for lack of humanitarianism.

We should be ready to co –operate with all those who are willing to work on the principles of sincerity and consideration of each other interest and concern

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