# Smart Sanitizer Dispenser

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***Abstract-*** *Smart hand sanitizer is an automatic device which can be used to measure the temperature of the person as well as measure the Saturated blood oxygen level[spO2] of the person with the help of oximeter and also sanitizes the hand. The temperature of the person is measured by Infra-red temperature sensor, an IR proximity sensor is used to detect the hand of about 4 cm and then the hands will be sanitized and spO2 is measured using oximeter.*

*The Iso-Propyl Alcohol or n-propanol in the sanitizer is almost 70 percent and ensures safety. By this type of automation, we can eliminate a workforce and also it is safer for the people who are using this device, since the person who is sanitizing the hands of the people has a high level of vulnerability and probability for the spread of contagious virus. Since the efficiency of sanitizing the hands is lot higher, we can able to save lot of sanitizers.*

***Keywords***- Oximeter, Infra-red temperature sensor, IR proximity sensor, Saturated blood oxygen level

## I. INTRODUCTION

In this pandemic situation, even though vaccines have been made to prevent the spread of Covid-19 virus, there are still possibilities for mutation of virus and also uprising of Covid-19 cases. So, we need to take a serious step towards preventing it by the existing technology. The currently available noncontact automatic hand sanitizing dispenser equipped with temperature sensor is able to measure the person's temperature while dispensing sanitizer. Our smart hand sanitizer which checks the temperature and have good efficiency of using the sanitizer. Hand sanitizers need to have an alcohol content between 60% and 95% and they are usually isopropyl alcohol, ethanol (ethyl alcohol), or n-propanol. Alcohol-based sanitizers are known to be able to kill bacteria and viruses effectively when used externally. In our smart hand sanitizing dispenser, we have included oximeter for checking the blood oxygen level (spO2) and Infrared temperature sensor for checking the temperature of the person and used a submersible pump for sanitizing hands and also used proximity sensors for ensuring non-contact beforehand sanitizing.

### 1.1.PROBLEM STATEMENT

During this pandemic situation hand sanitizers are being used morethan ever, to remove germs and virus, to minimize the risk of infection. While sanitizing the hands there will be a huge crowd standing in front of those people who are sanitizing, which creates a high vulnerability of those who are handling it. However public hand sanitizers are being used daily by many people so touching the sanitize creates the risk of infection

### 1.2.OBJECTIVE

- To reduce the time of sanitization.
- To measure the temperature without any contact.
- To sanitize the hand without any intervention of human.
- To measure the blood oxygen level.
- To identify the infected person.

And more importantly to integrate everything as a Single device.

## II. LITERATURE REVIEW

### 2.1. INTRODUCTION

In the present world, it is difficult to apply knowledge into automation field and expect changes in a day. It takes years of hard work, dedication and creativity to make an automated system to serve a purpose. We also do realize that other people are also working in the same field in order to develop a better tomorrow. So, it necessitates us to learn about other technologies being developed simultaneously, thereby helping us to adapt and connect to the changing world. In this section, we will discuss about the technologies developed so far, individually and the technologies incorporated in our system along with the modifications.

We proposed about the research, observation and finding that have been made regarding this project field. The biggest advantage of human beings are we are the best creatures in adapting towards the situation. All the related research papers and journals that provide thought and concept concerning this project ground also is explained into a simple means.

**2.1.1 Based on automatic hand sanitizer**

**Eddy Yusufa,b et al.,(2019)** are reported the work on There is new broad health crisis bargaining the world with the ascent and flare-up of 2019 novel coronavirus (2019-nCoV) or the genuine extraordinary respiratory condition coronavirus 2 (SARS-CoV-2). It has spread to the world and tainted people with Covid-19 infection. Other than the nonappearance of unequivocal treatment and immunization, covid19 are right now known to uncover a gigantic environmental obstruction. The transmission of the disease was viewed as spread through person-to-person that make it easily diffuse. The infection spreading starts from the infected droplets during sneezing or coughing. These droplets can in any case live on inanimate surface even in air and transmitted the infection to human. In order to reduce the spread of coronavirus, any contacts between people and potential carriers of the virus have to be limited. In current circumstances, social distancing and constant disinfection of public places become a necessity. Though, nowadays it is essential to sanitize hands, touching the same bottle surface already used by someone may increase the risk of contamination. Thus, suitable assessment for efficiency of the antiseptics disinfectants is a crucial matter. The aim of this study is todesign and develop a smart contactless hand sanitizer-dispensing system using Iot based robotics technology. On this reason, the robot functionality has been examined. What's more, the presented system has ability to hand disinfect with less time consuming and minimal human interactions.

**Juhui Lee *et al., (*2020)** are reported the work on hand sanitizers, since the coronavirus broke out andspread around the world. Hand sanitizers are usually applied by squirting the sanitizer liquid when one presses a pump with one's hand. This causes many people to come into contact with the pump handle, which increases the risk of viral transmission. Some hand sanitizers on the market are automatically pumped. However, because sanitizer containers and pump devices are designed to be compatible only between products produced by the same manufacturer, consumers must also repurchase the container for the liquid if they replace the hand sanitizer. Therefore, this paper suggests the design of an automatic hand sanitizer system compatible with various sanitizer containers.

**Puput Wanarti Rusimamto *et al., (*2020)** are reported the work on COVID pandemic has influenced human life in various sectors. Various attempts were made to reduce the virus transferring by work from home, social distancing, and also including hand hygiene. So far, most of the available hand sanitizers do not operate automatically. This article aims to make an automatic hand sanitizer where soap and water can come out automatically. Besides that, automated hand sanitizer will make notification to the owner, if the liquid has run out to the smartphone. The infrared (IR) will sense the presence of heat and motion of the object with the distance up to 50mm. It sends data to the Arduino Nano to activate the pump. If the ultrasonic sensor detects the distance of water to the sensor 35 cm it will send data to node MCU that connect to Blink server. It can transfer the data to the output devices such as smartphones or PC based on the Internet of Things (IoT). The results of the hand sanitizer testing that the system can run smoothly with a minimum detection error of transferring data.

**M. Srihari (2020)** are reported the work on automatic hand wash sanitizer. The motor pumps the sanitizer liquid or solution to the human while detecting the IR Sensor. The IR Sensor is the photodiode used for sensing the human hand detection and it is used to control the motor pump from the liquid. The motor is connected to an RC timer delay setup and the pipe connected to a reducer are used to control the flowing liquid of the sanitizer. It has three modes of Control LED's in the system, White LED is used for the user to understand that the setup is in working mode and battery is in use. Red LED is used for the user to understand that Battery is in charging mode. Green LED is used for the user to understand that battery is in full charged mode. It has On/ Off switch to control the whole setup from the battery supply. The consumer is convenient to use the setup and the user also saves costs and power.

**Meini Sondang Sumbawati et al., *(*2020)**are reported the work of government through the Ministry of Education and Culture (Kemendikbud) has made a decision to suspend teaching and learning activities in schools. The learning process that starts face to face directly in the classroom turns into distance learning /brave. However, the government decided to reopen schools in the Covid-19 corona virus green zone for teaching and learning activities for students. The opening of special schools in the green zone will be held in midJuly 2020. School openings must be opened with strict health protocols, no updated potential for new Covid-19 clusters in schools. This is a form of application of the "New Normal" that is being adapted to the people of Indonesia. Indonesian people must consider the existence of this corona virus pandemic with new normalcy, such as using a compilation mask outside the home, always using a hand compass tool and using a loudspeaker and distance measuring device. The purpose of this study was to make an automated hand sanitizer design as an effort to improve the delivery of Covid-19 in schools. Automatic hand sanitizer is useful to facilitate the hand sanitizer liquid out of the bottle, so it is more effective to use and does not run out quickly. This study uses an Arduino Nano microcontroller as the main control, a human hand detection sensor, and a servo motor as an actuator that will activate the automatic bottle. The mouth of the hand sanitizer bottle uses an elastic hose that leads to the part where the cleaning liquid comes out. This research uses the Research and Development (R&D) method. The result of this research is an automatic hand sanitizer with a large size hand sanitizer that can be mounted into a tool with a maximum of 500 ml. This automatic hand sanitizer will automatically release the hand sanitizer fluid which approves the sensor under the user's hand protective device.

**2.1.2 Based on ultrasonic sensors.**

**Agus Halim et al.,** ***(2020)*** are reported the work on automatic handsanitizer allows the discharge of the sanitizing liquid without pressing any nozzle. The design of the automatic hand sanitizer is focused on the mechanism of pressing the nozzle of the hand sanitizer that involves conversion from a rotation movement into a translation movement. VDI 2221 method is used to design the automatic hand sanitizer, which uses Arduino Nano as the microcontroller, servo motor as the motor, ultrasonic sensor for detecting the movement from the environment, and rack and pinion system as the mechanism for pressing the nozzle from the hand sanitizer. The prototype of automatic hand sanitizer has worked well and has become a reference for further development. Keywords: design, automatic hand sanitizer, ultrasonic sensor.

**Ashish Gupta *et al., (*2020)** are reported the work on Viruses such as COVID-19 are transferrable through touch and contact. There are WHO guidelines to clean or sanitize hands regularly to reduce the risk of infection. Dispensing of sanitizer from bottle and storage would require manual intervention. In this paper we propose a novel design of touch-less sanitizer machine to reduce the risk due to contact. The system can sense the proximity with the help of ultrasonic sensor and sends signal to microcontroller. The controller processes the sensor data & actuates the pump and solenoid valve. The sanitizer liquid dispenses through mist nozzle. Viruses such as COVID-19 are transferrable through touch and contact. There are WHO guidelines to clean or sanitize hands regularly to reduce the risk of infection. Dispensing of sanitizer from bottle and storage would require manual intervention. In this paper we propose a novel design of touch-less sanitizer machine to reduce the risk due to contact. The system can sense the proximity with the help of ultrasonic sensor and sends signal to microcontroller. The controller processes the sensor data & actuates the pump and solenoid valve. The sanitizer liquid dispenses through mist nozzle.

**2.1.3 Based on infrared temperature sensor.**

**Anowar Hossain et al., (2020)** are reported the work on IoT Based Medical Assistant Robot (Aido-Bot) that will be designed and implemented for the disabled and the patients in need. Such a robot's prime utilization is to minimize person-to-person contact and ensure proper cleaning, sterilization and support in hospitals. The paper explains the background of the study and will also explore some previous related works to find a collaboration of other relevant devices/systems so that a better device can be developed. Then the main algorithm, architecture and the controlling system are explained in detail. According to the proposed method, an IoT-Based Medicine Reminding and Medicine Providing System, Automatic Hand Sanitizer and IoT Based Physiological parameters observing system (Body Temperature, Pulse rate, and Oxygen saturation level) are developed including a direct one-to-one server-based communication method and an end user android app maintaining system. Though the achievements defined in the paper look fruitful and superior, shortcomings still exist.

**Marlon Gan Rojo et al., (2020)** The design and development of a non-contact temperature reader and sanitizer dispenser (NTRSD) system is presented in this study. The system is intended to help prevent the spread of SARS-CoV-2 infection and assist in maintaining and/or improving community health and reducing the negative impact of the infection on the economy and society. The NTRSD has two subsystems, the temperature reader (TR) and the sanitizer dispenser (SD), which is controlled from a common microcontroller and by design, cannot operate simultaneously. The TR is designed and developed to perform comparably in terms of accuracy with existing and commercially handheld infrared thermometers, display to the user the temperature read, and give visual and aural alerts when the temperature read exceeds the critical body temperature of 38 degrees centigrade. The SD is designed and developed to deliver sanitizer economically, by dispensing only once and only at a needed amount when activated. The design and development of the system go through the following methodology: System Specification, Control System Design, Hardware Prototype Development, System Test and Data Collection. Based on data obtained from tests made on the built prototype, a reiteration of the above steps is carried out wherein the control system software logic and parameters are adjusted so as to meet the specified system performance. The final test results are acceptable and shows the NTRSD provides a significant contribution on temperature monitoring and on disinfecting the hands. The system utilizes a single Arduino Uno, an MLX90614 temperature sensor, two ultrasonic sensors, an LCD, two pilot lights, a buzzer, a submersible sanitizer pump, an alcohol reservoir, a power supply and a frame to house the system. Photos of the built and tested prototype, a schematic diagram of the control system, and the flowchart on which the Arduino script is developed are shown. The operation and user interaction of the actual system is also described. Data are also tabulated and shown along with statistical analysis. The control system program is written such that the temperature read and displayed by the NTRSD very closely matches that of a hand-held temperature reader. The non-contact feature for both the reading of body temperature and the dispensing of sanitizer provided by NTRSD precludes the possible viral transmission from using traditional thermometers, renders handheld IR thermometer operators (HITOs) unnecessary, avoids viral transmission between HITOs and subjects of their temperature scans, and ensures a clean and uncontaminated sanitizer. The system is envisioned for strategic deployment in public and private areas like public markets, banks, hospitals, schools, offices, residences, and many others.

**2.1.4 Based on pulse oximeter.**

**L.K. Hema1et al.,** ***(2018)*** are reported the work on pulse oximeter is a medical instrument that indirectly measures the saturation oxygen level of a patients' blood, i.e. what proportion of the oxygen-carrying molecules in the blood (called haemoglobin) are actually carrying oxygen. This is known as oxygen saturation or SpO2.This saturation point oxygen level is very important to monitor while a patient is at risk for further process of medication. In our paper we proposed to develop a pulse oximeter to measure the saturation point oxygen level and the same would be stored in the cloud and also it is available live to the client's hand-held device (mobile phone).In this paper, we seek to monitor a patient's heart rate and blood-oxygen level using a pulse oximeter. The pulse oximeter is designed using infrared and visible (red) light detection from light that passes through a patient's finger from an emitter. The absorption will tell when blood is moving through the finger and how much of this is oxygen-rich. The output of this analog circuit will be fed into a Node microcontroller, which computes the pulse and oxygen level from these numbers. The values are uploaded to a cloud computing web host called Thing speak from where it can be viewed.

## III. METHODOLOGY

### 3.1 EXISTING METHODOLOGY

In the existing method, there are specialized devices for measuring the temperature, using infra-red gun. For measuring the blood oxygen level, using the blood oximeter. And for sanitizing the hand they have automatic hand sanitizer. There are devices where two modules are integrated together.

### 3.2 PROPOSED METHODOLOGY

The proposed system has oximeter for measuring the blood oxygen level, infra-red temperature sensor for measuring the temperature of the person and automatic hand sanitization using the proximity sensors and submersible pump which has been integrated together with the help of Arduino. The measurement of the temperature and blood oxygen level will be displayed on the LCD screen. If the measurement is above the normal level, it will be displayed in the LCD display as an indication. If the measurement is above the average level, buzzer will produce high amplitude sound. One of the main objectives of the device is to reduce the time, eliminating the labour (except maintenance) and moreover increase the efficiency in using the sanitization. Which creates an automation and further by reducing the crowd while sanitizing creates a less vulnerable place for the spread of contagious virus.

**3.2.1 Flow chart**

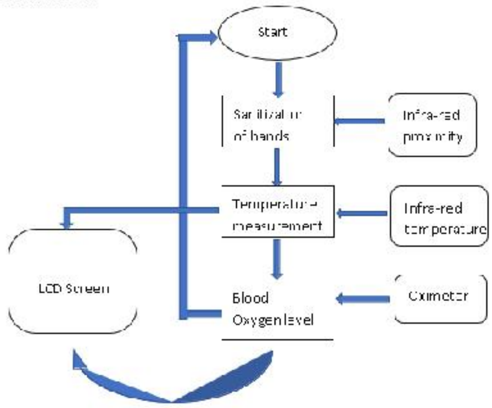


Fig 3.2.1 -Flow chart of process

Sensors continuously monitor the gases in the surrounding and posts in to the server for storing and usage of data for future purpose. While continuously monitoring if any gas level exceeds the range to that of normal range in air the alert will be enhanced and a SMS notification will be posted to in-charge and even to the workers mobile station only if required and it also closes gas cylinder valve. It carries the syntax of parameter (maximum permissible value) = value detected at the moment. If value detected at that particular moment is greater than that of maximum permissible value an SMS has sent by imitating the GMS module through commands programmed in micro controller and the valve is closed using a stepper motor.

### 3.3 FUTURE SCOPE

- Since it can be used in hospitals, clinics and malls.
- Automation can be further developed to open door only when the person has optimum temperature and spO2.
- Whether the person wearing mask or not can be detected using OpenCV.

It can be done using by the addition of camera and replacing Arduino UNO to Raspberry Pi

## IV. WORKING EXPLANATION

### 4.1 PROCESS FLOW

Process flow consists of two parts, in which the flow chart explains the detailed process of control which is explained in flow chart explanation.

#### 4.1.1. Flow chart

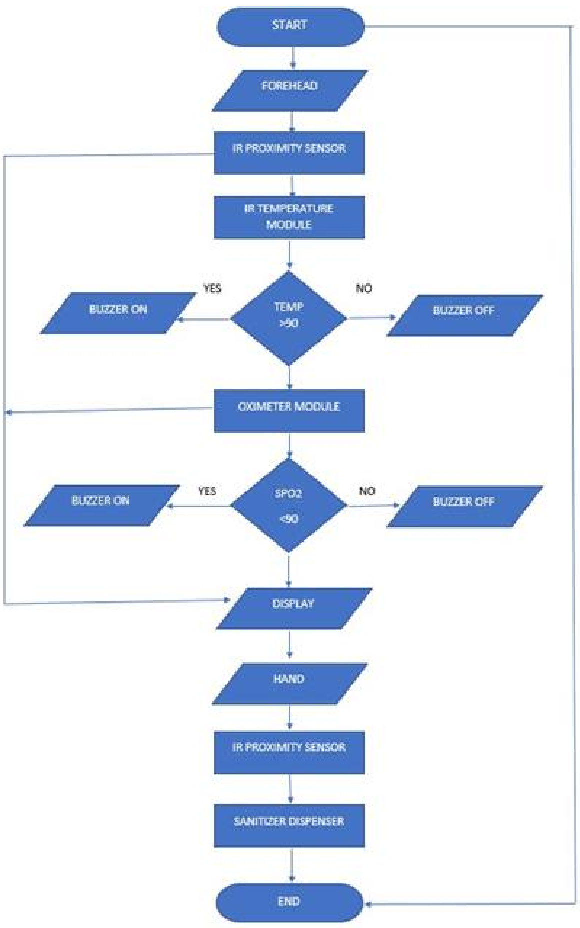


Fig:4.1.1. flow chart for the process flow

#### 4.1.2 Flow chart explanation

When the person standing front of smart sanitizer, the person's forehead is detected by the infrared proximity sensor and the value of the temperature is measured by the infra-red thermometer and displays the temperature measured. If the temperature of the person is more than the optimum level (above 100°F) the buzzer produces a high amplitude sound and indicates that the person temperature is high. Then the oximeter measures the blood oxygen level and displays the measured value. If the blood oxygen level is below the normal blood saturation level which is below 90 percent, the buzzer produces a high amplitude sound and indicates that the person having low oxygen level in the blood. After the above operations, the person's hand is sensed by the infra-red proximity sensor and sanitizer dispenser sanitizes the hand.

### 4.2 DESIGN CALCULATION

**Design calculation:**

Discharge Q = 6 ml/sec
= $6\times10^{-6}$ $m^3$/sec
Diameter of the pipe = $5\times10^{-3}$ m
Area = $3.14\times d^2/4$
=$1.963\times10^{-5}$ $m^2$
Velocity of the sanitizer = Discharge of the sanitizer/Area of the pipe
= 0.3 m/sec

**Design dimension:**
Base of the prototype: 12 cm × 20 cm
Height of the prototype : 34 cm
Dimension of the screen : 6.5 cm × 2.5 cm

## V. STUDY OF COMPONENTS

### 5.1 Hardware used

- Arduino Uno
- Arduino Mega 2560
- mlx 90614
- max 30100
- Submersible pump
- Proximity sensor module

#### 5.1.1 Arduino Uno

Fig5.1.1. a – Arduino uno

The Arduino Uno is an open-source microcontroller board based on theMicrochipATmega328Pmicrocontroller and developed by Arduino.cc shown in above fig 5.1.1.a . The board is equipped with sets of digital and analog input/output(I/O) pins that may be interfaced to various expansion boards(shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, pin diagram is shown below fig 5.1.1.b , and is programmable with the Arduino IDE(Integrated Development Environment), via a type BUSB cable. It can be powered by the USB cable or by an external9volt battery, though it accepts voltages between 7 and 20 volts. A Power barrel jack, an ICSP header and a reset button. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. We are using this Arduino UNO for temperature measurement with the help of Infra-red temperature sensor.

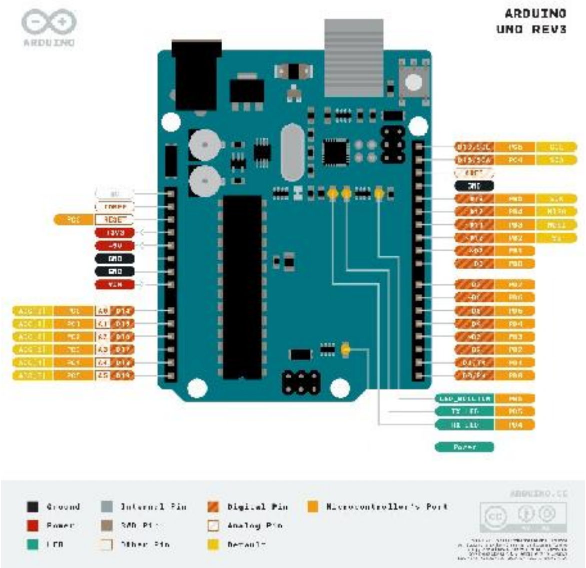


Fig 5.1.1.b – Arduino uno pin diagram

### 5.1.2.Arduino mega 2560

Fig 5.1.2.a-Arduino mega 2560

The Arduino Mega 2560 is shown in above fig 4.1.2.a is a micro-controller board based on the ATmega2560.It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs pin diagram is shown in below fig 4.1.2.b, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove.

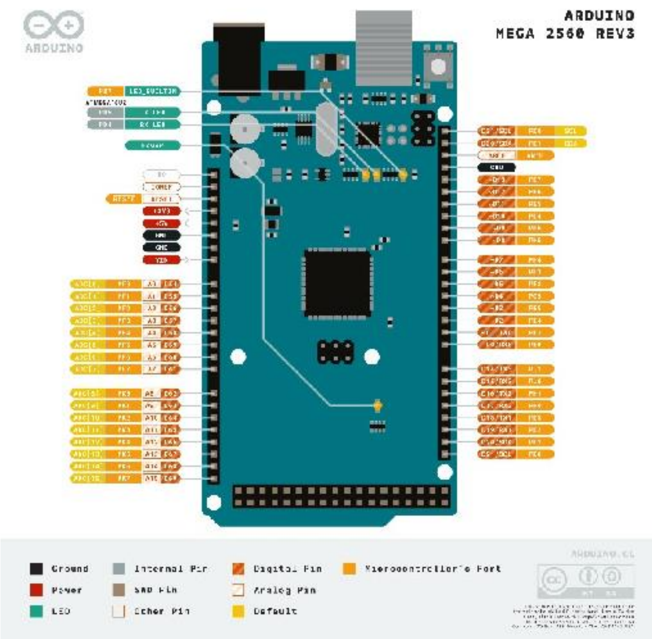


Fig 5.1.2.b-Arduino mega 2560 pin diagram

### 5.1.3 MLX 90614


Fig 5.1.3-MLX90614

Unlike most temperature sensors, this sensor measures infrared light bouncing off of remote objects so it can sense temperature without having to touch them physically.

Simply point the sensor towards what you want to measure and it will detect the temperature by absorbing IR waves emitted. Because it doesn't have to touch the object it's measuring, it can sense a wider range of temperatures than most digital sensors: from -70°C to +380°C! It takes the measurement over a 90-degree field of view so it can be handy for determining the average temperature of an area. We use this mlx90614 shown in above fig 5.1.3 for measuring the temperature of the person without contact by connecting it to Arduino UNO.

Some specifications

- Factory calibrated
- 40°C to +125°C for sensor temperature
- 70°C to +380°C for object temperature
- ±0.5°C accuracy around room temperatures
- High accuracy of 0.5°Cover wide temperature
- 90° Field of view
- 5V version: 4.5 to 5.5V power

**5.1.4. max 30100**


Fig 5.1.4.a-MAX30100

The MAX30100 is an integrated pulse oximetry and heart rate monitor sensor solution. It combines two LEDs, a photo detector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart-rate signals. The MAX30100 is shown in above fig 5.1.4.a operates from 1.8V and 3.3V power supplies and can be powered down through software with negligible standby current, permitting the power supply to remain connected at all times. Operating Voltage: 1.8v – 5.5v. Interface Type: I2C Serial Interface. The circuit diagram of MAX30100 is shown in below fig 5.1.4.b Module Dimensions: 18.8mm (L) x 14.4mm (W) x 3.0mm (H) and Module Weight: 1.2g (Header + module)

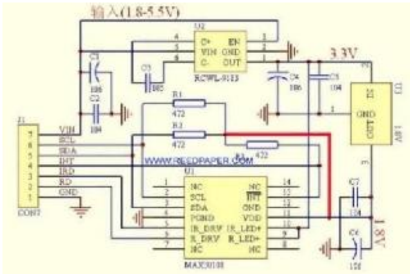

Fig 5.1.4.b-MAX30100 module circuit diagram

**5.1.5 Submersible water pump**.

Fig 5.1.5.a-Submersible water pump

This DC 3-6 V Mini Micro Submersible Water Pump is shown in above fig 5.1.5.a is a low cost, small size Submersible Pump Motor which can be operated from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with a very low current consumption of 220mA.This motor is small, compact and light. It can be controlled from a micro controller/Arduino using our DC Motor Drivers or one of our Relay Boards. Driving Mode: DC, Magnetic Driving. Operating DC Voltage: 2.5-6V.an example of submersible pump with Arduino is shown in below fig 5.1.5.b

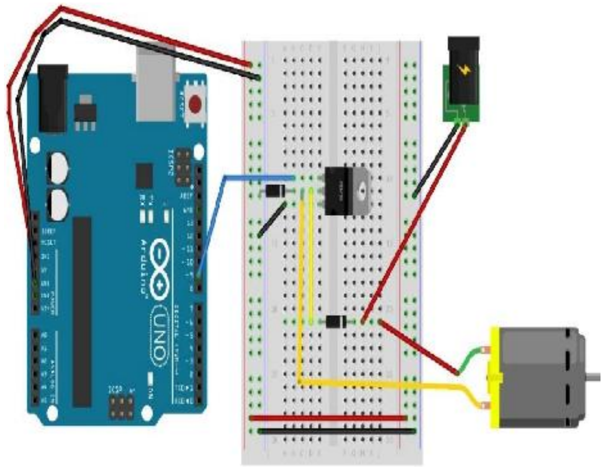

Fig 5.1.5.b-Submersible water pump with Arduino

**5.1.6 Buzzer**

A "piezo buzzer" is shown in below fig 5.1.6 basically a tiny speaker that you can connect directly to an Arduino. "Piezoelectricity" is an effect where certain crystals will change shape when you apply electricity to them. By applying an electric signal at the right frequency, the crystal can make sound.

Fig – 5.1.6 Buzzer

**5.1.7 Proximity sensor**

Fig 5.1.7.a-Proximity sensor

This IR Proximity Sensor is shown in above fig 5.1.7.a is a multipurpose infrared sensor which can be used for obstacle sensing, colour detection, fire detection, line sensing, etc and also as an encoder sensor. The sensor provides a digital output. The sensor outputs a logic one(+5V) at the digital output when an object is placed in front of the sensor and a logic zero(0V), when there is no object in front of the sensor. An onboard LED is used to indicate the presence of an object.

This digital output can be directly connected to an Arduino, Raspberry Pi, AVR, PIC, 8051 or any other microcontroller to read the sensor output.IR sensors are highly susceptible to ambient light and the IR sensor on this sensor is suitably covered to reduce effect of ambient light on the sensor. The sensor has a maximum range of around 40-50 cm indoors and around 15-20 cm outdoors.an example of Proximity sensor with Arduino is shown in below fig 5.1.7.b

**Features of proximity sensors:**

IR transmitter. Ambient light protected IR receiver. 3 pin easy interface connectors. Indicator LED & Power LED. Distance 2cm to 30cm. Can differentiate between dark and light colours. Active Low on object detection. 3.3 to 5V operation.

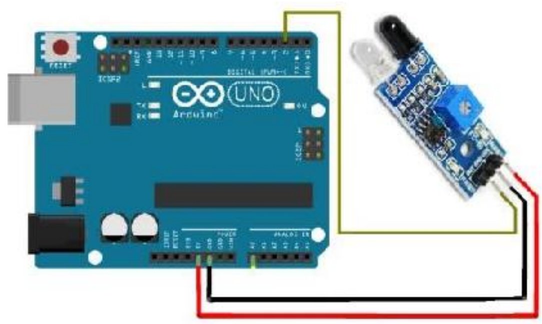

Fig 5.1.7.b- Proximity sensor with Arduino

**5.2 SOFTWARE USED**

Arduino

**5.2.1 Arduino**

The Arduino Software (IDE) allows you to write programs and upload them to your board. In the Arduino Software page you will find two options:

1) If you have a reliable Internet connection, you should use the online IDE(Arduino Web Editor). It will allow you to save your sketches in the cloud, having them available from any device and backed up. You will always have the most up-to-date version of the IDE without the need to install updates or community generated libraries.
2) If you would rather work offline, you should use the latest version of the desktop IDE.

## VI. CONCLUSION

The methodology of using hand sanitizer and measuring the both temperature and blood oxygen level enables the organization to save lot of power and also ensures the safety than the manual methods. The components that are to be integrated in the system have been analysed. Sample code has been developed through various reference codes. Flowchart and block diagram have been developed. The complete working prototype is developed and experimented.

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