Automated Sanitization and Monitoring System

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Abstract **- During the times of pandemic many innovations are being done to avoid the direct contact of people and provide utmost safety to reduce the probability of spread of virus through air or any other medium like touch etc. To reduce the effect, the authors have formulated the idea to develop an automated mechanism that would require no human effort or physical transaction of any kind and will be operated automatically using the concept of IoT. The main idea of this project is to make a mechanism that can try and prevent the spread of COVID-19. So, the authors took this initiative to make this Automated Sanitization and Monitoring System including thermal detection. The Automated Sanitization and Monitoring System is a demonstration of how it has been designed to provide maximum protection to people passing through the tunnel in around 15 seconds. This initiative may prove to be a milestone in protection against Covid-19.**

Index Terms **- Automated Sanitization, Motion Sensing, Thermal Detection.**

I.INTRODUCTION

The mere objective of the entire project is to create an automated mechanism to help prevent the spread of COVID-19 within an area, the sub objectives include collecting data and creating data sets to measure covid sensitivity in an area. The mechanism of the project is such that it maintains and follows the norms of social distancing and provides a technically sustainable solution to the no contact policy in the COVID-19 prevention norms. The device we will make will be placed at a particular office or institution and will be connected to an RFID, so anyone who passes through the mechanism can be registered and this data can later be used for analysis purposes (future scope of project). The thermal scanner will be similar to the scanning guns being used nowadays. These guns due to their manual mechanism pose a threat to the user, our system will have an integrated scanner that will automatically scan the person passing within the mechanism and will generate the temperature. If the temperature is found to be above the safe temperature, we will incorporate a red light that will glow in such a case and will inform us about the situation. If the temperature is accurate the person can move ahead for further sanitization purposes. A regular automated sanitization mechanism will be incorporated so as to sanitize the person moving ahead. It will be attached to sensors to identify the movement and process the task accordingly so that wastage of the sanitizer can also be kept under check.

II. WORKING OF THE SYSTEM

The sensor senses the proximity of hands when placed under the machine. It works on ultrasonic waves reflection principle.2cm - 400cm non-contact measurement function with the ranging accuracy reaching up to 3mm can be achieved by Ultrasonic ranging module HC-SR04. The basic components of the module are control circuit, ultrasonic transmitters, receiver. The basic principle of work:
(1) Using IO triggers for at least 10 high level signals.
(2) This Module can automatically send eight 40 kHz and detect whether there is a pulse signal back or not.
(3) If the signal is back, through a high level, time of high output IO duration is the time from sending ultrasonic to returning. Test Distance = (high level time*velocity of sound (340M/S) / 2. As the controller receives high signal from the sensor module, it triggers the pump to pull water from the storage area and send it to the nozzle in mist form. The program runs the pump for 3 seconds. It has been seen during testing that 3 seconds are sufficient to sanitize the hands with mist spray. We can change the time as per user needs through programming.

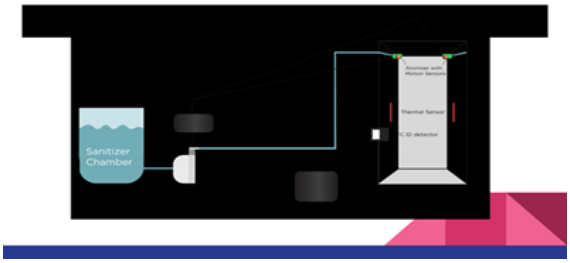

Fig 1. System Design of proposed project.

III. TECHNICAL REQUIREMENTS

The specification of the unit is mentioned below:

1. Sanitizer capacity of the unit: 5L
2. Mode of operation: Automatic Mist mode
3. Usage: Contactless
4. Weight: 5 kg (without sanitizer)
5. Electrical Input - 230V AC, 5 Amp
6. Power Consumption:
   a) Idle Mode - < 3VA
   b) When Spraying - 25VA approx.

1.Sanitizer Container - This is the container where the sanitizer is stored/refilled. MoC - ABS
Capacity - 5 Liters
2. Solenoid Valve - This valve prevents water to drip from the nozzle when the pump is not working MoC - Polypropylene
Working voltage - 24V DC
3. Diaphragm pump - This pump is used to provide increased pressure to the inlet of the mist atomizer. MoC - ABS Make - Luxcru
Pressure: 5-6 bar
4. Mist Atomizer - This atomizer sprays sufficient amount of sanitizer at a cone angle of 60 to wet both the hands for 12 seconds
Material - Polypropylene/Brass
Sanitizer Discharge - 5-6 ml for each operation
5. Waterproof non-contact ultrasonic sensor - This module, with air as medium, is a non-contact target detection and distance measurement module. This sensor is not affected by color or other visuals from the detected object. It sends out high frequency sound waves in the direction of detection, and receives the reflection from nearby objects and then gives distance reading by processing the echo time.
MoC - Epoxy filled ABS
IP Rating - IP 67
Min sensing distance - 2 cm
Max hand distance - 20 cm
Field of View - 8-10 degree
6. Switch Mode Power Supply (SMPS) - The power supply unit (PSU) is used in the unit to convert the AC voltage into the acceptable range for working of the pump and solenoid valve. This device has the facility handling electronic components that converts electric power efficiently.
Material - ABS
Output - 24VDC, 2Amp Material - ABS
Output - 24VDC, 2Amp
7. Control Circuit –
Type of Controller: ESP8266 controller.
Once the hand is detected it switches on the pump for a pre-defined time.
Firmware upgrade: Over the air i.e. by creating smart-phone Wi-Fi hotspot.
8. Arduino Uno- The Uno may be a microcontroller board supported the ATmega328P. It has 14 digital input/output pins (of which 6 are often used as PWM outputs), 6 analog inputs, a 16 MHz quartz , a USB connection, an influence jack, an ICSP header and a reset button. Each of the 14 digital pins are often used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an indoor pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is that the value that has got to not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

Fig 2. Arduino Uno

9. Liquid Crystal Display- LCD is a type of display used in digital watches and many portable computers. LCD displays utilize sheets of polarizing material with a liquid solution between them. An electric current skilled the liquid causes the crystals to align in order that light cannot undergo them. Technical achievements have resulted in brighter displacement, higher resolutions, reduced response times and cheaper manufacturing process. The liquid crystals are often manipulated through an applied electric voltage in order that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of sunshine is allowed to pass, the LCD monitor is in a position to display images. A backlight provides the LCD monitor's brightness.

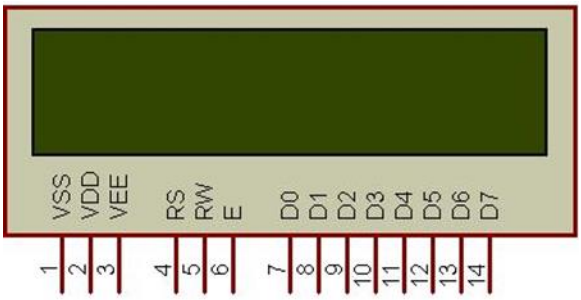

Fig 3. LCD

10. Crystal Oscillator- A quartz oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to make an electrical signal with a really precise frequency. This frequency is usually wont to keep track of your time, to supply a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. A crystal may be a solid during which the constituent atoms, molecules, or ions are packed during a regularly ordered, repeating pattern extending altogether three spatial dimensions. Almost any object made up of an elastic material could be used kind of a crystal, with appropriate transducers, since all objects have natural resonant frequencies of vibration. For example, steel is extremely elastic and features a high speed of sound.

11. RFID- The RFID tags attached to items will communicate with RFID reader which will detect every item within the cart and ring each up almost instantly. For most of our RFID based Arduino projects, RC522 RFID Reader/Writer module could also be an excellent choice. It is low power, low cost, pretty rugged, and easy to interface with. RFID or Radio Frequency Identification system consists of two main components, a transponder/tag attached to an object to be identified, and a Transceiver also referred to as interrogator/Reader. A Reader consists of a frequency module and an antenna which generates a high frequency electromagnetic field. On the opposite hand, the tag is typically a passive device, meaning it doesn't contain a battery. Instead it contains a microchip that stores and processes information, and an antenna to receive and transmit a sign. To read the knowledge encoded on a tag, it's placed in close proximity to the Reader (does not got to be within direct line-of-sight of the reader). The powered chip inside the tag then responds by sending its stored information back to the reader within the sort of another radio wave. This is called backscatter. The backscatter, or change within the electromagnetic/RF wave, is detected and interpreted by the reader which then sends the info bent a computer or microcontroller.

12. PIR sensors- PIR sensors allow you to sense motion, nearly always won't to detect whether a person's has moved in or out of the sensor's range. They are small, less expensive, low-power are easy to use and they do not wear out. For these reasons they're commonly found in appliances and gadgets utilized in homes or businesses.

IV. SOFTWARE USED

1. EAGLE

EAGLE (Easily Applicable Graphical Layout Editor) by Cad soft is a flexible and expandable EDA schematic capture, PCB layout, auto router and CAM program widely used since 1988.

2. Schematic Capture

EAGLE is a software which contains a schematic editor used for designing circuit diagrams. Different parts are often placed on many sheets and connected together through different ports.

3. PCB layout

The PCB layout editor allows the user to back annotate to the schematic and auto-routing so that to automatically connect traces that support the connections defined within the schematic.

EAGLE saves Gerber and PostScript layout files and ExcellonandSieb & Meyer drill files. These are standard files which are accepted by many PCB fabrication companies.

V. RESULT AND CONCLUSION

An automatic sanitizer dispensing machine designed and developed. The machine is wall mounted at entrance gates of society, schools, colleges or any commercial building. It can spray 40 times with 100 ml liquid and is effective in optimizing use of liquid sanitizer. The machine is tested for 24hour operation for quite every week and is functioning fine. It helped to scale back the contact for getting sanitizer and also reduce manpower employed to spray sanitizer with a sprig bottle. The power consumption is very low. For each spray the utmost current consumption is 2 Ampere at 24 V. Its hourly consumption is 48W if run continuously. The negative feedback circuit is little in size and low cost as compared to available controllers. The power consumption is low and the system can

help to achieve contactless sanitizer dispensers. It reduces the danger of community transmission of the virus.

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