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Human Body Temperature based Access Control and Sanitization Kiosk for COVID-19

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Abstract: ***The widespread of the Novel Coronavirus has sparked heated debate over how to keep public-facing workers safe in a range of businesses. This is especially important in businesses and organizations where officials are responsible for checking in possibly unwell employees or visitors. Eliminating the need for dedicated staff for screening is a challenge. This can be addressed by developing access control, sanitization, and detection systems. The project aims to develop a Healthcare Kiosk with integrated access control and sanitization module. The Access control system would be based on Human body Temperature values set under the health parameter policy of the institution or company. The Kiosk will first check the prescribed parameters of the person entering using the check-up stations and if the parameters are in range and sanitization is completed it will actuate the door using a logic-based signal given by the Programmable Logic Controller or Equivalent Electronic Controller.***
Keywords: access control, Human body Temperature, sanitization, Coronavirus, screening, prescribed parameters, logic-based signal, dedicated staff, actuate.

I. INTRODUCTION

The aim is to combine the Concept of Contactless body temperature-based access control and Personal Sanitization in a single Product. The idea of the project came from the requirement of a Company that needed a contactless access control system with built-in sanitization stations. Such a solution was yet to come into the market. This requirement is being tried to achieve in this project.

This can be achieved by a system similar to a check-in kiosk. The only criterion would be that it should be contactless and have sanitization features. The design must be compact, robust, easy to interpret (operate) and should comply with industry standards.

This project aims to achieve the following objectives-

1) Developing an Access Control System-based Kiosk to ensure that every employee or any person entering into the organization or the company passes from compulsory sanity checks and is free from the symptom of the COVID 19 virus.
2) Designing a system to restrict the person entering the organization or company who does not fit in the medical parameters set by the institution or company health policy.
3) Promoting Contactless monitoring and increasing health, safety and hygiene in an organization or Industry.
4) The goal is not only to make a project prototype but also to manufacture it as a saleable product in the market.

II. MARKET SURVEY

Information kiosks are widely used and favorably accepted by the general public. Deployment of contactless kiosks in both community and medical institution settings is an effective, efficient, and low-cost method of providing healthcare information and can improve access control of target audience regardless of age, gender, race, language. literacy, demographics, and previous computer usage experience. Careful design of the kiosk, its user interface, and the hardware are necessary to maximize the effectiveness of the kiosk and to allow for its use across a broad spectrum of users. Currently, there are mostly contact or touch-based systems deployed in the market. The design must ensure limited body contact with the Kiosk while operating.

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III.DEVELOPMENT METHODOLOGY

A. *Process Flowchart*

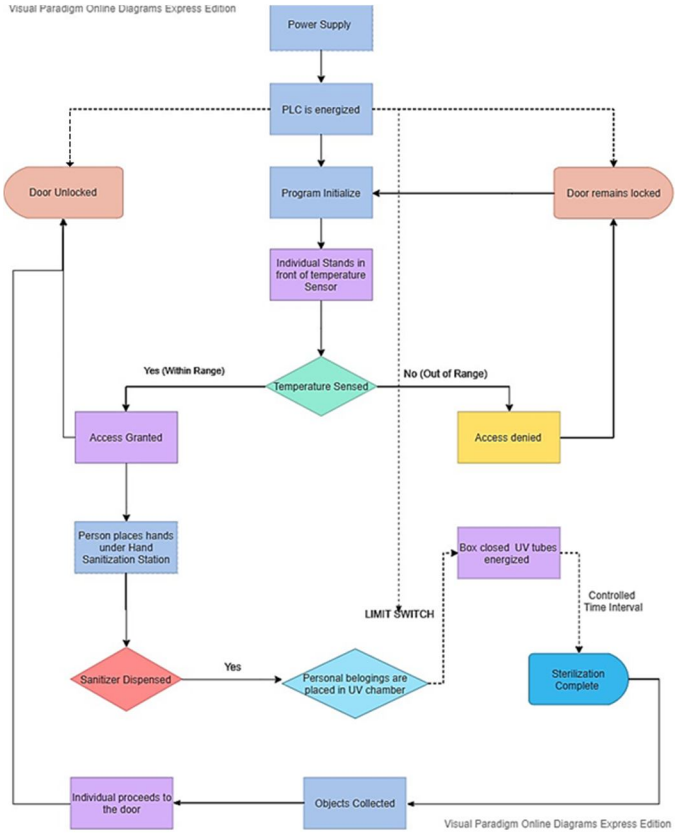

Fig. 1 Process Logic Flowchart

B. *Design Approach*

1) The main aim of the design was to simplify the user experience. The individual must have ease of operation while performing the checks. With this in consideration, the concept designs were drawn.

2) The average height of an Indian male is around 5'5" and 5'1" female (Source NFHS). Considering this data, the kiosk dimensions were finalized considering the proportionality.

3) As the head is on top the temperature sensing module would be on top. The digital display would be at the average vision level. Below that would be the hand sanitizer dispensing station. The movement of bringing hands in front of the body is easier than placing them below or above a straight-line reference.

4) At the bottom would be the Enclosed UV Sterilization Chamber. The position of the chamber would be at the bottom for structural stability. As the chamber will have to withstand heavy goods and belongings.

C. *Manufacturing and Hardware Fabrication-*

1) After the final design and procurement of Raw Material, the Steel Body will be fabricated. The external panels will be Cut and Bend on CNC Machinery.

2) The manufacturing processes involved in fabricating the structure will be as follows-

3) Cutting and bending of CRCA Panels according to dimensions. Cut-outs of components in the panel on CNC Machine.

4) Arc Welding the structure and panels.

5) Grinding and Polishing joints and body.

6) Powder Coating of Kiosk Body.

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D. Concept Designs

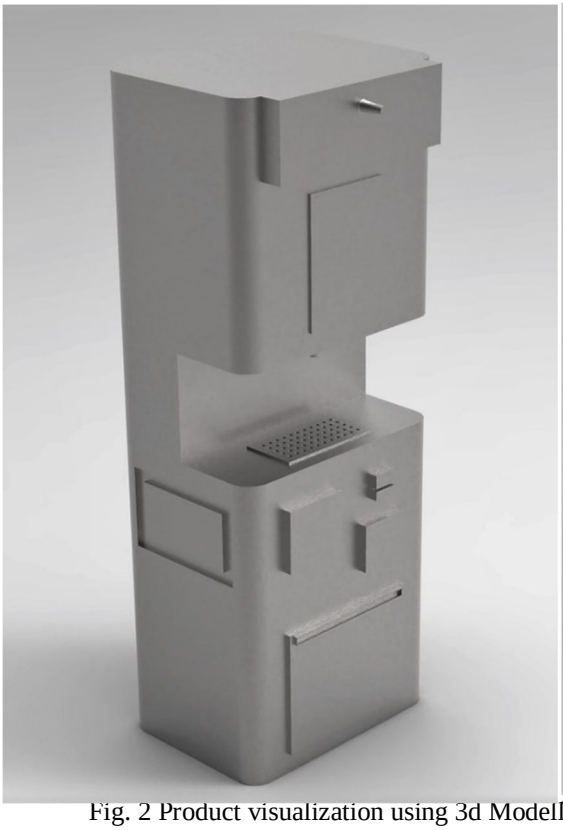

Fig. 2 Product visualization using 3d Modelling

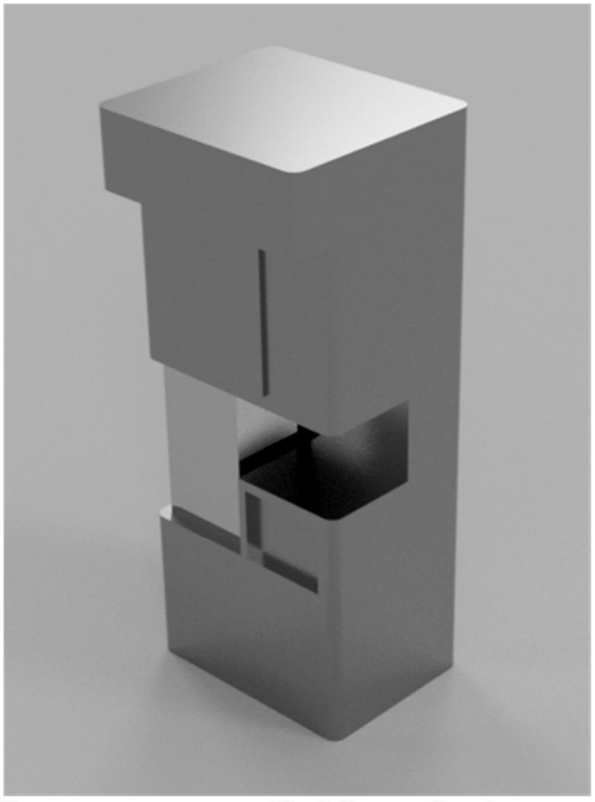

Fig. 2 Concept Render

IV. OPERATION PROCESS

The Kiosk will be placed at the controlled entrance door of the organization. The individual entering the organization will first have to go near the kiosk. The first check will be the Body temperature of the individual. The module has an IR contactless temperature sensor. If it is in the range set by the system the kiosk will prompt to the second station. The second station is the Pulse Hand Sanitizer Dispenser. Here metered amount of Sanitizer will be dispensed on the hands of the individual. Drain will be provided at the bottom floor of dispenser to flush excess/ spillage. Below this is the Ultraviolet Light Sanitization chamber wherein the personal belongings of the individuals will be placed inside the enclosed chamber. As the Chamber doors shuts the UV light will turn on and for a predetermined time. The Tubes produces UVC radiation of 253.7 nanometres (nm) which is used for disinfection. After this step based on the temperature results and the completion of sanitization procedure logic-based door actuation signal will be given to the linear solenoid door lock mechanism. If the parameters are in range door will open and if not, it will remain closed. This will restrict the person who does not fit under the health and sanitization compliance remain outside the premises.

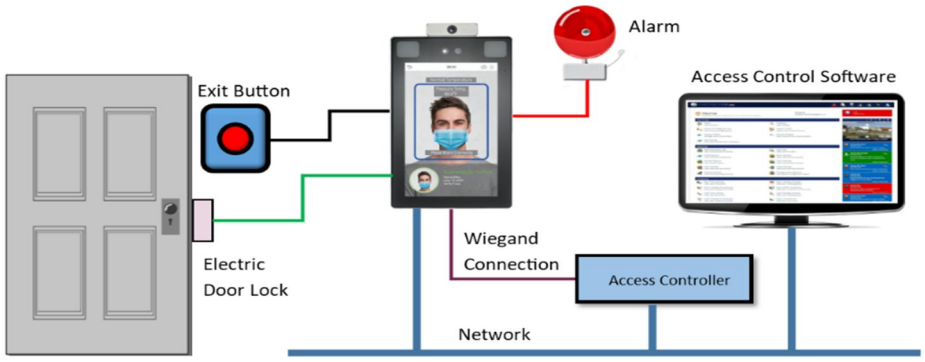

Fig. 4 Graphical Representation of Concept

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V. COMPONENT DETAILS

1) Raspberry Pi 4 Model B- It is a 64bit Quad Core Small board computer. The Processor Operating Voltage is 3.3V. 4 USB 2.0 sockets are present on the board. It has a Memory Card Slot for a Push/Pull Micro SD. Video output via HDMI.

2) 15.5" TFT Display screen- The Operating voltage is 12V DC. Current requirement: 1A-2A. Rated power of the screen is 6-7W. The screen supports HDMI and VGA input. The Physical resolution is 1920 x 1080p.

3) AD Board- The PCB is the display driver unit for the TFT display screen. The resolution supported is upto1920x1080 at 60HZ. HDMI and VGA Output. Push Button Controls for screen brightness, volume and mode selection.

4) Solenoid Sanitizer Dispenser- Solenoid Valve with operating Voltage: 12V / 24V DC and Operating Current: 400 mA. Normally Closed Valve. Push to Fit Connectors on both ends.

5) Fabricated Steel Structure- Material- CRCA Steel. Thickness 1.6 mm

6) Ultraviolet Light Chamber Tubes- Manufacturer Philips. UV radiation of 253.7 nanometres (nm) in the UV-C germicidal light band width. The glass in the light bulb blocks out 185 nm ozone forming light. This light bulb requires an enclosed chamber to operate. Consistent output of UV-C wavelength over light lifetime. Voltage- 56 Volt and 15 Watts. Length- 280 mm and Diameter- 15.875 mm. UV-C Radiation 2.4 Watts. Nanometres (nm)- 253.7. Rated Average Life- 9,000 Hours. Technology- TUV Germicidal (UV-C)

7) Linear Solenoid Actuated Door Lock Mechanism. Power Supply- 12v DC. Stroke- 25 mm. Rated Current- 5A. Holding Force- 150 N. Energized forms- Intermittent

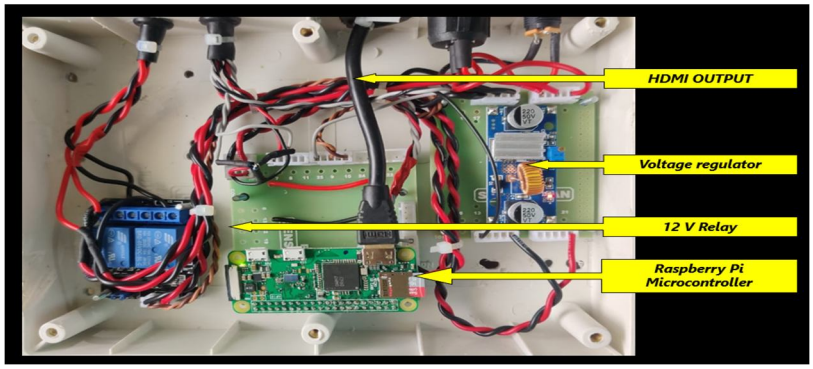

Fig. 5 Control Panel Internals

Fig. 6 Final Manufactured Product

VI. FUTURE SCOPE AND MARKET POTENTIAL

The outbreak of the Covid-19 virus has presented a challenge to communities and businesses, where the use of physical security systems has become more than a means to prevent criminal activity. Part of the post-Covid new normal is managing a location's occupancy levels to ensure social distancing or allowing hands-free entrance. Security measures for Covid-19 already involve using facial recognition or temperature detection devices that can check if people are wearing a mask, retail units, offices, healthcare units and other public places can ensure the safe protective measures with minimal disruption to services.

VII. CONCLUSIONS

With increase in demand of workforce health and safety monitoring systems in Industries and institutions, the product can benefit a wide array of sectors. The product be extremely helpful for employees or visitors to practice self-hygiene and discipline during such pandemics. Furthermore, enhancements in the range of kiosks can be, increasing number of examination stations, smart data tracking, digital signage panel, real time connectivity with the control center, implementation of machine learning and refined user experience. The aim is not only to make a project prototype but also to develop and manufacture it as a saleable product in the market.

VIII. ACKNOWLEDGMENT

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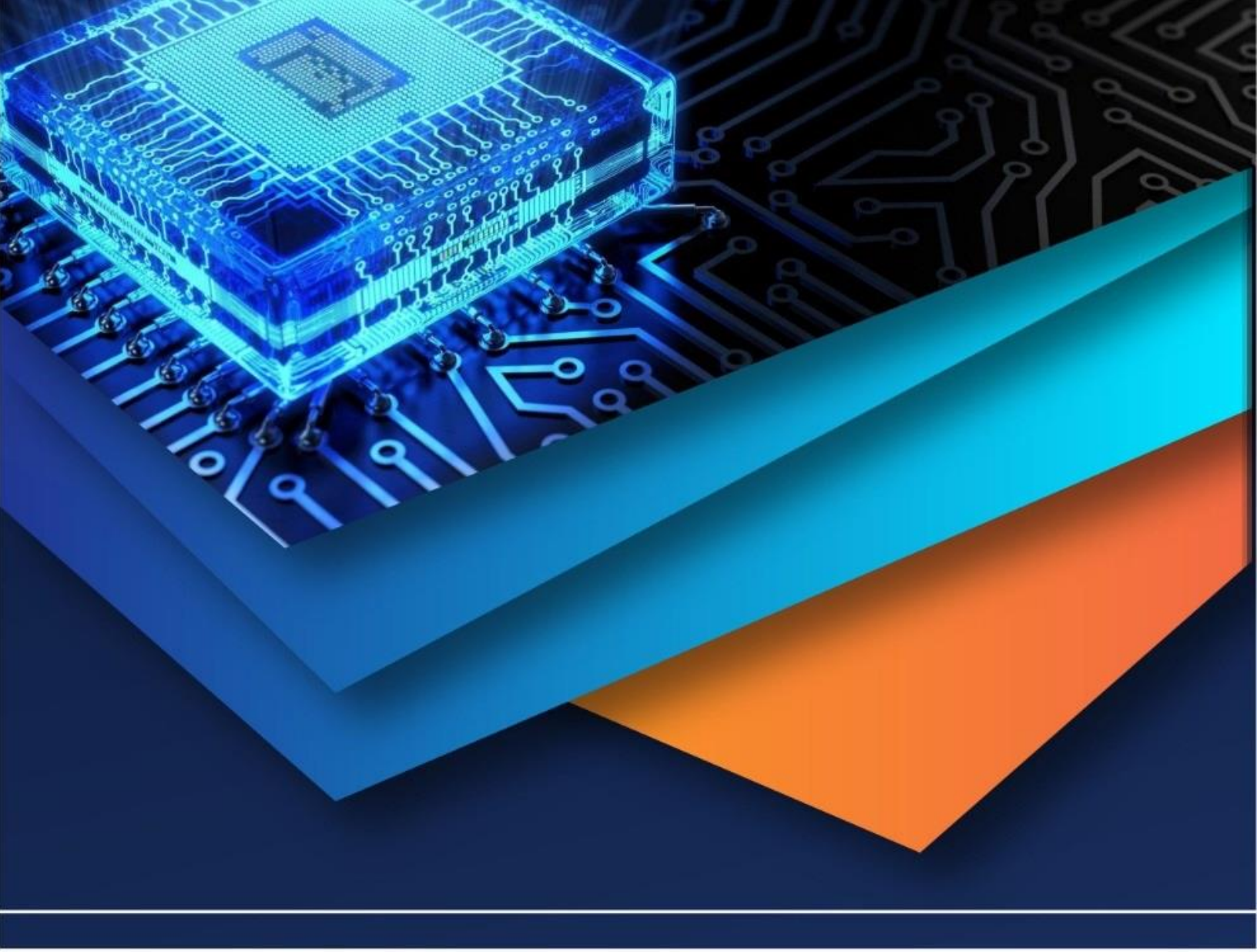

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