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Contactless COVID-19 vaccine verification system

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***Abstract*---**The novel Corona virus has created maximum impact to the society with growing challenges as a result of its new evaluation. The development of new strategic plans or initiated to safeguard the people from global pandemic were wearing Mask in public places sanitization or employed to have maximum protection. Various modifications or derived in public places to avoid contact with each other physically. The proposed studies focus on the driving a Roberts to model for contact us communication is established. The proposed approach utilised Embedded Technology enabled vaccinated people verification is done. Proposed design is identified as an advance people identification system using advance to computing techniques with Raspberry Pi 4. The benefit of reconfigurable embedded technology offers low cost and reliable hardware used to make customized consumer products. The proposed system can be placed in public places to validate the people entry. Automated systems are highly reliable in long term accessibility. The system can be installed anywhere easily using a small camera object and display insertion

***Keywords*---**COVID-19, embedded technology, image acquisition, vaccine validation, wireless communication**.**

Introduction

The novel corona virus started to spread from the city of Wuhan, China in late 2019. The global pandemic situation created many economic changes, lifestyle

changes and challenges in life of all levels of peoples. Various research are carried out to provide early detection process and make high end protection in all aspects. Public places are adapted to various changes due to the transit of infection happens through various forms of sources. People often used to sanitize their hands to avoid virus transit. In the same way, the maximum of the transit happens due to air channel, not maintaining social distance, not wearing the mask and not sanitizing the touch exposed places.

People started getting vaccinations, to safeguard themselves from the corona virus infection. Many places restrict the non-vaccinated peoples to enter. In order to ensure the status of vaccination, people are offered with certified vaccination. It acts as an identity to enter into many places. Contactless vaccination verification, temperature verification is highly demandable. People often travel to places, where contactless services are important. The emerging growth of embedded systems paved the way for innovative application developments, helpful for many real time solutions. Raspberry Pi enabled embedded system are utilized to make image acquisition effectively. It acts as an

independent operating system that enables the system to compute operations independently and manipulate the results based on instructions. Raspberry Pi enabled single board computers have gained significant change in the embedded kit development. The benefit of Raspberry Pi hardware have dedicated operating system provides inbuilt configuration modules.

The proposed approach is formulated as three processes.

- Capturing the person image using Web Cam connected via Raspberry Pi development Kit and process the image to make face identification. The image data is compared with the face database. The vaccinated people images are registered in the global database.
- The second process focused on collecting the temperature data using LM35 in a contactless way. The person temperature is normal (±36 Degrees) then the person is allowed with authentication window.
- The third process receives the speech data using the Microphone, convert the speech to Text process used to make step by step procedure of the validation window.
- The authenticated person details on Vaccine information, Temperature and other personal identity info are displayed in the LCD.

The rest of the paper discuss the Detailed background study in Section II. System tool section in section III. Followed by design methodology in Section IV. With that the integrated board and its results are viable in Section V. etc. further the paper is concluded with future implementations, recommendations, and related references

Background study

Y. Li et al., (2020) developed an android application for communication, to recognize the images using Raspberry Pi, audio interface, and speech recognition etc. the complete proposed system implemented as an integrated communication

module with camera for image capturing, speech recognition system, and communication of modules via internet of things connected with an android application[7].

Z. Ozkan et al., (2021) The author presented a model recognition framework for analyzing the UAV communication. Object detection framework is developed here, using Raspberry Pi platform. Using recurrent neural network (RNN) platform various UAV images are trained and tested in order to make object validation and achieved the accuracy of 91%, as utilized with Mobile Net [8].

A. M. Abd-Elrahim et al., (2020) the author presented a emebedded system based mobile communication system, where the GSM modem, touch screen, memory card are integrated. All the facilities required to compute certain task is incorporated within the Raspberry Pi window. Smart cellular phone is developed and impacted the IoT functionaliteis in an effciient way[9].

M. T. Islam, et al., (2020) The author presented a research work, using machine learning algorithms implemented using the SVM, KNN, and tensor flow modules are added up. Raspberry Pi enabled blind man guidance using audio process is developed. A smart glass like structure is implemented to recognize the family members images trained and stored in the database [10].

V. Sandeep et al., (2015) The author presented a globally acceptable autonomous machine learning process using customized algorithms implemented in Raspberry PI software. Since Raspberry PI comprises of dedicated algorithm implementation modules. high speed processing is applicable because of the Broardcom processor and integrated module[11].

System design

The system tool selection for the proposed design is through Raspberry Pi OS. It contains dedicated operating system, to compute the central processing. The arithmetic and numerical computations are implemented using the dedicated OS. The linear peripheral interfaces are applicable with the Raspberry Pi OS. The proposed processor computes logical operations, arithmetic operation, complex floating-point operations etc.

- Python is a broadly involved significant level programming language for universally useful programming.
- The language gives builds expected to empower composing clear projects on both a little and enormous scope.
- Python includes a unique kind framework and programmed memory the executives and supports various programming standards, including object-situated, basic, utilitarian programming, and procedural styles. It has an enormous and exhaustive standard library.
- The Python mediator upholds different Operating Systems

Methodology

System architecture

The proposed architecture is based on developing a embedded system enabled customized hardware for making contactless vaccine verification. The prime motive of the presented approach is to make the validation through Face image identification and authentication from the Vaccinated people database. The access to compute certain task is given as a instruction through Voice commands. The speech to text to conversion is implemented to manipulate the recorded voice commands to process the vaccine verification steps. The user not required to touch the computers while providing the input commands. The voice to text conversion process by the back end performs the control operations of the computer to search and validate the database. The image capturing is controlled by Raspberry Pi enabled live camera. The image is for the process to detect the face and the face pictures are comfortable with the existing database during vaccine process is implemented. Raspberry Pi is connected with the temperature sensor. The sensor is used to record the skin temperature of the user without touching the devices. If the temperature is below the normal range, then the person is allowed to enter. The three-process combined together is implemented effectively to make accurate vaccine validation process.

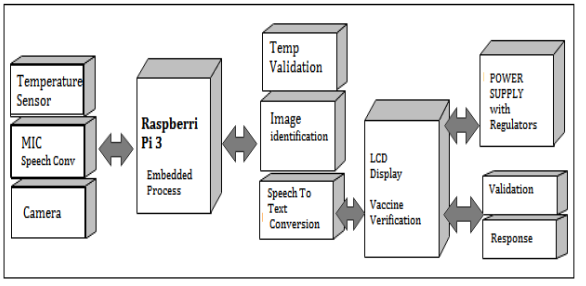

Fig. 1. System Architecture of Proposed model

Hardware Specifications

Fig. 2. RASPBERRY PI 4

Raspberry Pi 4 is a versatile device used to computer Complex processing and GPU operations USB ports I/O Pins, Wi-Fi Bluetooth, USB 2.0, and Network booting operations capable of certain functions in a regular Manor. Features of Raspberry Pi version or almost same as the tough the previous version in which the USB ports are added to the device. It is a Highly Effective SOC system on ship platform combined the control and Processing Unit and graphical Processing Unit on a single platform to work faster than previous Raspberry Pi devices. The Raspberry Pi 4 model stays ahead in process of image audio processing text processing and conversion of complex inputs into effective integer values.

The Wi-Fi connectivity using the Raspberry Pi development board works with the frequency of 2.4 GHZ heads and 5 GHZ provides a better wireless communication challenge. The Bluetooth enabled environment also support with the Raspberry pi system and the wireless module have the standard of 802.1 The proportion of the Raspberry Pi is a metal shielded instead of a plastic shoulder in the earlier models that acts as a heat sink and drains the excessive amount of power dissipation coming out as a heat.

The system model works in faster than the previous Raspberry Pi models. The major development or focus on executive high speed different functions and decent face. It for second the tax has one of the fastest person of early Raspberry Pi modules and during internet connection the ES USB ports or interface with the high speed integrated circuits.

- A 1.2GHz 64-bit quad-core ARMv8 CPU
- 802.11n Wireless LAN
- Bluetooth 4.1
- Bluetooth Low Energy (BLE)
- 1GB RAM
- 40 GPIO pins

Hardware Specifications

CPU

The major elements of Raspberry PI hardware is that the system operating clock is Work around 1.4 GHZ Broadcom BCM 283 70 that contains integrated core arm cortex processor with the RAM memory of 1 GB. The graphical Processing Unit Axe as an image Calculation and carry outing system that is used the video streaming data from cable and process it effectively for the it is applied in real time video game applications and video streaming process.

USB Ports

The USB ports have two options the USB 2.0 and USB 3.0 hub is available to integrate the external peripheral with the devices easily. The micro-USB also available in order to provide 200 mA power utilization using B model.

HDMI ports

The Raspberry Pi is nothing, but the high-definition medium access integrated and composite connection HDMI socket for video streaming applications effectively. It contains a USB hard drive for storing the data and booting the hardware as like your computer. The B + model have a Micro SD card memory that access I external storage. The LED status or commonly used to determine the program flow status such as Flag communication and locator to the opposite end of the

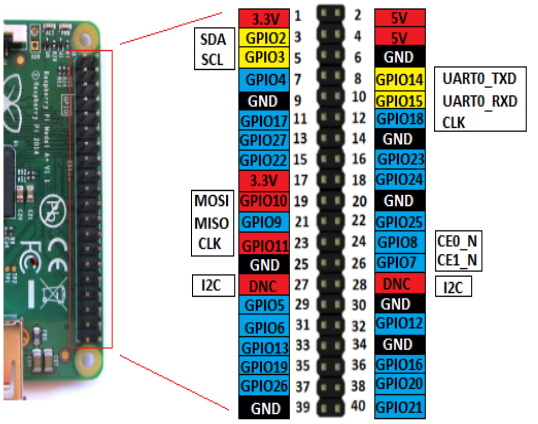

Fig. 3. PIN OUT diagram of Raspberry PI

Pin Out configurations

The hardware specification of Raspberry Pi contains dedicated central Processing Unit that Axis a tiny computer helps to carry out number of instruction cycles based on mathematical operations and logical operations. It comes with the capability of 64-bit working cycle that enable Reconfigure operation.

Temperature Sensor

The temperature sensor used here is the LM 35 it's a low precession integrated so cute measure the temperature of the user by wearing the output voltage linearly proportional to the temperature. A small variation in the temperature is directly proportional to the variation in the voltages with respect to the resistance stored. On the other hand, equivalent regulated voltage with prices output is fixed to the microcontroller here it is a Raspberry Pi for interfacing the data. Converted using internal ADC. The alarm 35 contains three pins the first 15 acts as a input pin the second pin access ground. The figure shows the temperature sensor devices.

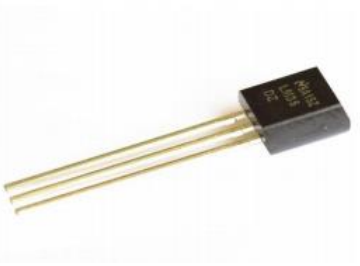

Fig. 4. Temperature Sensor

The USB camera is nothing but the webcam USB 2.0 or USB 3.0 technology to transfer the sensed image data. USB cameras or use of friendly devices interface by the any kind of computers using internal drivers. The accessibility of USB technology in computers transforms the data rate of 480 MB per second. USB camera is Highly Effective comparing with other inbuilt cameras present in the laptops.

Fig .5 Web Cameras

Lcd display

LCD display is used to display the resultant outputs coming out from the Raspberry Pi device. It is a liquid crystal display with a flat panel crystal at the back end used to perform the captured voltage variations of input data as a LED display in the Crystal board. The backlight is connected to a variable resistor to for adjustment of intensity. The LCD is a configurable 16x 2 panel that can be controlled by 6 bit data input. Raspberry Pi has the internal Programmable LCD controls that can be easily configured by the device.

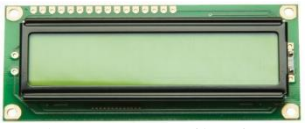

Fig. 6. LCD display

Fig. 6. Shows the LCD display used in the proposed integrated Vaccine validation system. 16x2 LCD display is connected.

Results and Discussions

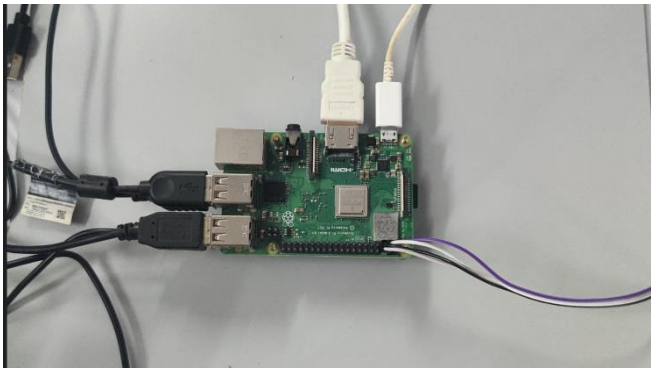

Fig. 7. Integrated Vaccine Verification system

Fig. 7. Shows the integrated Vaccine validation system using Raspberri PI 4 with temperature sensor, Mic and Camera integrated. The power supply to the raspberry PI board is given through Dc adapter. USB 2.0 or 3.0 is connected for communication as well as power supply. The challenges in embedded system enabled products are the installation and support system. Raspberry PI is formulated with user friendly adaptable plug and play model with light weight components easily installed in anywhere. The role of embedded systems in real time applications are enormous. Hence the proposed Vaccine validation framework is highly recommended for comercial usage.

```
Temperature of the person
34.75 C
vaccinated Status: Vaccinated
Mobile Number
1234567890
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Fig .8 Final Output

Conclusion

The increase in COVID-19 everywhere needs precausions on restricted entry at public places. The proposed framework is focused on real time Vaccine validation system using Raspberry PI. The hardware is integrated with real time temperature sensing component to measure contactless temperature monitoring, Camera to capture the person image and compare with the vaccinated people database, Microphone to provide instruction to the computer on step by step process involving vaccine validation. The complete process is updated into the LCD display. The validated person details are displayed in the LCD. Further the proposed model could be integrated with Mobile application for real time update and hassle free communication through Internet of Things.

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