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Artificial Intelligence based Contactless COVID-19 Testing Centre Automation

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Abstract - *Taking into account, current pandemic Corona virus testing process is a vital role of battling the virus. As of now Corona virus testing is done in allocated places of government that doesn't provide a safe environment for all the people. So the purpose of this project is to atomize the process of testing using the IOT. Our framework comprises of a camera and speaker using a Micro controller working hardware. In this process a button, sensors and internet of things module are interfaced with the microcontroller for an individual test. This system makes the process quicker and safer for an individual. It is a IOT based health monitoring system to analyze and compute the patient health smart devices connected to the internet for communicating with each other.*

***Key Words*: Artificial Intelligence, COVID-19, DSP, IOT, Testing centre automation.**

1. INTRODUCTION

The World Health Organization announced a public health emergency of international significance on January 30, 2020, with the emergency of Corona Virus Disease 2019 (covid-19). COVID-19 is a new coronavirus SARS-COV-2 infectious disease. The most commonly used procedures for controlling the spread of this highly infectious disease are contact tracing and case isolation.

Tracking of contacts involves identifying and informing people who are in contact with positive COVID-19 patients. Manual contact tracing procedures are not sufficiently efficient to control the virus spread. Despite the potential of this method to reduce manual contact tracking inefficiency, there have been important privacy concerns. One of the major problems currently faced by hospital agencies is continued monitoring of patient health parameters. Accurate, precise, and in real time monitoring should be performed. Today, patient monitoring systems are composed of patient monitoring systems that have hardwired sensors to a PC next to the bed. Human intervention is often also necessary. This requires a nurse to monitor the health parameters of the patient frequently. In contrast to a patient monitoring system by patient, the use of multiple patient monitoring system would make the monitoring of many patients more cost-effective and power-efficiency without being at the same location at the same time. So developing countries such as India will really benefit from a system that can overcome these problems. The system proposed uses the idea of wireless network technology. Each patient is identified using an ID, which simplifies the identification of the patient's current health condition for the doctor. The parameters monitored are processed and compared with each person's individual threshold limits and is interconnected to the doctor's room patient monitoring system.

The monitoring system is also networked in the nursery. Therefore, an experienced nurse can transfer the status of certain patient parameter to a mobile telephone when the doctor is not present since the monitored data is stored. The necessary medical assistance can be provided and the results of the patients involved can be checked once the doctor arrives.

2. SCOPE OF THE PROJECT

In order to reduce the spread of the Corona Virus, an Automatic Testing centre needs to be developed. This Automation of the Contactless Test Centre reduces the spread of the virus as well as manpower. It reduces the time needed to wait for the results and manages errors. It is a fully automated system with a micro-controller interface to the button, sensors and IOT module. It makes results easier to handle. Some of the major fields in which our project finds its applications are

- Schools & Colleges
- Entertainment Zones & Areas
- Transport Locations

- Religious Spots
- Companies &Industries

3. LITERATURE REVIEW

3.1 Patient health management system using e-health monitoring architecture

This paper illustrates the design and implementation of a networked e-health surveillance system. The architecture for this system is based on intelligent devices and wireless sensor networks to analyse different patient parameters in real time. This system is designed to develop a set of modules that can be used for physicians by telemonitoring patients. It also helps the patient to continuously investigate emergencies that are examined by patients and caregivers. To monitor the health and environment of the patient, a set of medical sensors and environmental sensors are used. Such sensor data is then transferred to the server in the vicinity of an intelligent device or base station. Doctors and caregivers monitor the patient in real time via the server data. Each patient's medical history, including medicines and medical reports, is clouded to facilitate access and logistical processing and prognosis of future complications. The architecture is designed for the privacy of a unit patient and multiple patients in hospitals and public health units. The use of smartphones to transmit data over the web reduces the system's total cost. We have also considered the data protection and security aspects of the system, ensuring that patients and their relatives have selective authority to access cloud storage as well as possible threats to the system.

3.2 Integrating biometric sensors into automotive internet of things

Rapidly ageing populations, obesity and associated medical conditions are important and make it possible to converge biometrics in cars to help save precious lives quickly and effectively. This requires drink driving incidents, telemetry and the development in the medical device and the emergence of 4G Mobile Network. In this article the authors describe how to achieve such a convergence by proposing a health care and safety framework in the automotive sector, which is controlled and integrated in the telemetric and other systems Internet of things. The paper also examines how emergency response via cloud computing and vehicle can be implemented and how this framework may impact on the safety of our cities.

3.3 A framework for health-care applications using internet of things

The Internet of Things (IoT) is the connecting point of various devices that allow the end user to collect and exchange data when integrated with sensors and software. In today's world, IoT usage allows us to connect and control remote infrastructure, thereby creating a better and more precise system and monetary value in terms of integration of the physical and digital worlds. In every aspect of human life, technology plays a very important part. Medical technology is an emerging field in which technology plays an important role. Medical technology using low invasion surgeries, good monitoring systems and superior scan equipment have allowed patients to waste minimum time in hospitals and to enjoy healthy and meaningful living in their homes. Three innovations in IoT-based technologies such as RFID, Raspberry Pi, Android and Bluetooth technology are discussed because of these benefits in healthcare. The focus of these technologies is on low cost, medical equipment reliability and patient wellbeing. In-depth analysis of the structural framework of all these technologies. Finally, a comparative analysis and a proposed framework of all three technologies is introduced by combining the best features of the technology discussed.

3.4 Assessing medical device vulnerabilities on the internet of things

Medical devices enabled on the internet offer comfort to patients. The numbers of cyber-attacks have increased in recent years in the healthcare industry. In view of the potentially fatal impact of a compromised medical device, the aim of this study is to identify medical device vulnerabilities. In order to detect vulnerability, our approach uses Shodan to obtain an extensive collection of IP addresses through Nessus for verification. Several main vendor devices such as Omron, Fora, Roche, and Bionet have been identified and contain severe vulnerabilities including Dropbear SSH Server and MS17-010. These enable remote code execution and authentication that potentially prevent attackers from controlling their systems.

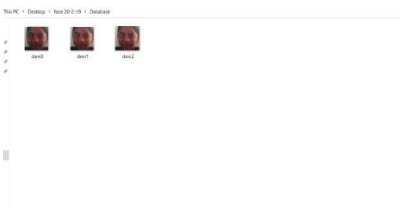
4. PROPOSED METHODOLOGY

The proposed system includes a fully automated testing cycle. An individual enters the testing room for Coronavirus and shows his or her Aadhar card immediately instead of manual entry for the camera, followed by his or her testing room and enter his or her registration number on a given keyboard. Sensors are used to monitor individual respiratory and temperatures. The system uses a speaker to inform the person when it finishes the test and then comes next person. Data collected by time shall be automatically transferred to the laboratory using the IOT before the next person arrives In charge can view the no of samples tested in real time, update results on the IOT server and immediately send an SMS to the individual by the system itself when the laboratory charge updates the test result of a sample. Thus, we are fully automating covid testing to help fight the pandemic faster, safer and more error free.

5. IMPLEMENTATION METHODOLOGY

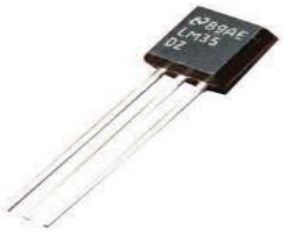
5.1 Image processing of Aadhar card

It is a method for carrying out certain operations on an image, to obtain an enhanced image or to extract some useful data. It is a kind of signal processing where input is an image and output may be image or image features. The processing of digital images handles digital images via a digital computer. Signals and systems are subfield, but they focus especially on images. The focus of DIP is to develop a computer system that can process an image. The system input is a digital image and the system process which uses efficient algorithms to produce an image as an output. Face detection can be treated as an object class detection specific case. The purpose of face detection is to identify the characteristics of such locations and dimensions of a known number of faces. The detection of frontal human faces is a focus of diverse algorithms for the face detection. It is also an attempt to solve problems of multi visual sensing, which are more general and difficult. This allows a person to enter the test room and displays the Aadhar card for instant registration in front of the camera using the image processing technology.



5.2 Temperature sensor

The LM35 range consists of precision, built-in, circuit-temperature devices with output voltage that is linear to the centigrade. In comparison with linear temperatures calibrated in Kelvin, the LM35 device has an advantage because the user is not required to remove large constant voltage from the output for comfortable Scintigraphy.



No external calibration or trimming is required for the LM35 system to deliver typical precisions of ±1/4 °C at ambient temperature and of ±2/4 °C over the full range of −55°C to 150°C. Low-performance impedance, linear output and accurate inherent calibration make it particularly easy to interface with or control the circuitry. The standard body temperature is between 97.5 and 99.7 degrees Celsius. If the temperature ranges from 100 to 103 degrees FF, this shows viral fever.

5.3 Respiratory sensor

The respiration sensing element is employed in training program applications like stress management and relaxation coaching to observe abdominal or body part respiratory. This sensing element offers you a sign of the relative respiratory depth in addition as a measuring of respiratory frequency.

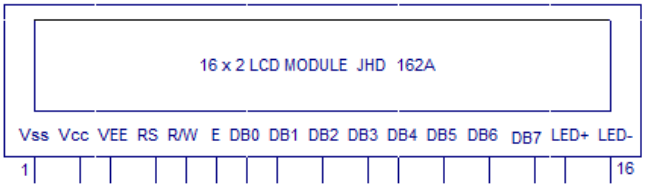
Metabolic process sensing element may be a strategic partner of medical device manufactures within the fields of respiratory and respiratory that develops and manufactures extremely reliable sensing elements and individualised sensor systems. Air respiratory or

breathing is that the beginning during this method. Air made in gas is indrawn into the body and therefore the body's exhalation is termed air made in greenhouse gas. The second step is that the exchange of gas inside the lungs, that diffuses gas to blood and emits greenhouse gas from the blood. The third part is cellular respiratory that generates a energy needed by the cells within the body and greenhouse gas. Finally, the metabolism greenhouse gas is breathed out of the lungs of the body. a human average respiratory rate is 12-16 breathes a moment. If this rate of breath will increase, Associate in Nursing irregular condition is indicated. If the speed of respiratory reaches thirty breaths per minute, respiratory disease is indicated.

5.4 *16 X 2 LCD*

It's an E-block-designed LCD display.

This enables connectivity to most I/O ports in the e-block. The LCD display needs serial data, as outlined in the following user guide. A 5V power supply is also required for the display. The 16 x 2 alphanumeric matrix displays will display 224 different symbols and characters. Pages 7/8 have a complete list of characters and signs (note these symbols can vary between brand of LCD used). It has an alphanumeric 2-line LCD screen 16 character connected to a single 9-way connector D-type.



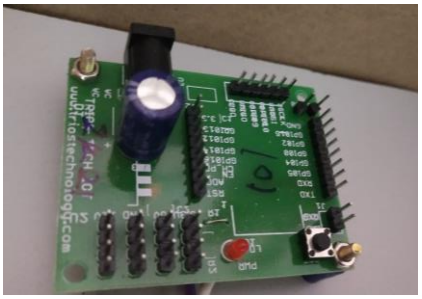
In many Arduino-based embedded system designs, LCD modules are very important to enhance the system user interface. Interfacing with Arduino provides more flexibility for programmers to easily modify the code. Any Arduino, 16X2 LCD, jumping wires and a breadboard are enough for the compilation of the circuit.

5.5 Voice module

The APR9600 provides true single chip voice recording, computer memory and forty to sixty seconds of playback capability. The device is wont to read multiple messages through number and series. Goal costs ought to be chosen from the client, so styleers will change their design to the actual quality and storage time needs. APLUS integrated achieves these high levels of storage capability by exploitation its proprietary analog /multilevel storage technology enforced in a complicated Flash non-volatile memory method, wherever every memory cell will store 256 voltage levels. This technology allows the APR9600 device to breed voice signals in their natural type. It eliminates the requirement for coding and compression, which regularly introduce distortion. AI (AI), could be a simulation of the intelligence of individuals in computers designed to suppose and imitate the behaviours of individuals. The AI assisted voice module tells the individual however the check is complete and asks following person to form progress.

5.6 IOT Module

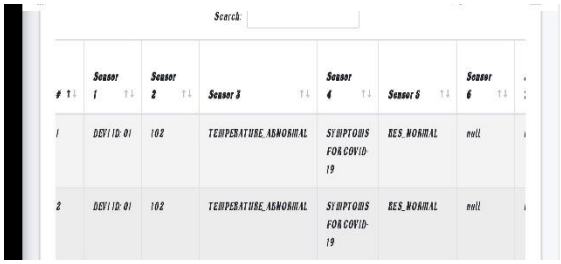
IOT is a network of everyday objects – physical objects built into electronics, software, sensors and networking that enable data exchange. Basically, a small network shop is attached to something which enables the exchange of information to and from it.
Computers are all around us — ubiquitous, uniquely recognizable, Internet-linked, embedded computing devices. The Internet of things is beginning to start off because of low-cost, networkable microcontroller modules. Before the next person comes in, the data collection will be moved to the lab via an IOT module.



5.7 IOT Server

Espresso's ESP8266EX provides an outstanding wireless software solution for users in the fields of energy efficiency, a lightweight interface and secure web efficiency. With full and autonomous Wi-Fi networking features, ESP8266EX can serve as an individual application or a slave for a host MCup. If ESP8266EX hosts the programme, it begins quickly. The built-in high-speed cache allows optimisation of system performance Also for any Design Microcontroller ESP8266EX can be used as a Wi-Fi Adapter via SPI/SDIO and I2C/UART interfaces.

The laboratory charging will view the number of test samples in real time and update the results on the IOT server.



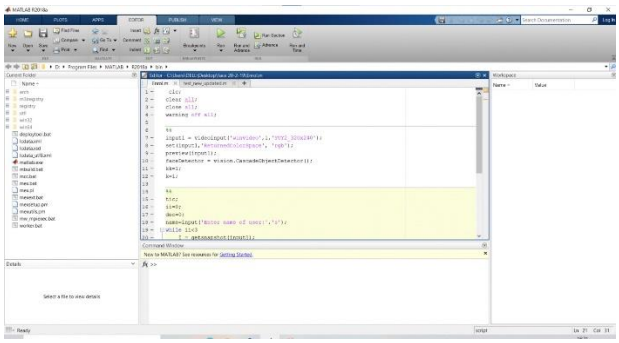
5.8 Message Management

The chip circuitry is handled for playback and record operations. Depending on the desired process, multiple messaging modes are available. The style of the message management, message duration and external parts count are determined in these message modes. Before the design starts, the designer must then choose the proper operating mode. Operating modes do not impact Voice Quality; the Sampling Rate & Voice Quality segment offers information on quality factors.

The ability to audibly prompt the user for system status changes by using 'beeps' superimposed on the device's performance is an essential aspect of the APR9600 Message Management capabilities. It allows you to affirm a high degree of rationality on the BE pin.

5.9 MATLAB

Matrix laboratory is that the name MATLAB. the initial purpose of MATLAB was to produce quick access to the LINPACK and EISPACK matrix applications. Over variety of years, MATLAB has adult with the input of the many individuals. it's the quality technique for initiation and advanced coaching in arithmetic, engineering, and science in university environments. this is often a set of resources and facilities for victimization MATLAB functions and information. several of those instruments area unit user interfaces of graphic style. The command history and browsers for viewing support, the space, files and also the search path area unit enclosed within the MATLAB Desktop and Command window. It is a high level matrix / array language that contains flow standing, functions, information structures, input/output, and programming options for objects. It helps each small-scale programming to construct quick and dirty throw-away programmes and large-scale programming to develop strong, advanced application programmes.



5.10 Embedded C

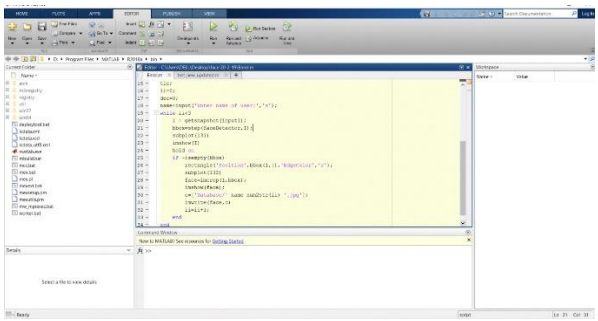
For embedded systems growth, high-level language programming was long used. Montage programming remains prevalent, particularly for systems based on a Digital Signal Processor (DSP). Programmers who are aware of processor design within the programme DSPs are mostly programmed in assembly language. Despite the drawbacks of assembly programming compared to high-level programming, the main reason for this approach is success.

Embedded C attempts to solve the discrepancy between Standard C and the hardware and the device architecture in the embedded system. The C-language extends with primitive elements that are commonly given by DSP processors, and which are required by signal processing applications.

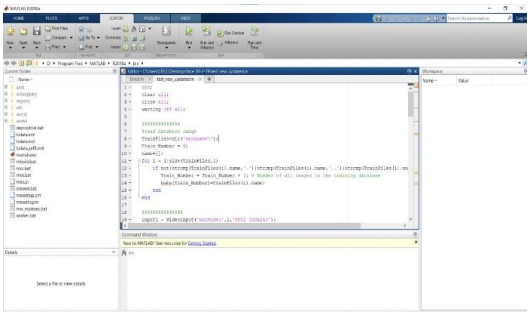
DSP-C is the basis for the conception of a support for fixed-point data types and called address spaces.

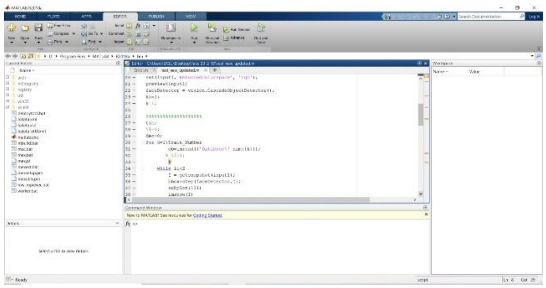
DSP-C is an extension of C, designed by the industry, for which many DSP manufacturers have gained experience in compilers since 1998. Cooperation with embedded application designers and DSP manufacturers was sought for the production of the DSP-C by ACE (for which three of us work).

The Embedded C specification allows free-standing embedded processors to use multiple address space functions, user-specific named address spaces, and direct access to processor and I/O registries.



These features are popular in most consumer products with small, embedded processors. Fixed-point and saturated arithmetic, parts of the memory and hardware I/O addresses are the features implemented by Embedded C. The definition we present here covers the extensions from the point of view of language design, as opposed to the point of view of the programmer or processor.





6. RESULTS

We can see how perfectly the package works. The patient information is recorded by using the picture processing technique to capture the aadhar card.

Then the body temperature is sensed and the breathing sensor control the individual's breathing rate. Completion of the test tells the voice module. The IOT module transfers the data obtained to the laboratory.

The laboratory charge will display a number of samples evaluated on an IOT server in real time and update the results. The device itself would immediately send an SMS to the particular person.

The individual's natural body temperature must range from 97.5 degrees Fahrenheit to 99.6 degrees Fahrenheit. If the body's temperature is over 100 degrees Fahrenheit, the person suffers from viral fever.

The person's average breathing rate is between 12 and 16 breathes a minute. It means that a particular person has pneumonic infection when the number of breaths per minute reaches 30 breaths.

7. CONCLUSIONS

In an indoor scenario this patient surveillance system will simultaneously track many patient parameters. Testing was performed with numerous patient cardiac readings.

This system is so effective, simple to use, and can therefore be used in hospitals. Doctors or nurses may connect to a central server in order to obtain multiple tracked patients with health status and values.

It makes diagnosis simple. The device also retains the patient's comfort since conventional cable and instrument control tools are no longer needed. Furthermore, wireless connectivity allows rapid data sharing, which provides instant outcomes in a critical situation for many patients in real time.

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