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Covid Positive Patients Detection Using Sensors, Iot And Securing the Data Implementing Sha- 512

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ABSTRACT

Even with ongoing research and development of vaccines and therapeutic techniques, the entire ordeal behind the mechanism, detection and treatment of the novel Coronavirus disease remains to be unidentified in the human population and has now been declared a global pandemic. Common symptoms of COVID-19 that can be identified easily are fever, dry cough, and tiredness out of which fever is the most common and indicative symptom. Since the novel virus outbreak, thermal screening using infrared thermometers has been carried out at public places to detect elevated body temperatures of infected individuals. This is the most convenient way of detecting and separating infected individuals from the crowd to prevent contact-spread. This method of detection still lacks efficiency as it is a tedious and time-taking process. Another disadvantage of this technique is that the health professionals who carry out the temperature check are at a major risk of exposure to the infection due to close contact. This study proposes the design of the system that the use of Sound Sensor to detect cough and Temperature Sensor for elevated temperatures of the people and identify potentially infected individuals. Post-detection, the detected health parameters of multiple individuals will be uploaded on the cloud server of government agency. This will help the government to access an updated large-scale database with the information of each and every citizen who has undergone the sensor detection. This will make their monitoring task simple and will highly reduce human efforts and chances of errors.

Keywords: *COVID-19, Coronavirus, IOT, Sound Sensor, Temperature Sensor.*

I. INTRODUCTION

COVID-19 is a contagious viral disease which is now widespread globally. The name 'coronavirus' was obtained from a Latin word *'corona'*, which means 'crown', because of the crown-like spikey structure found on its surface. The World Health Organization (WHO) officially publicized the origin of the new viral pandemic in January, 2020 for which they coined the term 2019-nCov. This infamous virus belongs to the large group of Coronaviruses which include SARS, MARS and other member of Coronavirus family. The first human case of COVID-19 is allegedly known to have emerged from the city of Wuhan, China and had affected 7,711 people and caused 170 deaths before it was acknowledged as a pandemic WHO. After further investigation, it was found that the spread of the virus originated from the wholesale markets in Wuhan. The first few cases outside China arose in Japan, Thailand and South Korea and then found its way to other countries worldwide. With the increase in the spread of this disease, many nations implemented lockdown protocols and asked their citizens to maintain social distancing to contain the spread of the virus through contact. WHO has provided several precautionary guidelines like wearing masks, use of sanitizers which contain a minimum of 60% alcohol, follow safe hygiene etc. As of today there are almost 36,002,827 infected people and 1,049,810 deaths due to the disease globally. This infection can spread from one person to another through saliva or droplet exchange while talking, or standing close to an infected person. The virus is released efficiently by the means of sneezing, coughing and physical contact. The common symptoms displayed by an infected individual are fever, sore throat, dry cough, tiredness, nasal congestion, shortness of breath, diarrhoea, conjunctivitis, chest pain, runny nose, pain and aches. Though, there are some individuals who do not show any symptoms they show signs of fatigue and breathlessness.

Around 80% of the people infected with Coronavirus recover with general treatment or best case without any treatment. The risk of contracting the infection is higher for old people, immuno-compromised people or the people with pre-existing health conditions like asthma, heart problem, diabetes than people with normal health condition and are hence placed in high-risk subpopulation category. Till date, no effective vaccine has been devised for the treatment of COVID-19 disease. The research for the vaccine and medication is still under process and there has been a considerable increase in the number of tests being conducted to detect COVID-19 impacted patients by prominent medical research centres worldwide. Health practitioners, researchers and WHO are taking extraordinary efforts to invent and implement an effective treatment plan to tackle the

spread of the disease and to cure those who are already impacted.

As the cases are increasing many countries have implemented strict lockdown & Standard Operating Procedures (SOP) to reduce contact spread. The infected person is kept in isolation for a period of 14 days and the doctors and health care officers looking after the infected patients are advised to use PPE (Personal Protective Equipment) kits to reduce the risk of getting infected. Infrared thermometers are being used for detecting the temperature of the individuals in public places to screen for the infected individuals in the masses. Infrared thermometers aren't very efficient because their use is time-consuming and the heath officers have to check individual temperatures with the added risk of contracting the infection themselves. To prevent this inefficiency and to combat the spread of the virus, a safer, substitute technology has to be developed. Internet Of Things (IOT) is currently being used almost all around the world and has become one the most prominent technologies today. The research and development now focusses on using remote sensors which are majorly based on Internet Of Things.

IOT can be defined as the connection of numerous devices through the internet for sharing and transmitting large-scale data with other devices. IOT is also popularly used in several technician and industrial areas like alarm systems, anti-theft systems of new born, data security and many more. It is also helpful in maintaining large amounts of medical data. It helps in data collection of the patients efficiently and reduces the chances of error in the collection and storage by helping medical professionals access the accurate health records of the patients. IOT finds it's applications in several other technical fields like handling data-controlled medical equipment's, Big Data, Cloud Computing, Data Mining. It helps in monitoring, production, tracking of medical devices and medication which indirectly reduces management costs. With the IOT technology becoming popular all around the world, especially in health care, this study aims to design a system which has the capability to efficiently measure the temperature of the population sample without any human interaction requirement which aids in reducing the spread of COVID-19 infection specially reducing the risk of contraction of health care officers using thermal sensors.

II. RELATED WORK

2.1 – Infrared Thermometer

Infrared thermometers, also referred to as pyrometers, are advanced sensors that are widely used today in many areas, from research and development to automotive and manufacturing applications. Infrared thermometer is a contact less device used for screening and monitoring temperature of a human body. Infrared thermometer is a simple, versatile single wavelength technique. The temperature is determined from a distance by an infrared thermometer. This distance can be an inch. The device consists of an infrared sensor that helps to measure the temperature without touching the skin of the person. Infrared thermometers operate on the basis of a phenomenon known as black body radiation.

2.2 – Technical Working

The infrared thermometer consists mainly of the following elements.

a) A **Lens** that absorbs thermal radiation emitted from a given surface.
b) A **Detector** that converts that power into an electrical signal.
c) An **Emissivity Adjustment function**, so that the instrument can be tuned to the properties of the target material.

Compensation function for ambient temperature, which stops the detector from factoring the temperature of the device into the output signal. LED which gives two colours, red if the temperature is high i.e. 37.5 C to 42.0 C and green if temperature is normal i.e. 34.0 C to 37.3 C. It also consists of AAA batteries with a 1 second measuring time. It has automatic shutdown power for energy saving. Frontal temperature and physical temperature methods are used for infrared interaction analysis. In Celsius and Fahrenheit, the temperature can be determined. The working environment ambient temperature is 16 C to 35 C. It is easy to use and have 99 set of measured values are stored in memory data for easy reference. Infrared light behaves like visible light. It can be concentrated, transmitted or absorbed. Using a lens to concentrate infrared light on a detector known as a thermopile, infrared thermometers convert infrared radiation into heat. In order to calculate the temperature, the heat energy is then converted into electricity and passed to the detector. The power sent is directly proportional to temperature of the object. The more power, the hotter the object is. For its internal functions, the infrared thermometer only uses RF resources. As a result, RF emissions are very low and may not interfere with surrounding electrical devices. The analysis of infrared temperature is a modern, well-engineered technique that is constantly being developed and extended to respond to new applications.

Stand at a distance of 1 metre or more from the human body. Depending on the severity of the situation, you can stand further apart, but according

to the WHO safety guidelines, a minimum distance of 1 metre is recommended to protect yourself. Once you are at the right distance, by straightening your arm to 90 degrees from your body, align your infrared thermometer or Digital infrared thermometer with the person's forehead. After that, click the button and wait for the body temperature to be processed by the system through its compensation algorithms which is used to overcome the effect of the angle of incident on the outcome of the temperature calculation and displayed on the device's mini-screen. One must ensure that the temperature of the human body must be about 98.6 degrees Fahrenheit-normal body temperature, but if it is above that, with COVID-19 symptoms, the individual must be self-analysed.

2.3 – Limitations

On a daily basis, various diverse manufacturing sectors as well as the research and development community have come to rely on pyro metric methods but it has several limitations like frost, moisture, dust, fog, smoke or other particles in the air may momentarily affect the infrared thermometer. Infrared thermometers can be temporarily influenced by sudden changes in ambient temperature. The measurements can be unreliable if they are used in an area that is too hot or too cold. The temperature varies with the thickness and the type of skin. The health officers who are checking the temperature are at a high risk of getting infected. If the sensing area is not clean it can give inadequate readings which lead to spread of coronavirus. The temperature measurement can be influenced by the position of the instrument and how it is used.

III. PROPOSED TECHNIQUIES

3.1 - TEMPERATURE SENSOR

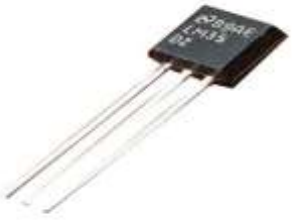

Figure 1: Temperature Sensor

A temperature sensor is a device designed to determine an objects' degree of warmth or coolness. As shown in figure 1, the voltage across the diode terminals is the fundamental concept of operating with temperature sensors. The temperature also rises as the voltage increases, followed by a voltage drop between the base transistor terminals and the diode emitter.

3.2 – SOUND SENSOR

Figure 2: Sound Sensor

A sound sensor is described as a module which, by its strength, detects sound waves and converts them to electrical signals via air molecules, sound waves spread. The diaphragm in the microphone allows certain sound waves to vibrate, resulting in a change in capacitance. For sound intensity processing, capacitance shift is then amplified and digitalized.

3.3 – ARDUINO

Figure 3: ARDUINO

Arduino refers to a forum or brand for open source electronics and the tools used to program it. Arduino is meant to make electronics more available to musicians, programmers, hobbyists and other involved in the development of immersive objects or environments. Figure 3 shows the Arduino board. It can be bought pre-assembled or, as the architecture of the hardware is open source, built by hand. Users can adapt the boards in any way to their specifications, as well as upgrade and sell their own versions.

3.4 - SHA ALGORITHM

Safe Hash Algorithms is designed to maintain data security. First, the data is converted into encrypted

format with the help of a hash function. Then it produces an alternative text to the original data which is completely different from it. Once the data is converted, it cannot be decrypted by virtual means. It reduces the risk of leaking important information.

3.5 - CLOUD

The Cloud is computing environment on the internet that exists. It is a storage space where individuals, including apps, programmers and data, can put their digital capital. Cloud storage technology enable users, often satellite networks, to use the data services housed in virtual space across networks. It enables individuals to exchange information and software over the internet without limiting their physical location.

3.6 - R PROGRAMMING

Computer engineers, mathematical scientists, computer technicians, and data minors use it extensively. It is one of Data Analytics and Market Analytics' most popular analytics tools. In fields such as nursing, academia, consultancy, banking, media, and many more, it has various applications. Its comprehensive applicability in analytics, data visualization, and machine learning has resulted in the need of R. accredited qualified professionals.

3.7 – CLUSTERING

The dataset is grouped by partitions with correlations in multiple classes that may serve as a framework for further study. The effect would be that objects will be identical to each other in one category but distinct from objects in another group. For exploring results, clustering is useful. Clustering algorithms can be used to find natural groupings where there are several instances and no clear groupings. For anomaly analysis, clustering may also be used.

IV. METHODOLOGY

The section describes the working flow of the model in 3 progressive phases: Real-time data collection, data sharing and data analytics. In which Real-time data helps us to improve efficiency, Reduced errors as we know that in when we collect data manually, there is a risk that errors might get infested in our data set. Even if the cause of error is multitasking, lack of experience or as small as bad handwriting, this variable is removed by automated data collection. Data sharing encourages further linkages and collaboration between researchers, which can contribute to important new findings in the field. Data exchange is more effective at a time of decreasing budgetary investment in science and study, as it allows researchers to share capital. Data Analytics eliminates redundant data from data sets and thereby saves vast amounts of memory space. And it also helps in detecting and correct the errors from data sets with the help of data cleansing.

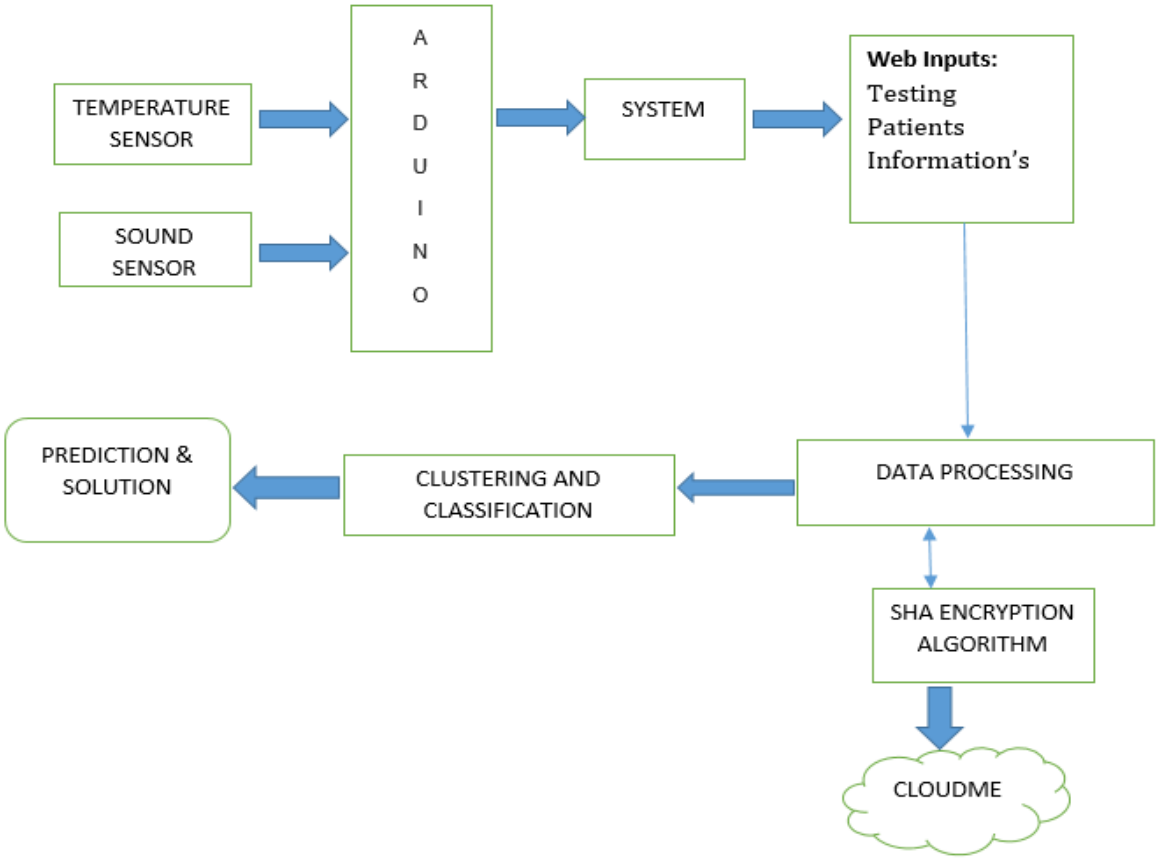

Figure 4: Work Flow Diagram

In Figure 4 the first phase involves collecting of temperature data by using the temperature sensors (fever) and sound sensor(cough) and adding the parameters to Java web pages by the user. The sensor is connected to the Arduino from which the data gets transmitted to Java using comport and is then dynamically collected in the database (MySQL). The collected data is encrypted using **SHA algorithm** and converted into hash values and stored in the public cloud for global access for the concerned authorities. The analytics team can pull up the data as per convenience from the system and convert to .CSV format to embed it to R Studio for analytics. In R programming, we perform grouping of data (clustering) using **k-means algorithm** and conditions. The solutions are trained for each cluster and are performed using **naive Bayes classifiers**. Thus, the machine learning model employed to detect the corona infection can be set up and health preventive measures can be directed accordingly. This proposed design will meet the demands of healthcare systems and additionally will help in controlling and preventing contact-spread.

The Arduino IDE (Arduino Integrated Development Environment) is implemented in this project and is written in Java. This includes many code editor functions, such as syntax highlighting, auto indentation, etc. In addition, via compiled and uploaded programs, the IDE uploaded an Arduino board. The basic one-click method is used. It also supports the use of specific rules to order code in C and C++ languages.

V. RESULTS AND DISCUSSIONS

At the outset, the principle proposed should be tested by simulation to determine its feasibility and confirm the unwavering quality of the said control technique. The basic model of the generated system is constructed. The testing process based on the logic of the programmer in order to ensure that all statements are attempted and that a realistic intermediate is carried out within the tests in order to identify errors in order to provisionally approve the framework. It also maintains that the given input will produce real results that are synchronized with the necessary results. Every test at the level of the software and models was integrated and carried out.

Sound Sensor helps to distinguish a specific person's cough to alert the system. Collecting temperature data through the use of temperature sensors and applying parameters to the user's Java web pages. The sensor is connected to the Arduino from which the data is transmitted via comport to Java and then collected dynamically in the database

(MySQL). Using the SHA algorithm, the collected data is encrypted and translated into hash values and stored in the public cloud.

The R-Clustering Screen (K means Clustering) where solutions are trained for each cluster is shown in Figure 5 and Figure 6. This makes it possible to easily and accurately classify individuals with elevated body temperature and to isolate them for more precise testing. Beyond body inspection for COVID-19 diagnosis, temperature, machine learning is used. This device senses high temperatures automatically and can speed up diagnosis and reduce the chance of human error. Figure 7 shows the data analysis of the people.

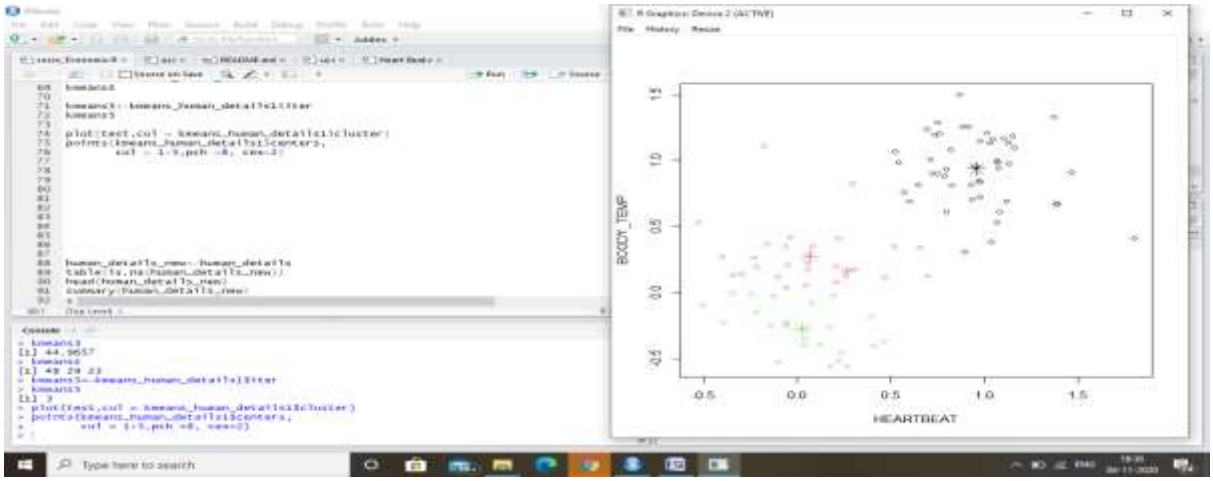

Figure 5: R-Clustering Screen (K means Clustering)

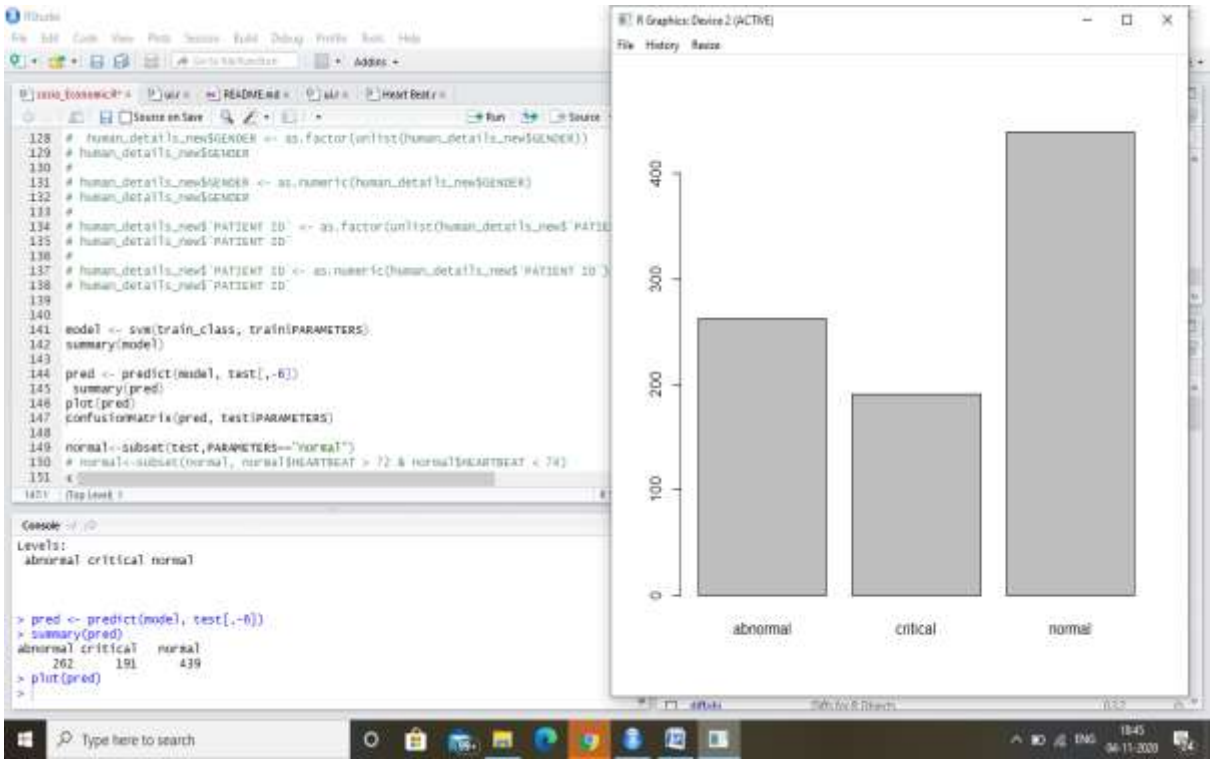

Figure 6: R-Clustering Screen (K means Clustering) - Data Analysis

VI. CONCLUSION

While the impacts of the COVID-19 pandemic continue to be discussed by the world, complementary attempts are being made to mitigate the effect of various emerging technologies, such as UAVs, AI, block chain. With all this in mind, using Smart Sensor and SHA Algorithm, Java Application, we proposed an innovative early real-time coronavirus detection and monitoring system, which collects recorded temperature data in the cloud for use on a larger scale. The spread of coronavirus provides so much attention and recognition among individuals as the current major problem that has occurred worldwide today. An early identification of coronavirus symptoms will be one of the appropriate ways to prevent the spread of coronavirus. As one of the very common symptoms is the high body temperature of individuals, a real-time monitoring system is required that automatically records people's temperatures. Thus, the automated recording of temperature would take less time and less human interactions to help stop the coronavirus from spreading. It can be concluded that the procedures of remote sensing, which include a variety of ways to recognize, sense, and track coronavirus, offer an outstanding promise and ability to meet the healthcare system requirements.

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