REVIEW ON WIRELESS PATIENT HEALTH MONITORING SYSTEM USING IOT FOR COVID-19 PREVENTION

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ABSTRACT

Health has the prime importance in our day-to-day life. Sound health is necessary to do the daily work properly. As a result of the worldwide transmission of sever acute respiratory syndrome Coronavirus2 (SARS-CoV-2) and COVID-19 has evolved into an unprecedented pandemic. Internet of Things (IoT) enabled healthcare system is useful for proper monitoring of COVID-19 patients, by employing an interconnected network. This technology helps to increase patient satisfaction and reduces readmission rate in the hospital.

Covid-19 has become pandemic, spreading all over the world. Scientists and engineers are working day and night to develop a vaccine, to evolve more testing facilities, and to enhance monitoring systems. Mobile and web-based applications, based on questionnaires, have already been developed to monitor the health of individuals. Internet of Things (IoT) can be used to avoid the spreading of Covid-19. Internet of Things is an interconnection of physical devices and the Internet. Devices are not only sense and record, but can also monitor and respond. In this proposed system, we are going to monitor and keep record of patient health with the help of IoT and web application, system will monitor three parameter:

1. Temperature
2. Heart Rate
3. Oxygen level in blood.

As oxygen level in blood is very important parameter for patient who is found COVID-19 positive, proposed system will` send text message to family member about emergency alert using GSM modem.Here GSM modem 800C will be used to communicate with web application and send text message in emergency conditions.

Keywords : (IoT in COVID-19 prevention, IoT in Healthcare, IoT, web application, SIM800C) .

1. INTRODUCTION :

IOT Internet of Things is the technology new connected through the internet among different fields. The paper proposes the IOT based as a health monitoring system with Wi-Fi to detect the body parameters like temperature, heart rate and also determine jaundice [1]. A web based smart phone wise all the mobile connectivity anywhere anytime and the sensor data are displaying via web application. The main aim of this research is to create and develop low cost meter for real-time in newborn based.

From the compact sensors embedded within the patient's body, physiological data is collected consisting of various necessary physiological parameters. Then a small hardware capable of preprocessing the acquired data and a communication software to transmit that data. The sensors must be small, light-weight and not troubling the patient's mobility and movements. Those sensors must operate on small, energy efficient batteries. The batteries are expected to be working continuously without charging and replacement.

An increase in the use of mobile technology and smart devices in the healthcare sector results in a significant impact on the world. Potential development of new smart and powerful devices for monitoring of individuals' health, health experts are taking advantage of these technologies, thus a substantial improvement in healthcare in clinical settings and out of them. IoT allows integrating physical devices capable of connecting

to the Internet and provides real-time health status of the patients to doctors. Chronic diseases such as diabetes, heart, blood pressure are remarkable in the world economic and social level problems. It can also provide a platform that allows public health agencies to access the data for monitoring COVID-19 pandemic. Fig. 1 shows the present trends of new cases of the top ten counties. New cases in the USA are increasing rapidly than in other countries.

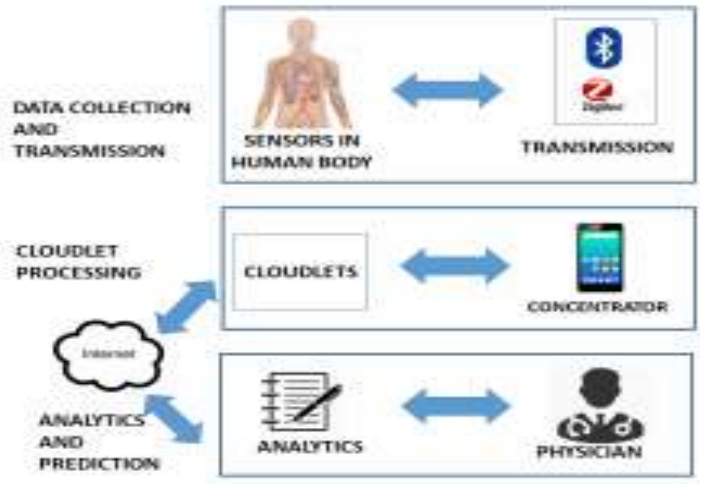

Fig1. Concept of IoT in HealthCare

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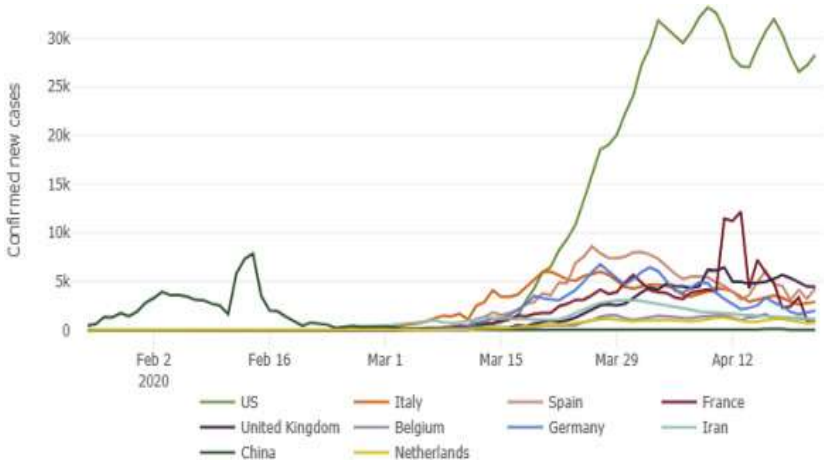

Fig. 2.Trends of new cases in the top ten countries [1].

COVID-19

Corona virus is transmitted to humans, birds, camels, pigs, rats, bats, and cats. Bat origin corona virus HKU2 was responsible for acute diarrhea syndrome in pigs in 2018. In November 2002, a novel beta corona virus resulted in nearly 8000 human infections and 774 deaths in 37 countries. In 2012, Saudi Arabia identified the Middle East Respiratory Syndrome (MERS) corona virus (MERS-CoV), which was the seventh member of the corona virus family. COVID-2019 is closely connected to other bat-origin beta corona viruses. Zhu et al. [2] COVID-19's first case was identified, and a cluster of unknown patients with beta corona virus pneumonia linked to the seafood wholesale market in Wuhan, China. A novel CoV (2019-nCoV) was detected in hospitalized patients in Wuhan, China, from December 2019 until January 2020. Evidence for this virus's discovery includes the identification of whole-, direct PCR, and bronchoalveolar fluid culture in three patients. Phylogenetic studies indicated that 2019-nCoV falls into the genus beta corona virus, which provides for corona viruses found in humans, bats, and other wildlife (SARS-, SARS- CoV bat, and others) Guan et al.[3] analyzed the clinical characteristics of corona virus and extracted data from 552 hospitals in 30 provinces, autonomous regions, and municipalities in China from 1099 laboratory-confirmed COVID-19 patients through January 29, 2020. The patients 'median age was 47 years; the patients were 41.9% female. The primary composite outcome occurred in 67 patients (6.1%), including 5.0% who were admitted to ICU, 2.3% who were subjected to intrusive mechanical ventilation, and 1.4% who died.

2. LITERATURE REVIEW & RELATED WORK:

Joseph et al. [4] analyzed social media data based on three approaches: content, descriptive, and network analysis. Findings show that it can be used to extract the information of individuals likings and dislikings.

Misra et al. [5] presented a review of IoT and depicted critical challenges in the same field. The article offers an outline of the IoT concept and its related technologies, application, and future scope of research of the area.

Gómeza et al. [7] developed an architecture based on an ontology for monitoring the health and workout and provides recommendations to patients with chronic diseases. The model developed for the system proved to be efficient when making inferences related to the context.

Li et al. [8] developed an IoT based system (nCapp) to diagnose COVID-19 earlier. According to existing data, questionnaires, and check results, the diagnosis is automatically generated as confirmed, suspected, or suspicious.

Zaheer et al. [9] highlighted the need for standardization of protocols for smart city communication.

Noah et al. [10] utilized the Centers for Disease Control and Prevention (CDC, USA) website, and a comprehensive review of PubMed literature, and obtained information regarding clinical signs and symptoms, treatment and diagnosis, transmission methods, protection methods and risk factors for Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS) and COVID-19.

Mohammed et al. [11] explained the applications of IoT technologies in the medical and healthcare field and highlighted the potential.

Rinto Priambodo and Tric Maya Kadarina [12] explain the application of Internet of Things for monitoring the COVID 19 patient using with Android application. It can be controlled or observed by a particular staff or a healthcare person.

Mohammed et al. [13] developed a smart helmet-mounted with thermal imaging systems for identifying the infected among the crowd. It also equipped the facial recognition system.Fig. 2 shows the workflow of the

smart helmet. Scanning of the crowd using infrared Camera and if the high temperature of any person detected, then it will capture the face using an optical Camera. It also provides the location of the infected person through GPS.

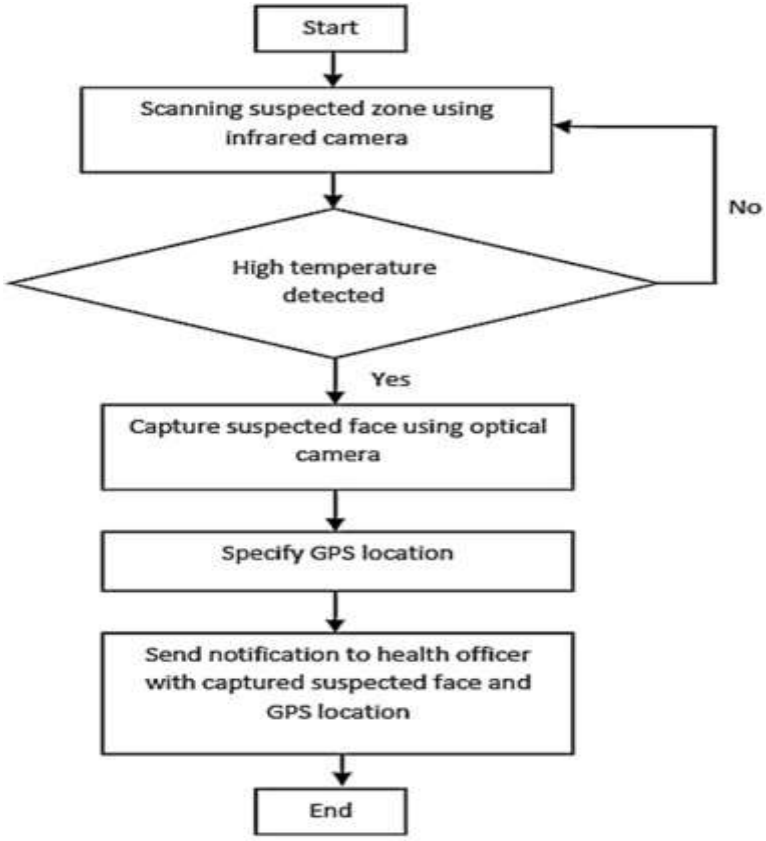

Fig. 3. Work flow chart of Smart Helmet [13].

3. ANALYSIS OF PROBLEM :

Oxygen percentage in blood is very crucial parameter for a patient who found COVID-19 positive along with the heart rate and temperature it's also very important to maintain the historical health related information of patient. The main target of this project is to monitor and send temperature, Heart rate(Pulse Rate) and Oxygen percentage in blood to remote web server for continuous monitoring and to maintain history of patients health. System will also alert family member of patient if any of three parameter found above or below threshold.

4. PROPOSED WORK AND OBJECTIVES:

Integration of the IoT technology with e-Health solutions is the main focus here, that is, to show how IoT's main technology is useful in health care domain. Here we are going to use Blood pressure sensor, Temperature and Humidity sensor. Blood pressure sensor will be able to measure Systolic, Diastolic and Pulse Readings and send the reading to controller using UART Communication.

SIM900 GSM modem will create HTPP post request to web server to call php page and store reading in MySQL database. The data stored in database is now ready to publish to Doctor or family member to read the recent measured parameters. System will be always in operation and if found any measured blood pressure,

pulse rate, temperature and humidity out of predefine range then system will send alert SMS to doctor and family member for help.

SYSTEM ARCHITECTURE :

The Architecture framework for IoT enabled e-health, can be best understood by visualizing the lifecycle of the various entities and their interactions. Fig 3 shows the proposed system architecture. The Architecture for e-health must consider the needs of each step in this life cycle and must address the effective and efficient execution of each function. The key to e-health architecture is to support an interoperable system of different types of devices, applications, and backend systems to enable the free flow information for precise and timely decision-making.The data flow architecture focuses on the source of the data, the destination the data and path the data. The source of the data is typically the sensor. The data can be either locally cached or issent to the upstream systems without storing in the sensor. The path taken by the data includes a gateway, which can also cache some of the data and do distributed processing.

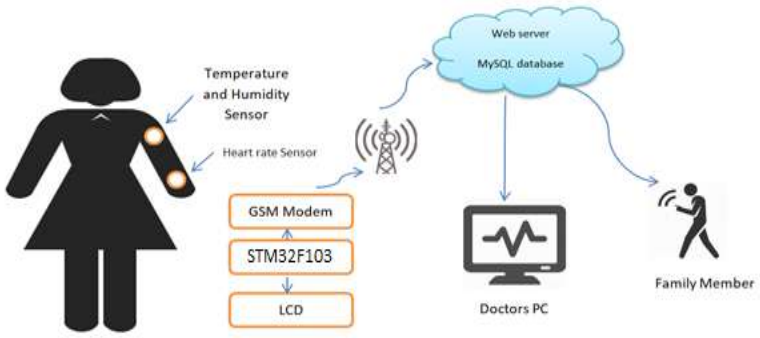

Fig 4: System Architecture

STM32F103C8T6 :

This is STM32F103C8T6 Minimum System STM32 ARM Core Board. This board is a low-cost Minimum System Development Board for ARM Microcontroller STM32F103C8T6. The main feature of STM32F103 is Arm Cortex-M3 MCU with 64 Kbytes of Flash memory,

Features :

- 72MHz work frequency.
- 64K flash memory, 20K SRAM.
- 2.0-3.6V power, I/O.
- Reset (POR/PDR).
- 4-16MHz crystal.
- On-board Mini USB interface, you can give the board power supply and USB communication.

Features that we need to use in proposed system is USART communication hardware. The controller also has 2 x 12-bit, 1 µs A/D converters (up to 16 channels), which will help us to read more accurate analogue readings. I2C protocol is going to use for interfacing MAX30100 sensor.

Fig-5: STM32F103C8T6 Minimum System Board

SIM900 GSM Modem :

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption

Fig-6: SIM900 GSM Modem

MAX30100 Pulse Oximeter Heart Rate Sensor :

Heart Rate click carries Maxim's MAX30100 integrated pulse oximeter and a heart-rate sensor. It's an optical sensor that derives its readings from emitting two wavelengths of light from two LEDs – a red and an infrared one – then measuring the absorbance of pulsing blood through a photo detector. This particular LED colour combination is optimized for reading the data through the tip of one's finger.

The signal is processed by a low-noise analog signal processing unit and communicated to the target MCU through the mikroBUS I2C interface. Developers of end-user applications should note that the readings can be negatively impacted by excess motion and changes in temperature. Also, too much pressure can constrict capillary blood flow and therefore diminish the reliability of the data. A programmable INT pin is also available. The operates at the 3.3V power supply

5. BENEFITS OF IOT IN HEALTHCARE :

Iot has many advantages to individuals, society, the environment, consumers and business, as with every technology there are some benefits with some drawbacks. Following table provide the list of major benefits we have from iot. Though, iot is very beneficial in the domain of the medical health care. Iot based applications and systems have transformed the world into an imaginary world which human of 90's thought about. Due to Iot there is revolutionary change in the field of internet communication; this has a lot of contribution in the

growth of many challenging domains but especially in the field of medical things. This is the one of major reasons to close the gap between doctors, patient and healthcare.

REFERENCES:

[1] **"Johns hopkins university's center for systems science and engineering"** website https://coronavirus.jhu.edu/data/new-cases

[2] Ph D, X. Ma, D. Wang, W. Xu, G. Wu, et al. "**A Novel Coronavirus from Patients with Pneumonia in China"** Ph D(2019), pp. 727-733, 2020

[3] W. Guan, Z. Ni, Y. Hu, W. Liang, C. Ou, J. He, etal. "**Disease"** China 2020: pp1–13 (2019)

[4] N. Joseph, I.I.T. Delhi, N. Delhi "**Review of discussions on Internet of things (IoT): insights from** Twitter Analytics, 25 (2017), pp. 38-51.

[5] D. Misra, G. Das, D. Das **Review on Internet of Things (IoT): Making the World Smart"** Springer Singapore (2018).

[6] D. Gil, A. Ferrández, H. Mora-mora, J. Peral "**Internet of Things : a review of surveys based on context aware** Intelligent Services, 2 (2016), pp. 1-23.

[7] J. Gómez, B. Oviedo, E. Zhuma "**Patient monitoring system based on Internet of things"** Procedia – Procedia Comput Sci, 83 (2016), pp. 90-97.

[8] L. Bai, D. Yang, X. Wang, L. Tong, X. Zhu, N. Zhong, et al.Clinical eHealth Chinese Experts "**Consensus on the Internet of Things-Aided Diagnosis and Treatment of Coronavirus Disease 2019 (COVID-19)"**, vol. 3 (2020), p. 5.

[9] Z. Allam, D.S. Jones "**On the corona virus (COVID-19) outbreak and the smart city Network : universal data sharing standards coupled with artificial intelligence (AI) to benefit urban health monitoring and management"** (2020).

[10] N.C. Peeri, N. Shrestha, S. Rahman, Z. Tan, S. Bibi, M. Baghbanzadeh "**The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned?"** Pp 1–10 (2020)

[11] M.N. Mohammed, S.F. Desyansah, E. Yusuf "**An Internet of Things-Based Smart Homes and Healthcare Monitoring and Management System"**: Review, vol. 1450 (2020), pp. 1-15.

[12] RintoPriambodo and Trie Maya Kadarina "**Monitoring Self- isolation Patient of COVID-19 with Internet of Things"** IEEE International conference on communication, Networks and Satellite 1978-0-2517-6/20 pp 87-91.

[13] Stephanie B. Baker, Wei Xiang and Ian Atkinson "**Internet of Things for Smart Healthcare: Technologies, Challenges and Opportunities"** IEEE vol 5, Digital object Identifier 10.1109/ACCESS 2017. 2775180, PP 26521-26544.

[14] M.N. Mohammed, H. Syamsudin, A.K. Sairah, R. Ramli, E. Yusuf **"Novel covid-19 detection and diagnosis system using IoT based"** Smart Helmet, 24 (2020), pp. 2296 2303