E-Seva Remote Healthcare System

Ms. Pranita Khaire[1], Ms. Ananya Mitra[2], Ms. Namra Ansari[3], Prof. Devikarani Roy[4]

[1-3]Student, Department of Information Technology, Excelsior Education Society's, K.C. College of Engineering & Management Studies & Research, Thane, Maharashtra, India

[4]Professor, Department of Information Technology, Excelsior Education Society's, K.C. College of Engineering & Management Studies & Research, Thane, Maharashtra, India

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Abstract - —*Internet of Things(IoT) devices and services today are leading the healthcare field toward new era of efficient services and saving time and lives with high accuracy and speed. Constant progress in remote healthcare industry paves the path for innovative devices and services. Also today patients overall health can be obtained through next generation methodologies using Internet of Things and Internet of Everything. Healthcare combines with IoT drives the innovation of IoT based medical services to population especially in the rural and remote areas where efficient health centers are still not prevailing.*

In this paper we have proposed an IoT based E-Seva that improves healthcare systems in the rural parts and remote areas and provide better and enhanced health monitoring and control of rural citizens health parameter like blood pressure(BP), etc.

Key-Words: IoT, IoE (Internet of Everything), eHealth monitoring, rural health, remote facility

1. INTRODUCTION

World Health Organization (WHO) defines the maternal mortality as the death of a woman while pregnant or shortly within 42 days of termination of pregnancy. An indirect maternal death is a pregnancy related death in a patient with pre-existing or newly developed health problems during pregnancy. According to UNICEF's 2003-2008 report, the maternal mortality ratio is 2.5%. Illiterate women in the rural part of developing countries tend to ignore their health problems due to either poverty or unawareness of the health issues [1].

The World Health Organization (WHO) and UNICEF report states that each year 585,000 women die from causes related to pregnancy and childbirth [2]. Women from any part of the world can develop complications, but women in developing countries are much less likely to get prompt adequate treatment, and are therefore, more likely to die. In some countries of Africa, it is estimated that 1 in 7 women die of complications of pregnancy or delivery, compared with only one woman in several thousands in Europe and North America [3]. The majority of cancer related deaths are due to late detection of the abnormal cellular growth at the last stage. If this abnormal cell growth is detected in the primary stage of cancer, many lives can be saved.

Proper and systematic healthcare system in rural and remote areas is still a big challenge in India. Also 75% of the medical practitioners prefer urban health care centers and infrastructure than rural and hence 70% of the rural population suffers due to poor infrastructure and facilities.

Even today the health facilities in rural areas are not very efficient and people there are deprived of specialized doctors, centers and medications. Hence even in this era everchanging technologies and next generation innovations in health sector, the health of rural and remote parts lack trained doctors, specialists and super specialized physicians apart from the local paramedical staff present in the health centers.

This paper highlights the concept of creating a dedicated community of specialized practitioners and physicians striving to monitor remotely the healthcare centers in rural areas. With the assistance of such community, rural areas will have an advantage of diagnosing the disorders and illness from such specialized doctors and there by bridge the gap between urban and rural health centers using IoT

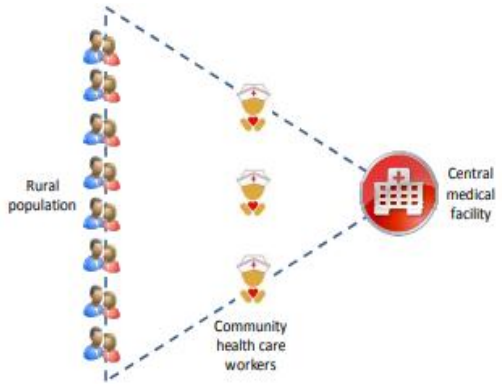


Fig. Basic Flow Model

The community of health worker will monitor the patients in the remote areas and there by providing efficient diagnosis and serve as the, counselors, treatment providers and advocate the health of these rural population. Also they will be able to detect serious diseases at an early phase, before disease become more widespread and expensive to manage.

2. RELATED WORK

In recent times, the field of technology has attracted so much attention from people around the world. With technology being multifaceted, scientists and researchers have harnessed the opportunities offered by IoT in the field of the healthcare industry, as well as the practical challenges it faced [4]. Over the years, the application of internet-based technologies in healthcare rehabilitation has become more prominent, most especially after the introduction of new concepts, such as Smart City and Smart Planet [5]

Wearable body sensor devices are used in monitoring patient's vital signs from a distance which helps to save time and cost of transportation and improving healthcare [6]. According to the authors [7], the proposed real time human body vital signs monitoring system using Bluetooth, Wlan and Raspberry Pi is having the drawback in transmitting the patients data because WLAN and Bluetooth technology cannot travel a far distance and patient's data are not transmitted in real time to physicians. Patil & Umale [8]

The main problem in this system is, the system is wireless and it can transmit the data within the range of 30 meters in an indoor non-line of sight environment and within 100 meters in line of sign environment. Author Madhu & Rao [9] proposed, IoT based remote patient health monitoring system. The major problem is, in the case of emergency, email alert or SMS is sent to physician or patient relative thereby creating a gap between patients and physicians to monitor patient's vital sign in real time.

According to the authors of [10], the proposed IoT-Based Ambulatory Vital Signs Data Transfer System has the drawback that the system produces enormous amount of data and need huge storage space. Also, some classification algorithms cannot classify large amount of data. Patient's data cannot be sent in real time because of batch processing. Swaroop et.al [11] proposed a health monitoring system to monitor the vital sign of the patient based on Internet of Things. But the accuracy of the system is limited to the accuracy of the sensors.

3. REQUIREMENTS

3.1 Hardware Components

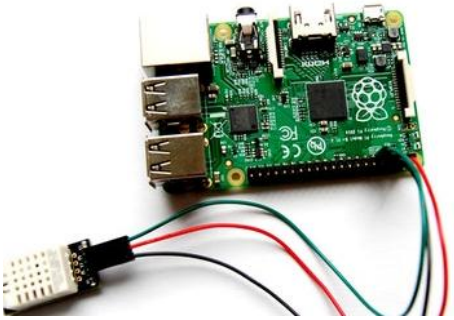
3.1.1 Arduino :

Series of hardware components were configured and integrated together in Arduino board to achieve the desired goal. The Arduino board in Fig.3, which is a microcontroller board/ motherboard based on the ATmega328. The Arduino board host a variety of hardware chips, such as external power supply, USB/Wi-Fi interface, reset buttons, capacitors, TX/RX LEDs, ATmega 328, ICSP header, Power led and other hosting pins such as analogue/digital pins, power pins etc. other sensing chips such as oxygen monitor, KY39 pulse rate monitor, DS18B20 temperature sensor, and heartbeat sensor are all supported by the Arduino board. The board is equipped with clock speed of 16MHz and flash memory capacity of 32KB.

Fig: Arduino

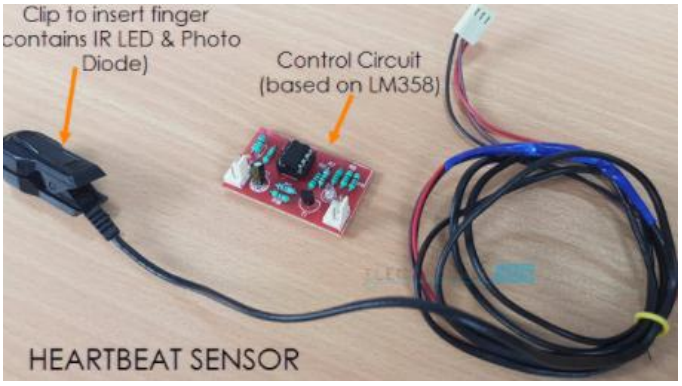
3.1.2 Temperature Sensor

Temperature sensor is integrated with the Arduino and the temperature is recorded. These sensors are widely used in IoT system to sense the readings.



3.1.3 Heartbeat Sensor

Heartbeat sensor is a device that is used to measure the heart rate ie speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy.

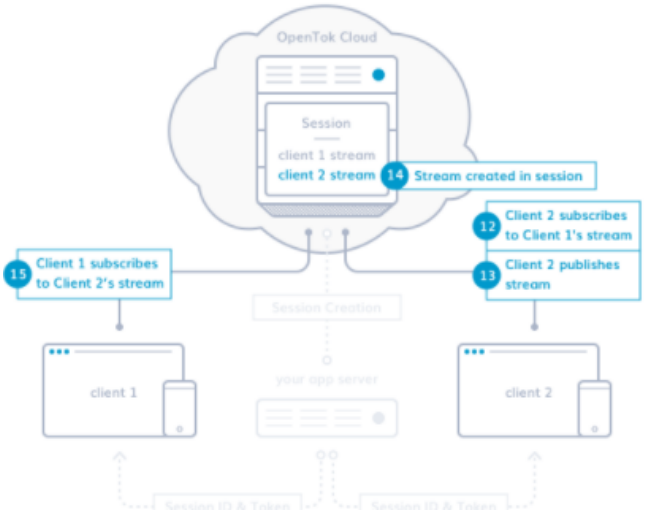


3.2 Software component

3.2.1 Web RTC

Web RTC refers to real time communication through web. It supports video, voice, and generic data to be sent between peers and allowing to build powerful voice and video communication platforms. The technology is available on all the major platforms. He technologies behind web RTC are implemented as a open source web standard available as regular JavaScript APIs in all major browsers. For native cloud clients like Android etc.

2.2.2 Open Talk



The basic API used to build video conferencing platform between clients. This API used prominently to support web RTC. It allows interfacing of high end video chat facility using mobile apps or web applications.

4. PROPOSED METHODOLOGY

The proposed system is designed to integrate the physical components of the system (Arduino board with the corresponding hardware nodes, components and sensors), users, healthcare community doctors. It is aimed at integrating multiple vital sign monitoring sensors into a whole and connecting the system over the internet for real time access by the physician.

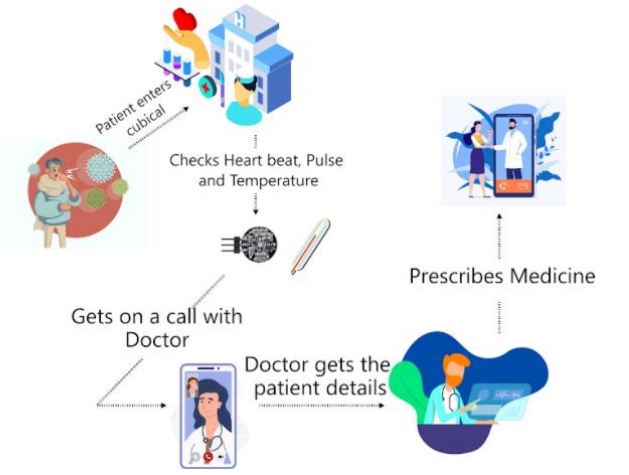


Fig: System Architecture

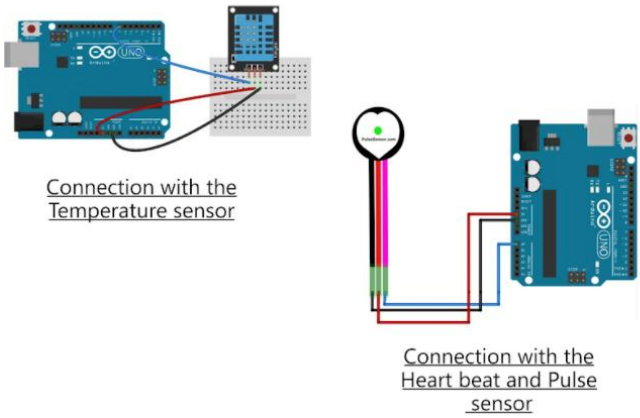
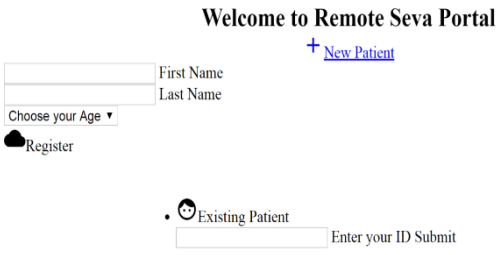


Fig: Circuit Connection

GUI is paired with IOT Gecko, which is a cloud deployment platform with unprecedented support by Raspberry Pi, Arduino, Microcontrollers and other controller boards. It is an open-source IOT development platform that allows developers to set up their devices and run them free on IoT Cloud.

The registration and login page where the patient's information's are maintained. The system will allow the user to do any actions once login is done. The healthcare personnel can view the patient's vital sign reading in real-time. Fig.8, shows the heart pumping value in real-time and as well as displaying the heart rate reading. The temperature reading is also displayed and if any of the vital signs reading falls below or above a certain threshold, the system triggers an alarm and the abnormal reading is continuously flashed in red to indicate danger. Doctors can view the patient's vital sign in real-time by logging into the system database and clicking on each patient's record.



Fig; GUI page for login

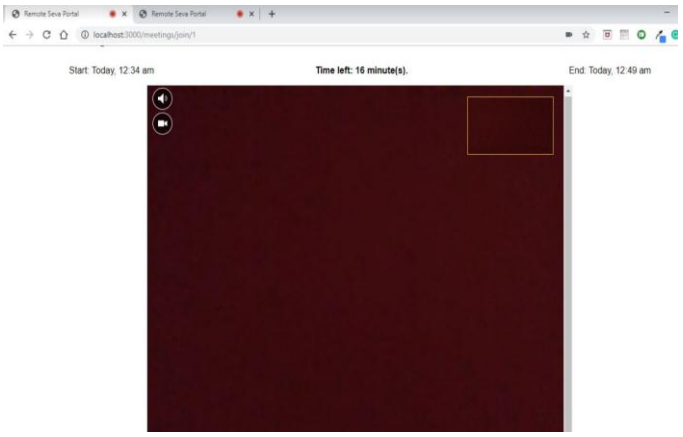


Fig : The video conferencing Display

5. CONCLUSION

This research is focused on implementing an E-Seva healthcare system that can measure certain vital signs (temperature, heart rate, and respiration) of users that can be viewed by the user and transmitted in real-time over the internet for healthcare providers to view. The system is built on the Arduino. The LED monitor displays the reading from the integrated chips, such that users can see their vital sign readings in real-time. The system is paired with IoT gecko over the internet, so that all the patient reading is seamlessly relayed to the site, for viewing by healthcare providers.

Health care providers are able to login to the IoT Gecko platform to monitor patient vital sign in real-time, using a unique IP address. This system is a win-win for both patients' and healthcare providers since patients' do not have to visit the hospital each time they want their vital sign checked thereby giving the right tool to healthcare providers to manage their patients' effectively and efficiently, at a more reduced price and increased convenience in the remote areas.

6. FUTURE SCOPE

The proposed system hence can be integrated with government bodies under the "Make In India " and "Smart India " projects in order to install such systems locally in all the rural areas to pave the path for an efficient facilities in the remote areas. Also further AI, AR and other technologies can be incorporated in this system.

7. REFERENCES

[1] Maternal Mortality Estimates 2008 by the WHO and UNICEF.
[2] World Health Organization/UNICEF. Revised 1990 Estimates of Maternal Mortality.
[3] WHO/FRH/MSM/96.11, UNICEF/PLN/96.1, April 1996.
[4] P. Gupta, D. Agrawal, J. Chhabra and P.K. Dhir, IoT

based smart healthcare kit. In Computational Techniques in Information and Communication Technologies (ICCTICT), 2016 International Conference, IEEE, March 2016, pp. 237-242.

[5] Y.I.N. Yuehong, Y. Zeng, X. Chen and Y. Fan, The internet of things in healthcare: An overview. Journal of Industrial Information Integration, 1, 2016, pp.3-13.

[6] S. Asthana, A. Megahed and R. Strong, A recommendation system for proactive health monitoring using IoT and wearable technologies. In AI & Mobile Services (AIMS), 2017 IEEE International Conference, June 2017, pp. 14-21.

[7] N.A. Khan, M. Hai, M.A. Sawand, A. Khuzema and M. Tariq, Real Time Monitoring of Human Body Vital Signs using Bluetooth and WLAN. IJACSA) International Journal of Advanced Computer Science and Applications, 7(10), 2016.

[8] H.B. Patil and P.V.M. Umale, Arduino Based Wireless Biomedical Parameter Monitoring System Using Zigbee. International Journal of Engineering Trends and Technology (IJETT), 28(7), 2015, pp.316-320.

[9] J. Madhu, and N. Rao, IoT based remote patient health monitoring system, 2017.

[10] S. Misbahuddin, J.A. Zubairi, A.R. Alahdal, and M.A. Malik, IoT - Based Ambulatory Vital Signs Data Transfer System. Journal of Computer Networks and Communications, 2018.

[11] K.N. Swaroop, K. Chandu, R. Gorrepotu, and S. Deb, A health monitoring system for vital signs using IoT. Internet of Things, 5, 2019, pp.116-129.