

# Smart Chair Tele-medicine Based Health Monitoring System

G. Vinoth chakkaravarthy, P. Jothimalar, S. Kalyani, V.S. Bargavi,

<sup>1</sup>Associate professor, Department of Computer Science and Engineering, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

<sup>2</sup>Final year student, Department of Computer Science and Engineering, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

<sup>3</sup>Final year student, Department of Computer Science and Engineering, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

<sup>4</sup>Final year student, Department of Computer Science and Engineering, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

<sup>5</sup>Final year student, Department of Computer Science and Engineering, Velammal College of Engineering and Technology, Madurai, Tamil Nadu, India

## Abstract

The main aim of this project is to design a smart chair that helps elderly people or patients to monitor their physiological parameters such as blood pressure, pulse rate and body temperature using appropriate sensors. After sensing these parameters, they will be stored in a cloud and sent to specific devices through a Wi-Fi module so that patient could view the results in mobile app. In parallel, local devices would automatically send the results through cloud or fog for analysis and diagnosis by medical professionals who could be anywhere in the world. Our smart chair will be most helpful for patients who feel difficult to visit the doctor frequently, who are in remote areas or in emergency situations.

**Keywords** - Health monitoring, Sensors, Signcryption, Fog computing, Thingspeak, Virtuino.

## I. INTRODUCTION

In this modern era, the health care system plays a vital role in hospitals. The health monitoring system is one of the major developments due to its innovative and emerging technologies. Though several health monitoring devices are available, they are inconvenient for the people who are used to it. Moreover a large number of elderly people require regular assistance for their daily living and healthcare, which are supported by their family or friends. To overcome this issue, there has been a growing awareness to develop and implement an efficient and secured strategies and systems in order to provide a time sensitive yet superior healthcare and monitoring services for the people having limited access to healthcare facilities, particularly the aging population. Thus we proposed a system entitled “SMART CHAIR TELEMEDICINE BASED HEALTH MONITORING SYSTEM” that will overcome the above issues

## II. LITERATURE SURVEY

Punit Gupta: Proposed an IOT-based health monitoring system for emergency medical services which cansenses the health status of the patients by collecting the data such as heart rate, temperature, blood pressure by using different sensors and then data are sent to the cloud using WIFI module. In emergency cases, doctors are alerted through message. It reduces the informing time and risk to the doctor and alerting nurses using buzzer who are near by the patient. The advantage of this system is the proper and efficient medical services provided by sending an emergency alert to patient's doctor with his current status. The disadvantages are no security to protect the data and there is a delay in response time.

Byeong-GuAhn: The system aims to provide the health management solution through the bio-signal measurement and activity level analysis based on the location information. Here, sitting posture was based on a real-time implementation of the health care system. Through the non-constrained bio-signal measurement a person's heart activity will be analysed. When no constrained activity occurs according to the change of the posture then the electrocardiogram measurement will be difficult. In this case, the smart chair to complement the ballistocardiogram measurement is additionally possible to utilize the system. The advantage of this system is to measure the ECG and BCG that minimize the failure of the measurement of the heart rate monitor information. The disadvantages are data will be affected by noise because of signal transmission and sensitive data storage is not provided.

SuryadipChakraborty: This paper describes about the new features offered by fog computing (e.g., distributed analytics and edge intelligence). When it is successfully applied for time-sensitive healthcare

applications, it has a great potential to accelerate the discovery of early notification of emergency situations to support smart decision making and to provide immediate remedy to the patients. They have been using Bluetooth interface to upload the gathered data to remote servers and generate alarm in case of emergency situations. The advantages are it provides Smart decision making in emergency situations and provide quick response time. The disadvantages are it generates alarm only in small regional area and it doesn't achieve privacy.

Pengfei Hu: Proposed the fog computing based face identification and resolution framework to improve processing capacity and reduce the bandwidth consumption. Though there are some security and privacy issues, this paper provides security and privacy preservation scheme to solve above issues. They gave an outline of the fog computing based face identification and resolution framework, and summarize the security and privacy issues involved. Then the authentication and session key agreement scheme, data encryption scheme, and data integrity checking scheme are proposed to solve the issues of confidentiality, integrity, and availability in the processes of face identification and face resolution. Finally, they implement a prototype system to evaluate the influence of security scheme on system performance. Meanwhile, they also evaluate and analyze the security properties of proposed scheme from the viewpoint of logical formal proof and the CIA (confidentiality, integrity, availability) properties of information security. The results indicate that the proposed scheme can effectively meet the requirements for security and privacy preservation of data. The advantage is that Comparing cloud, Fog provides efficient processing capacity and save the bandwidth usage. Moreover they solved the issues involved in CIA property. The disadvantage is that, it cannot achieve resource efficiency in securing data and increases computation and communication overhead.

SubhanUllah: Developed an approach towards data security for smart cameras rooted on protecting the captured images by signcryption based on elliptic curve cryptography (ECC). Signcryption achieves resource-efficiency by performing data signing and encryption in a single step. They introduced the system architecture motivated by a typical case study for camera-based IoT applications, evaluate security properties and present performance results of an ARM-based implementation. The advantages are it achieves resource efficiency, confidentiality, Integrity, Authentication and Freshness of captured data. The disadvantage is data storage is not efficient.

### III. EXISTING SYSTEM

Existing health care and monitoring systems are not reliable, secured enough and applicable to be used

in rural places. Security measures are not properly undertaken, fails to provide confidentiality and integrity. In cloud computing, security issues like man in the middle attack, spoofing may likely to happen. Broadcasting the signcrypted data leads to large bandwidth consumption and computational resource usage

### IV. PROPOSED SYSTEM

In our system, the biological sensors such as Temperature sensor, Pulse rate sensor, pressure sensor are fixed in the appropriate part of the chair. They are connected to the arduino. The Patient's data collected from serial monitor of the arduino are recorded in spreadsheet and the required data are extracted using PLX-DAQ extraction. The unique ID for every sensor are created and transmitted to the fog node. While transmitting those data, Security of the data is not enforced. So, Signcryption technique is used to preserve the data. Now the fog node will decrypt the received data and analyze them with reference to the predefined medical threshold value. If the analyzed data exceeds the threshold value, those high sensitive data are sent to Remote Doctor's Mobile by using GSM module. On the other hand, data received from the arduino are stored in thinkspak cloud for continuous monitoring, that provide a way to maintain the historical data. From the cloud, data will be visualized by the patient's relatives or medical professionals through virtuino App via WIFI module.

#### LIST OF TECHNIQUES TO BE IMPLEMENTED

##### A. PLX Daq Excel Extraction

After running the code for the sensor in the arduino -IDE, the data needs to be extracted in order to enable the signcryption security. PLX DAQ is nothing but the parallex microcontroller data acquisition add on tool for the Microsoft excel.

##### B. Signcryption

Signcryption is said to be a public key primitive, which can perform the functions of encryption and digital signature. In order to provide confidentiality, non repudiation and integrity, these cryptographic tools could be used.

##### C. Unsigncryption

A technique which can perform both the functions of decryption and digital signature.

##### D. Fog computing

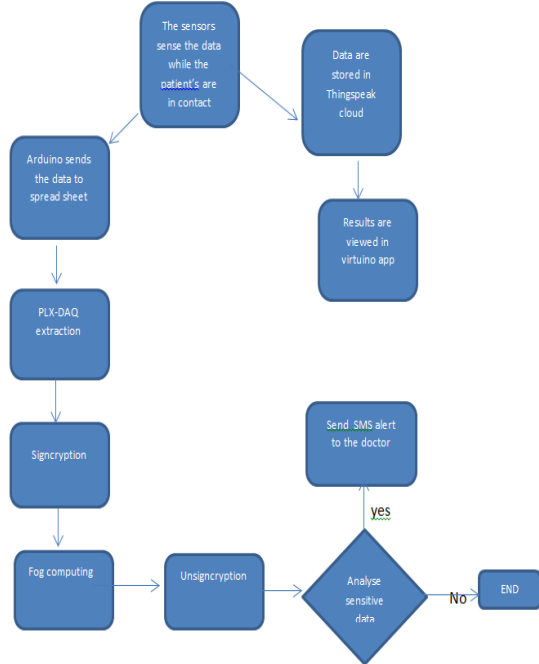
Fog computing could be seen as the extension of the traditional cloud computing in which the implementations are said to reside in a multiple layers in the network topology.

**E. Thingspeak cloud**

An open source IOT application which could be used for storing and retrieving data over the internet or local network by making use of http protocol. With the help of matlab ,they could be used to analyze and visualize the uploaded data.

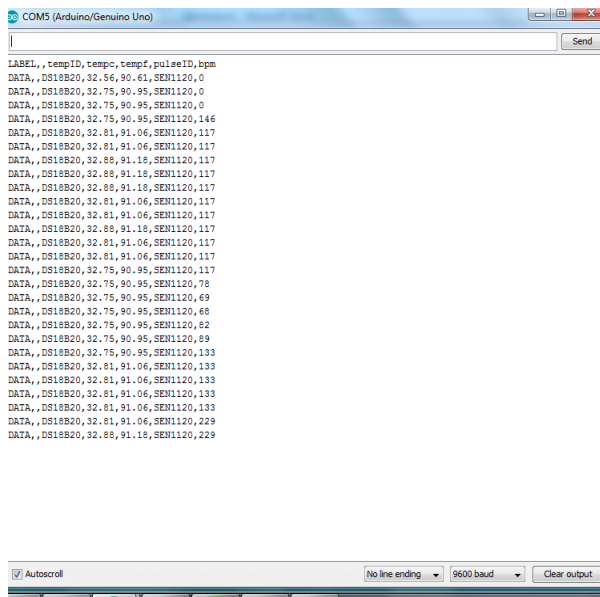
**F. Virtuino mobile application**

An android application that could be used for monitoring the sensors through internet, Bluetooth or any other local area network. They can also be used for controlling the electrical devices.

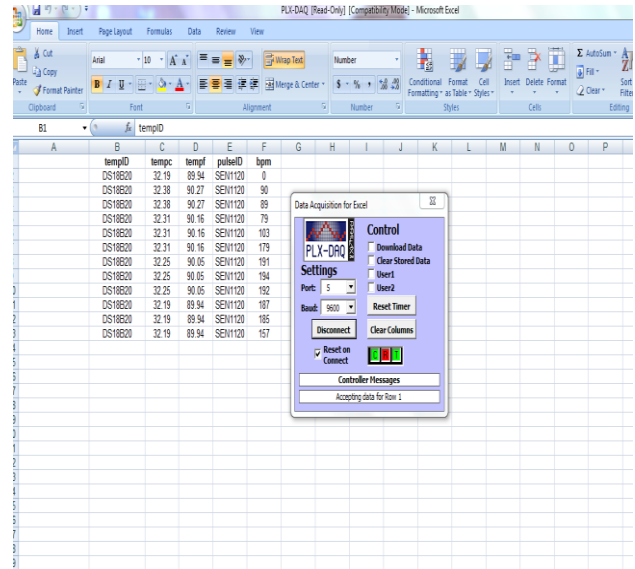


**V.RESULTS**

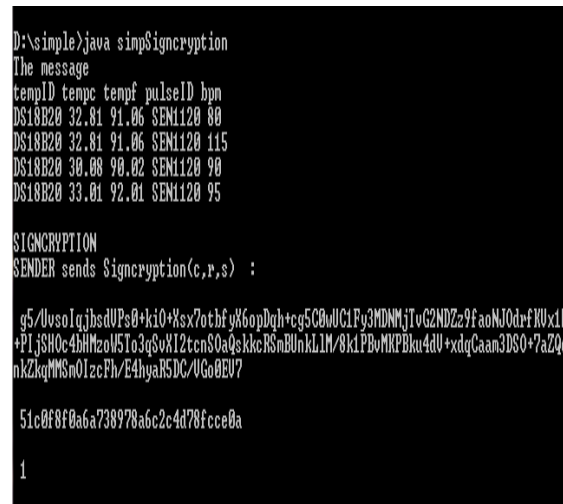
**A. Sensor data from arduino**



**B. Plx Daq Extraction**



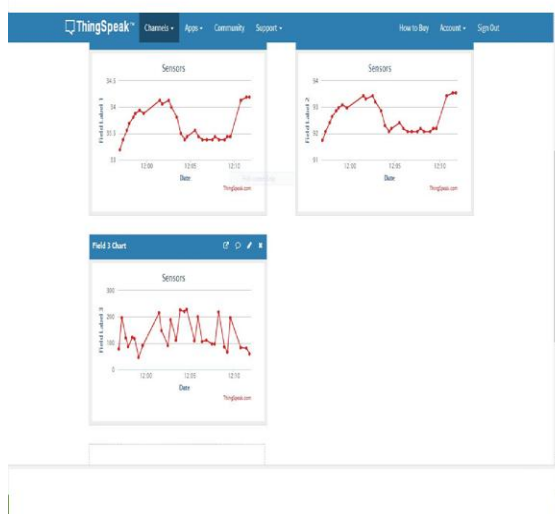
**C. Signcrypted data**



**D. Unsigncrypted data**



### E. Visualisation in thingspeak cloud



### F. Cloud to virtuino app



## VI.CONCLUSION

As health care services play a vital role in our day to day life, automating these services will reduce the burden on humans and eases the measuring process. In addition, the transparency of this system helps patients to trust it and increases its usability. The main objective of our system is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure. Further improvements can be made to make it better and easily adaptable such as adding more advanced sensors. Through internet, health related data will be send to doctor's personal computer or on his mobile. So, Patients are in no need of visiting doctors every time and sending message to the doctor gets immediate treatment or prescription related to the health condition.

## VII.FUTURE ENHANCEMENT

More features can be added to our system like location access, linking the ambulance services,

leading doctor's list and their specialist, hospitals and their special facilities.

## REFERENCES

- [1] B. N. Karthik, "Survey on IOT & Arduino Based Patient Health Monitoring System" International Journal of Scientific Research, Volume 3 Issue 22, February 2018 ISSN: 2456-3307
- [2] Punit Gupta, "IoT Based Intelligent Healthcare Kit", International Journal of Science and Research (IJSR) Volume 7 ,Issue 3, March 2018 ISSN (Online): 2319-7064
- [3] SubhanUllah, "Smart Cameras with onboard Signcryption for Securing IOT Applications" International Journal of Science and Research (IJSR) Volume 3 ,Issue 1, June 2017
- [4] Chakraborty, S., Bhowmick, S., Talaga, P., & Agrawal, D. P. (2016). Fog Networks in Healthcare Application. 2016 IEEE 13th International Conference on Mobile Ad Hoc and Sensor Systems (MASS).doi:10.1109/mass.2016.065
- [5] Huansheng Ning, "Security and Privacy Preservation Scheme of Face Identification and Resolution Framework Using Fog Computing in Internet of Things" IEEE Internet of Things Journal vol- 3,issue – 2017
- [6] Byeong-Gu Ahn, Yun-Hong Noh, & Do-Un Jeong. (2015). Smart chair based on multi heart rate detection system. 2015 IEEE SENSORS.doi:10.1109/icsens.2015.7370628
- [7] GennarTartarisco, "Patient HealthMonitoring Systemusingiotdeviceshttps://www.elprocus.com/wpcontent/uploads/2017/07/heartbeat-sensor.jpg
- [8] Jorge Gómez, "Patient Monitoring System Based on Internet of Things: A survey", Computer Networks, Vol.54, pp. 2787-2805, 2016
- [9] X.Zhou, "Improved signcryption scheme with public verifiability,"in Proc. KESE Pacific-Asia Conference on Knowledge Engineering and Software Engineering, Dec 2009, pp. 178 - 181.
- [10] Pioggia, "Personal Health System architecture for stress monitoring and support to clinical decisions", Computer Communications Vol.35, pp.1296-1305, 2017.
- [11] Giovanni Baldus, "Design of Iot Based Smart Health Monitoring and Alert System" 2016 Center for TeleInFrastructure, Aalborg University, Denmark, P.P
- [12] Bonomi, F., Milito, R., Zhu, J., Addepalli, S.: Fog computing and its role in the internet of things. In: Proc. of MCC. ACM (2012)