A Light Weight Secured and Efficient Health Monitoring System Implemented Over IOT Based Networks

Desu Pavani Ramya, Md.Ali Hussain

Abstract: The main aim of using a Light weight cryptography in a body sensor network (BSN) is to provide security to the data and devices using limited resources. The body sensor network (BSN) designed to monitor patient continuously. The BSN consist of various sensors placed on the body of the patient to obtain various parameters to diagnosis patient such as the temperature, pulse rate and saline level values of the sensors are stored in cloud in the form of PHR’s by this automatic entry in the cloud platform it helps in eliminating the manual entry which is time effective and accurate. The data in the PHR’s can only be accessed by the concerned doctor and the nurse. In the abnormal condition of the patient the alert alarms are generated in the concerned API’s. The data present in the cloud is stored in encrypted form. The proposed model is a combination of the sensors, internet of things, encryption is done in the board level and the security algorithm called LICI is a lightweight algorithm which is efficient in both hardware, software and also stops various Biclique and Zero correlation attacks. In many cases due to negligence of hospital staff or relatives the saline level is not monitored it leads to the "AIR EMBOLISM" causes heart attack. In this model the patient data is maintained in to two PHR’s of doctor and nurse the security of PHR’s is provided basing on the sensitivity level of the data present in PHR’s.

Index Terms: Arduino, Encryption, health monitoring, Lici

I. INTRODUCTION

The main purpose of designing of body sensor network (BSN) is to establish connectivity among various sensors placed outside of the patient body through this we can monitor patient continuously. In-now-a-days the people are opting for automation to increase the accuracy and to avoid the problems caused due to human negligence [1]. In hospitals the staff need to monitor the saline level, pulse rate and temperature manually continuously due to many number of patients present in a hospital there may be a chance of negligence in monitoring patients. In the monitoring of saline level there should be no chance of negligence [8,9]. If any negligence occurred by the patient relative or staff may lead to death of the patient [4,6]. The death may happen if the saline bottle is totally fed and not removed causes a difference of pressure between the patient blood flow and the empty saline bottle. In case the sensor values of temperature, pulse rate and saline level is beyond limits the immediate notification is [8,9] send to the hospital staff by this the immediate care to the patient is taken in critical situations [1]. The patient monitoring data is needed to be shared among various users in a hospital in order to provide fast attention in case of critical situations [5]. PHR’s are contain the various data of the patient. The data of the patient present in a PHR may be sensitive and the security provided to the PHR’s basing on the sensitivity level (encryption, password authentication) this leads [10,11] to enhancement of the system i.e if all the data patient present in a single record will take more amount of time for processing. Our main aim is to provide fast service to the patient so the data of patient is in different PHR’s [5]. The encryption is done by using the Lici encryption algorithm [7]. The lici is a light weight encryption algorithm, lici has a feistel based network [7]. It works at 64 bits of plain text. Lici has 128 bit length is used to generate the 64 bits of cipher text. It has low power dissipation of 30mW. It has good performs in both the platforms (hardware and software). The project discussed in this paper has the both hardware and software, both plays vital role. Lici requires only 1944 bytes are flash memory which is a less amount of memory till date used by any encryption algorithm. Lici provides best security by preventing attacks from basic level to the advanced level [7].

II. LITERATURE SURVEY

In this section we are going to discuss some previous methodologies and their corresponding method of implementation. PoojaKanase et al discussed the data from different sensors such as temperature sensor, ultrasonic sensor, LDR (Light Dependent Resistor) will acquired the temperature sensor will acquire the values of room temperature. LDR will sense the amount of light illumination in the room of patient. All the data acquired by the sensors will be transferred to the arduino mega through a universal serial bus. The data collected from the sensors will be published in a MQTT broker through a ethernet cable. The MQTT platform used to control the switch of the electric applications (fan and light) [1], by controlling the switch the power management will be done. The saline level can be monitored continuously without going to the patient room as the values are displayed in a webpage. Vikas Vippalapalli et al proposed model is the consist of sensor network which monitors the patient continuously. It monitors various parameters such as the temperature, pulse rate, blood pressure.
by using LM35, IR pair and a photo diode for pulse rate, Sphygmomanometer for blood pressure measurement. all the sensors are connected to the arduino fio. Arduino fio is connected to the xbee module by using a USB. All the data of the sensors are converted into the ASCII values in a write to measurement file which is present in LABVIEW which checks the abnormal values. In case of abnormal condition it generates a alarm. By this method the manual data entry by the hospital staff can manage the patient efficiently[2]. The generation of alarm causes no delay in arrival of patient information in accidents or emergency incidents.

Deepesh K Rathore et al discussed wireless system is present that enables the real time health monitoring of the patients present in a hospital or health care center. The patient’s heart rate is measured by using Photoplethysmograph, potential irregularities and the data is transmitted by using the zigbee module to the device[3] present in a doctors office and the decoded data can be viewed by using a laptop or a smart phone that displays the data page and in case of any emergency warning signal of audio or video signal is sent to the doctors cabin using a GSM module (message). so the immediate care /attention to the patient id done[3].

III. PROPOSED MODEL

In proposed model the sensors continuously monitor the patient pulse rate, temperature, saline level. the saline level is monitored by using ultrasonic sensor. The data acquired by sensors are transmitted to Ubi dots from arduino uno by using wifi module. the transferred data is saved in the form of two PHR’S. The one PHR is considered as main PHR. the main PHR consists of all data collected by sensors and other PHR consist of only saline level. the phr’s are secured by sensitivity of data present. The main PHR is secured by Lici which is a light weight encryption algorithm and other is secured by the password authentication. if any drop of saline level is beyond level the alert message is sent to the nurse. If any case of temperature or pulse rate the emergency message is sent to the doctor.

IV. BLOCK DIAGRAM OF PROPOSED MODEL

PULSE SENSOR
It is a biometric sensor (plug and play type sensor) works at the voltage of +5.5V to+3.3V, the rate of current consumption is 4 milliamps. It is used to sense the pulse rate of patient and later transferred to the cloud.

TEMPERATURE SENSOR

DS18B20 is best for temperature measuring of patient. The pins namely VCC, GND and DATA are present in DS18B20. The sensor is waterproof as it can be placed inside of a persons mouth and underarms. It works at the operating voltage of 3.0V to 5.5V.
The main advantage of DS18B20 sensor is it can be powered by data line present in sensor and works at the accuracy of +0.5°C. It can measure temperatures from -55°C (-67°F) to +125°C (257°F).

The fig 2 is the flow chart of the working model of the proposed model.

After the hardware is connected the sensors present in the BSN starts monitoring the parameters of pulse rate, temperature, saline level of patient are monitored using DS18B20, pulse rate sensor, ultrasonic are attached to the arduino UNO and encrypts the data in board level and sends the data to the cloud the data in cloud is stored in form of two PHR’s and the decrypted data is sent to doctor and through password authentication the nurse can monitor saline level.

RESULTS

In the proposed system is implemented by using the arduino uno, DS18B20, ultrasonic sensors. All the sensors are interfaced to the arduino and the values are encrypted using Lici algorithm and sends to the doctor and nurse.

Fig 3, 4 represents pulse rate, temperature, and saline level graphs of the patient are displayed in the Ubidots and the hardware kit of the project.
CONCLUSION

The proposed model plays an important role in the patient health care system. All the parameters are observed accurately by using ultrasonic, temperature sensor, pulse sensor and the values are encrypted by using a Light weight algorithm called LICI. The proposed method is less cost and provides the security to health records of the patient efficiently.

REFERENCES

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AUTHORS PROFILE

Desu pavani ramya M.Tech student in ECM, KL deemed to be UNIVERSITY, VIJAYAWADA, INDIA.

Dr. Mohammed Ali Hussain, Professor in ECM, KL deemed to be UNIVERSITY, VIJAYAWADA, INDIA.