A Survey on Secure Patient Information System

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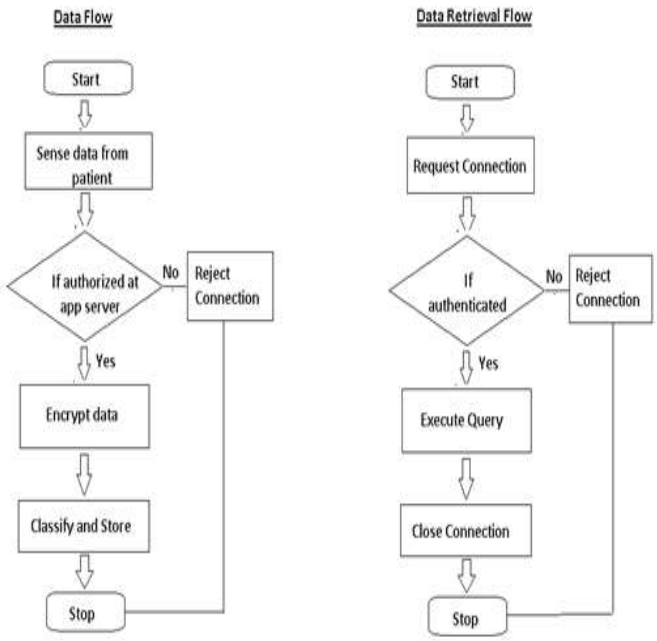
***Abstract* - Patient monitoring is fundamental to care in operating rooms, emergency rooms and intensive care units (ICUs). Our goal here is to create a Secure Patient Information System that gives constant security and authentication to valuable patient data on the internet. Patient monitoring can reduce the risk of complexities. Recent technology advances in wireless sensors. We have been given a wide scope for designing intelligent sensor platforms. Saline sensors that can be integrated into a body area network for monitoring patients are putting up a larger impact nowadays. The sensors can be located anywhere in the body like implanted below the skin or even they can be wearable. Increased use of sensors enhances power consumption and hence extending the battery life. A signal will be sent to the concerned authorities if any abnormal activity or complexity is observed during their absence.**

***Index Terms* - Modified Hybrid Port Knocking, Saline Monitoring**

I. INTRODUCTION

The basic idea of the project is to gather all the patient information actively and securely transfer it to a server system for further analysis. With growing population and pollution, an upsurge in epidemics in evident. This possess a potential threat to humans as well as other life forms. Early diagnosis of such epidemics is certainly desirable. Also, if the medical practitioner has a prior knowledge about the patient's medical history, it becomes easy to treat the patient. If such patient data, as his allergies and medical history are available to the practitioner easily, it will greatly reduce the threat that epidemics pose.

DATA FLOW DIAGRAM



II. ARCHITECTURE

a. Monitoring patients has always been a tough task. The state of patient changes several times a day. The only observations the doctors can make are when they are around them. This may result in weak or less accurate observations and sometimes may lead to wrong treatment methodology.

b. Many times the medical practitioners don't have prior knowledge about patient's history. As a result many times different drugs are tested on the patient to see which one suits the best. This is very harmful when a patient is allergic to certain drugs or some medical condition makes it harmful to take some drugs.

c. The recent advancements of Internet of Things it is possible to monitor patients continuously for better accuracy of observations. It also helps in identifying critical situations and alerting the responsible personnel. We propose a method to analyze such data monitored from patient to create knowledge such as the patient history and the drugs that are harmful for the patient etc.

d. We first digitize the monitored data and store it. The data is classified with respect to the abnormality. Any new data that comes will be classified using the previous data. The stored data will be encrypted with a new encrypting algorithm. Access to this data will be given by strong authorizing techniques.

e. From the stored data, knowledge is generated such as tolerance of the patient for certain drugs or environmental conditions etc.

f. We propose two techniques, extended hybrid port knocking and randomized encryption for securing the patient data on the server systems.

III. SURVEY ON DIFFERENT PAPERS

[1] An ICU Clinical Decision Support System Using Association Rule Mining

ICU clinical decision support system "icuARM" is based on associate rule mining (ARM) and a publicly available research database MIMIC-II (Multi-parameter Intelligent Monitoring in Intensive Care II). It can provide a perception for the ICU doctors with a patient during his status in hospital.

The clinical data is collected from MIMIC-II's ICU information systems and hospital electronic health record systems. All the clinical data consists of time series waveforms and time series measurements fromthe bedside monitors. The data mining process only includes clinical data in this study.

MIMIC-II is divided into clinical data into two groups of categories: basic and event-based.

Values in event-based categories are processed to generate mean, minimum, maximum, and standard deviation during an ICU stay. The "support" and the "confidence" metrics suitable for ICU clinical application from conventional association rule mining is used.

[2] Embedded Patient Monitoring System

The authors propose a system which informs the doctor about the condition of ICU patients through wireless devices. A device which continuously monitors the important data of critical patients in a setup like a hospital or clinical assists the doctor by raising an alarm or by communicating with the concerned doctor via SMS.

An efficient way of monitoring patients in Cardiothoracic Intensive Care Units which has a massive amount of critical data has been proposed here. This countless data is very much crucial to handle and analysis is time consuming.

Patient is transferred from one hospital to the other if necessary. During that the patient details are required to be transferred to the hospital where he is shifted. Here is the point where heuristics comes into picture. In the proposed system, patient details will be transferred from one hospital to the other over the cloud.

This is an attempt to provide a device which will continuously monitor the body temperature and status of drip status of the patient. If either the temperature goes high or if the drip administration fails, this device will raises an alarm and communicate the concerned doctor by means of sending SMS to the doctor. The major part of this project is the hardware model consisting of sufficient sensor with embedded system.

[3] Design and Development of Saline Flow Rate Monitoring System Using Flow Sensor, Microcontroller and RF ZigBee Module

During last few decades, the population of the world has been increasing exponentially. This in turn increases the need for health care experts. But the ratio of number of health care experts to that of the number of people needing the expertise is unsatisfactory, especially in developing countries. This necessitates the use of remote health monitoring devices. This paper describes the development of saline flow rate monitor using flow rate sensor, microcontroller as coordinator and RF ZigBee module to transmit

and receive the signal. Saline is often given to patients to rehydrate and fulfill the water and salt needs which depends on the patient. Hence it is necessary to keep the saline flow rate in check. The mentioned system enables the doctor or the nurse to monitor the flow rate of saline remotely.

A Hall Effect based flow sensor is attached to the neck of the saline bottle. The droplets pass through the sensor which are sensed by the pinwheel and the magnet inside the sensor. The output of sensor is in the form of voltage which is given to the microcontroller AT89S51 at one of its port. These voltage pulses from the sensor are counted by the microcontroller which are stored in its registers.

They are then compared with the default values already defined and then further displayed at the LCD. This flow rate is then transmitted thought the RF ZigBee transmitter module to the receiver module via wireless transmission and displayed to a remote location where doctor or nurse is present. So it becomes easier for them to monitor the flow at times whenever required.

[4] Automatic patient monitoring system using scatter net for critical care

The principles of Wireless Sensor Networks have been implemented to monitor the physiological signals of a patient in the proposed system. Such signals were recently transferred using Piconet, but with unwanted shortcomings. Hence the authors propose a system which has Bluetooth scatter net. If anything critical occurs the doctors are notified by the system immediately. Hence medical personnel can attain a few patients simultaneously which reduces the expenses.

Three piconets are interconnected to form Scattered Sensor Network. The first and second piconet consists of one master node (local nurse) and five slaves nodes (patients). The third piconet consists of one master node (Chief nurse) and three slave nodes (Chief Doctors). Chief nurse act as a bridge node, which interconnects.The three piconets are connected by the Chief Nurse which acts as a bridge node.

[5] Patient Monitoring System Using GSM Technology

The proposed methodology presents a technology to monitor the patients remotely using a GSM network and very large scale integration (VLSI) technology. The physiological signals of a patient are measured at fixed time intervals or continuously. Hence the authors propose an error free patient monitoring system.

[6] A Wireless based Real-time Patient Monitoring System

The authors propose a system which monitors the critical patients' temperature, voice level, heart rate and movement remotely. This remote sensing is done using four different smart sensors and wireless technology. The system continuously monitors the data of an adult patient or a baby and transmits this data sensed by the detector circuit using wireless communication.

IV. COMPARISION OF DIFFERENT PAPERS

Sr. no.	Author	Work done	Techniques used
1	Cheng, Chih-Wen, et al(2013)	Decision support system for ICU	Associate rule mining
2	Ramya, V., B. Palaniappan, and Anuradha Kumari	Embedded patient monitoring system	Cryptographic techniques and heuristics
3	Tawade, I. S., M. S. Pendse, and H. P. Chaudhari.	Saline flow rate monitoring system	Using microcontrollers and zigbee technology
4	Sivaranjani A, Vignesh Kumar K, Sathya S, SAnthi B. (2005)	Patient monitoring system	System monitors critical patients using Scatternet Technology.
5	Jaiee Sitaram Adivarekar, Amisha Dilip Chordia, Harshada Hari Baviskar, Pooja Vijay aher, Shraddha Gupta. (2013)	Implementation of patient monitoring system for critical patients	GSM technology
6	Sowmyasudhan S, Manjunath S. (2011)	Measures temperature, voice level, heart rate and movement remotely of critical patients.	It is done using four different smart sensors and wireless technology.

V. REFERENCES

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[4] Sivaranjani A, Vignesh Kumar K, Sathya S, SAnthi B. (2005) "Automatic patient monitoring system using scatter net for critical care".

[5] Jaiee Sitaram Adivarekar, Amisha Dilip Chordia, Harshada Hari Baviskar, Pooja Vijay aher, Shraddha Gupta. (2013), "Patient Monitoring System Using GSM Technology".

[6] Sowmyasudhan S, Manjunath S. (2011), " A Wireless based Real-time Patient Monitoring System".