A PORTABLE VITAL SIGN MONITORING SYSTEM

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Abstract—The objective of the work is to make a simple wireless ECG, BP and temp transmission system for rural use. The system uses Internet of things domain where, Things will be on Network in different forms. Telemedicine makes combine the use of telecommunication and information technologies to eliminate distance barriers and give access to medical services that would often not be available in distant rural communities. Telemedicine implemented using Wireless Sensor Network (WSN). Telemedicine uses WSN for sense patients' data. WSN consists of a number of different sensor nodes. These nodes are able to form a network through which sensor readings can be Initiating. Data processed as it flows through the network. Authorized users can browse the patients' data, monitored blood pressure (BP), electrocardiogram (ECG) and temperature on devices in store-and-forward mode. This device is able to acquire ECG/BP/Temp, and transmit them through wireless to a PC. A MySQL relational database system can be used to store the BP readings, ECG data, temp reading, patient records and clinic and hospital information.

Keyword : Global System for Mobile (GSM) Module, GPS (Global Positioning System), SMS (Short Message Service), URL (Uniform Resource Locator), Wireless Sensor Network (WSN).

I. INTRODUCTION

Telemedicine refers to the use of telecommunication technology with information technology for medical diagnosis, treatment, and patient care. It involves the use of telecommunications technology as a medium for the provision of medical services to sites that are at a distance from the provider [3]. It can be divided into two modes of operations first is real-time mode, in which patient data are available at the remote terminal immediately after data acquisition, and second is a store-and-forward mode, involves access to the data which is stored. The definition of "Things" refers as physical or virtual entities that exists and move in an environment with respect to time. The merging of the Internet and telecommunication will promote the developments of devices all aiming to provide mobile Internet access with sensor technology.

A Telemedicine system aims is to utilize Sensors, internet, GSM Module for general Patient record and patient-monitoring services. With this system, authorized users, who can be doctored or patient's relatives, can view the patients monitored record in store and forward mode. This system will make patient-monitoring an attractive application and benefits for the rural community. From an economic angle, Telemedicine capability in a rural hospital can have numerous benefits. Although extra jobs are not added when Telemedicine equipment becomes part of the hospital, so it allows savings to both.

The hospital and the patients that participate in Telemedicine. These savings take the form of reduced hospital payments for the service offered via Telemedicine and decreased costs of travel, amount of work missed for rural community who otherwise would have to drive to the closest area that offers a particular service. The local area will be beneficial by retaining any additional health work required for the initial visit, since people tend to have laboratory or pharmacy work done in the same area where their health service was performed. For these reasons, the proposed monitoring system electrocardiogram (ECG), blood pressure (BP) and Temperature measure will helpful in early diagnosis.

A Wireless subsystem captures ECG for viewing at Doctor End. The Proposed system only allows browsing information on the Internet with web portal. Users simply need to access web portal to get patient data. Mobility is enhanced because simple GSM modules are wired with hardware. This paper describes the survey and the study of a telemedicine system for patient-monitoring [5]. In our system Different sensor different module like GSM, microcontrollers are things which use the Internet to achieve the goal of a project. There are three IoT components:

a) Hardware Consist of sensors and embedded communication hardware

b) Middleware - Storage and computing tools for data analytics

c) Presentation - Visualization and interpretation tools. To be accessed by different platforms

II. MOTIVATION

We stay in INDIA, which is a diverse country in the context of population and resources. This uneven distribution is responsible for the increasing gap between rural and urban areas. There is an urgent need to bridge this gap with the help of technology. And health is the basic and unavoidable need. For these reasons, the proposed monitoring system will helpful in early diagnosis by prediction through vital sign. Through the use of telemedicine everyone will be able to get appropriate diagnosis, which they can't get earlier because of time and resource constraints.

III. RELATED WORK

One of the android based heart monitoring and reporting system is in existence use Body sensor network or body area network is used to measure vital sign of patient [3]. The system is consisting of sensor and actuators. The system takes heart rate and temperature parameter and save reading. A system prototype consists of Android phone and Bluetooth connectivity to Perform operations.

A WAP based telemedicine system has recently been developed. It utilizes WAP devices as user interfaces for general inquiry and patient monitoring services. Using the system only authorized users, who can be doctors or patients relatives allow viewing the patients monitored physiological parameters on WAP devices in store-and-forward mode. The prototype consists of five elements that is WAP, WML, Web Scripting Language, Database and Design of web Page that cover the overall process of the system [6]. Another WAP based system work for the same parameter like BP, ECG and Temperature but focus on how data retrieved from content server and displayed on user Interface [2].

In Agent based health monitoring system, with the help of agent data collection, co-ordination and storage is done [7]. Here system is divided in 4 agent Admin agent, Control Agent, Query Agent, Data Agent. Goal behind making different agent for different task is to make it independent. That is why, if an error or fail in one agent will not affect another. Here data reduction is done with an epsilon approximation algorithm.

Research done by one of A Wireless electrocardiogram (ECG) / blood pressure (BP) Tele-monitor system focused on measurement of blood pressure, microcontroller devices, programming methods, wireless transmission, signal filtering and analysis, interfacing, and long term memory devices (24 hours) to develop an ECG/BP Tele-monitor [10]. Also Mazima, Michael discuss what are impact of different values of BP and temperature [9].

The existing system works with Android phone this can be overcome in proposed prototype. Also, WAP based implementation deal with security issues that also resolves by applying various security algorithms on data. The proposed system will automatically upload data and data reduction technique will be used to avoid unnecessary data.

IV. PROPOSED WORK

To solve the health related issues of rural people telemedicine system is to be implemented in proposed work. It is independent of distance. GPRS, GPS and Wireless sensor network communication technologies used. Telemedicine

Application needs to run in heterogeneous platform. In telemedicine project sensor and GSM module is used also for cloud storage. Logical unit for telemedicine is shown in fig 1.

Wireless Sensor Network (WSN):
Telemedicine makes use of Wireless Sensor Network (WSN) to sense patients' data. WSN consists of a number of tiny sensor nodes. These nodes are able to form a network through which sensor readings can be Initiating. Data can be processed as it flows through the sensor network. The Telemedicine system utilizes GSM module patient monitoring services. A wireless Telemedicine system is built for recording
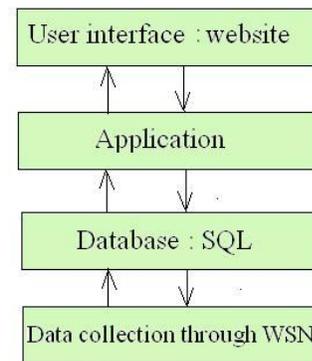

Fig. 1. Layer architecture

ambulatory ECG for storing ECG data into the database. Different types of sensor include ECG sensor, BP sensor and temp sensor.

Database:
A My SQL relational database system can use to store the BP readings, ECG data, Temperature reading, patient records, clinical and hospital information. Databases will store information in the form of field, records, and file for easy retrieval as an individual. A field is a single reading of parameter and a record is a sequential reading of a single parameter, whereas a file is a collection of reading from all parameters.

Application:
The applications use JQUERY, HTML, CSS3 Perl code Igniter. Authorized users can browse the patients real time reading; patient's history also monitors blood pressure (BP), electrocardiograms (ECG) on devices, Temp of the body in both real time and store-and-forward mode. If patient reading goes out of normal reading then emergency alert immediately alert doctor.

User interface (GUI):
Authorized users can browse the patients real time reading; patient's history also monitors blood pressure (BP), electro-cardiograms (ECG) on devices, Temp of the body in both real time and store-and-forward

mode. If patient reading goes out of normal reading then emergency alert immediately alert doctor.

Figure 2 shows the framework for the proposed module which is designed by connecting sensor to human body where we can measure parameter like pulse rate, blood pressure and temperature. To measure this parameter differential sensor is used like for Temperature LM35. Multiplex signal from sensor to ADC. An ADC converts analog signal to equivalent digital value and pass it to the microcontroller chip. Microcontroller which is burn with C program using the Keil compiler. 89C51/52 Microcontroller is used from 8085 families. From here data
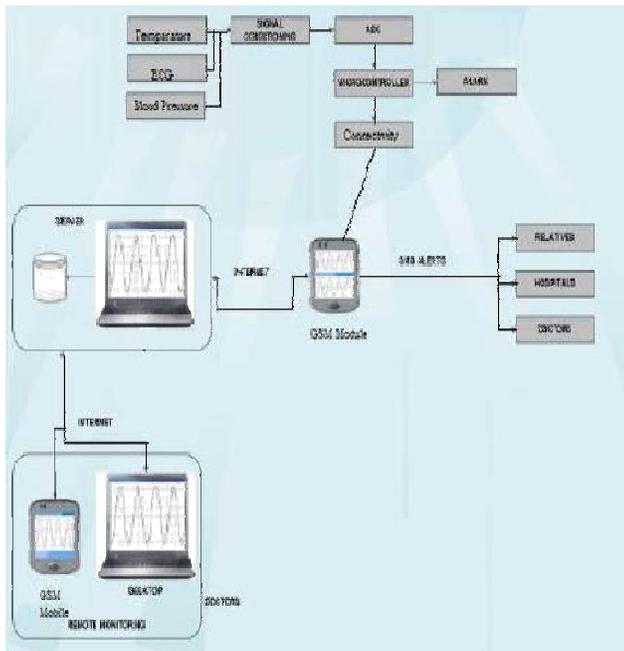

Fig. 2. Framework for Proposed System

packet transfer to GSM Module. In the existing system android media are used to transfer data from the microcontroller to the server. In proposing system we will use a GSM module to transfer data. The data are remotely processed and sequence of actions is generated.

V. DATA ANALYSIS

Once the required data has been captured, merge into a single place, and tied together, then data analysis can begin. To analyze data we apply following algorithm
a) Naive Bayes algorithm:
The Naive Bayes classifier technique is particular model that takes a list of symptoms, predict whether a patient has problem X or not. For complete model it takes vital sign and predicts what it causes according to reading. For parameter

x1, x2, x3 we can predict y that is the type of problem that the patient can face according to the dataset.
b) C4.5 Algorithm:
Decision tree can use to Emergency alert. C4.5 algorithm is used for Emergency alert. We are taking the decision tree which has 3 parameters ECG BP Temp dataset.
C4.5 algorithm checks all base cases. Then calculate Entropy and information gain using formula,
Entropy = - p (a) *log (p (a)) - p (b) *log (p (b)) Information Gain = Entropy before splitting decision tree Entropy after splitting decision tree.
Select the best attribute that has highest information gain and create a decision node that splits on best attribute, as root node.
If there is any emergency then automatic alert will go to doctors Mobile through short messaging service (SMS).
c) K-means clustering algorithm:
K-means algorithms solve the well-known clustering problem.
1) Starts by initializing the center of the clusters
2) Attribute the closest cluster to each data point
3) Set each cluster to the mean of all data points belonging to that cluster
4) Repeat steps 2-3 until last data point

VI. RESULT

In these papers we use techniques that will collect different sensor values continuously and then compare these collected values with the table value which are already set in three categories shown in Table 1.

Different sensor	ECG Sensor	BP Sensor		Temp Sensor
		Systolic	Diastolic	
Minimum and Low level	60 bpm	90 mmHg	60 mmHg	36.50c
Normal range	60-90 bpm	90-120 mmHg	60-80 mmHg	36.50c - 37.50c
Maximum or High level	90 bpm	120 mmHg	80 mmHg	37.5oc

Table 1 shows minimum and maximum value require for prediction. If the certain parameter follows Normal range, then there is no risk of disease. If it's less or greater than normal range, then the probability of disease increase and according to how much value differs we can predict and treat patients.

Figure 3 shows some sample reading for ECG, BP and Temp. For generating report consider reading occur after 1
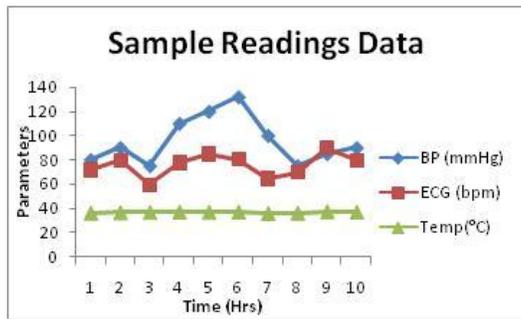
Fig. 3. Sample value Line Chart

hour for every next 10 hour. Result shows using different colors in Line chart. Graph is generated using time with respect to particular parameter.

CONCLUSION

Telemedicine is a challenging task, but it reduces the human effort and increase the result accuracy. Applying Internet of things into Health Care systems would help to improve the efficiency and effectiveness of the health care organization's activity. The integration of the internet of things and health care systems also offer benefits where distance separates the participants.

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