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Remote Health Monitoring & Reporting System

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ABSTRACT: Technology is playing an important role in today's health care environment. Therefore health care systems of today's generation should be designed such that full advantage of technology can be taken. The objective of proposed scheme is to basically develop an android (web) based application with the ability of monitoring, acquiring, recording, displaying and finally transmitting the data related with physical parameters from patient's to any remote location. The data will be recorded at regular interval of time which can be accessed from any location. This system will be useful for monitoring parameters such as temperature, heartbeat, pulse rate etc. which can be accessed by doctor so that necessary suggestions are given to particular patient. The data related to patient's parameter will be entered manually and given to controller by the nurse or hospital faculty in the proposed system which will then be sent to the system. Feature of accessing the data by making use of android application or webpage for the doctor is provided in the system along with sending SMS in case of emergency so that necessary action can be taken by doctor. The record of database can also be kept by system which can be helpful in future.

KEYWORDS: android application, database,monitoring system, physical parameter, short message service.

I. INTRODUCTION

Health care has become an important aspect of human beings with the change in era of new technologies. Periodic monitoring of old people and physically challenged is the need of time. Most of the people are bed ridden due to old age and difficulty in body movements. Monitoring patient's parameters is a process in which data is recorded continuously over a period of time form remote areas. Display of data can be done in for of webpage, android application or SMS in case of remote areas which can also be accessed in case of emergency. Recorded data can be used for long duration of time which will provide proper diagnosis to patients in return. Tremendous research has been done in the field of healthcare. Various systems designed have some limitations and techniques overcoming these shortcomings are discussed by various researchers. System based on Graphical User Interface (GUI) is an example of technique used in such systems. Android is rapidly taking over the field of health care in recent times. Online systems can be developed with the help of this technology which can be used even in the absence of the doctor and staff in the hospital. Data of patient can be recorded with the help of GUI and SMS can be sent in case of emergency. The advantage of SMS facility is that it can be used even in case of no internet facility. Traditionally used health care system is not efficient in case of emergency. Eight parameters can recorded by the proposed system based on GUI in this paper which the ease of increasing the parameters as per requirement. Features such as android application through server and short message service (SMS) in case of emergency has also been proposed in this paper.

II. EARLIER WORK

Research has been carried out by many researchers in the field of healthcare in which technologies such as Zigbee [2], GSM technology [14], Bluetooth [11], 3G mobile phones[1], Android phones[1], [2], [4], [5], [8] etc. each with its own importance. A tele-monitoring system which is used for sensing ECG signal making use of electrodes has been developed. It also includes a GSM system containing electrodes along with an android application [2]. Voice calling has been used by ECG based monitoring systems by making voice calls to monitor the signals [1]. Database has been used by most of the systems for transfer of data [5], [3]. Bluetooth technology can be used for monitoring blood pressure. BP sensor, accelerometer sensor and data display has been used by this system but it has limitation of being

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useful only for certain range [13]. A system based on android for monitoring parameters such as heart rate, temperature and BP. Here the central unit is a microcontroller [3]. Application making use of peak flow meter for measuring the maximum level of forced expiratory air flow parameter has been developed [12]. System for monitoring various parameters in ICU and sending the data to cell phone by making use of GSM technology [10].

The remaining paper is organized in following subunits. Section III which gives brief review of the design methodology comprising of database subsystem, the android unit subsystem and the web server. Conclusion and future work are given last section.

III. DESIGN METHODOLOGY

Block diagram of the system as shown in the fig. 1

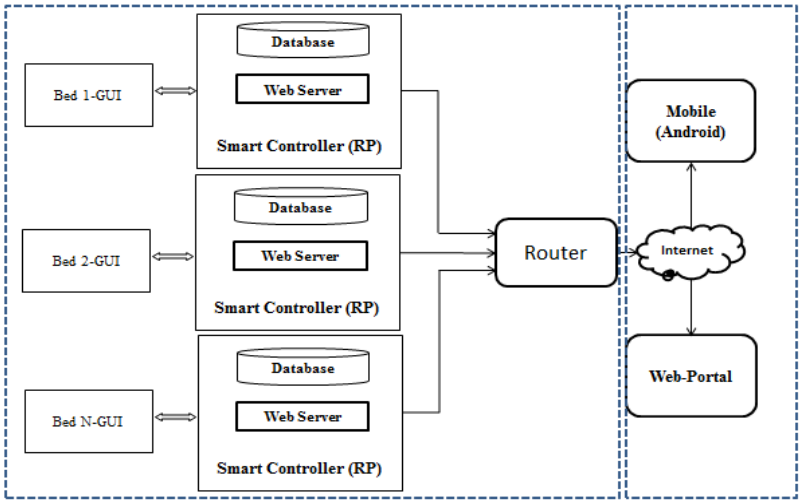

Fig 1.Block diagram of intelligent patient monitoring system

The above block diagram can be divide into two sections one consisting of hospital side section and the other user section which can be used in remote area. Graphical User Interface (GUI) section can be used by the hospital and the website or android application section by the doctor when not present at the hospital or remote area. Thus this system can be useful both to doctors as well as patients. Eight parameters can be monitored by the proposed systems such as heart rate, temperature, SpO2, respiratory rate, blood pressure, current weight, input and output. Here raspberry pi 2 model B which act as a smart controller has be used at the hospital side. The raspberry pi is used for display of GUI and it also acts as small computer. Remote users can make use of website, android application and GUI as display units. When the data is entered in the system in periodic manner by the medical staff it is saved immediately which can be accessed by making use of patient ID. Android application has been used displaying the current and previous parameter values at the hospital section. The hospital and the remote user section can be connected by making use of router and in absence of router Wi-Fi module can also be used.

The materials used in the proposed system are as listed below:

A. Hardware used:
- Raspberry pi2 model B
- Personal computer or laptop

B. Software used:
- Geany
- Android studio

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A. Remote Server

APACHE 2 server which is a web server has been used here for transmitting the remote information. It is an open source http server which can be mainly used for windows and Linux platform thus making it one of the most widely used server. PHP can be used to create web page. Patient's details can be accessed from tis webpage.

B. Raspberry pi

A smart controller based operating system used for collecting data manually and then performing operation on it which in turn makes the database. When such control system is installed mobile phone, tablet webpage can be used to monitor patient's parameter. Making use of raspberry pi will also reduce the need to expensive laptops as only basic accessories are required by it. Hence raspberry pi has been used as a mini computer over here.

C. Database system

When data is to be stored in form of tables then database can be used. MySQL is an open source database. For longer usage of database MYSQL has been used here. Collection of data is done through various tables provide by GUI. Availability of network is not possible every time hence MYSQL database is required here for storing the data.

D. Graphical User Interface

In the proposed GUI has been designed basically for entering the patient's parameters along with patient's information. A large number of readings can be entered by making use of GUI. Geany GUI text editor has been used here.

E. Android (web) Application

The data sent from GUI is stored for longer duration in database and by making use of server it can be displayed on android phone when the android application is installed on the mobile phone. Here android studio has been used for making the web application.

IV. RESULT AND DISCUSSIONS

There is a scope to access the output data in three ways: An android application, webpage and via SMS also. SMS facility use, if there is any emergency occurs i.e. parameters crosses the threshold values. Android mobile are now available with almost all doctors. So accessing the data with android application is much easier now. Raspberry pi based minicomputers are available with each bed of patient. The measured values are put in the GUI by any medical staff or nurse.

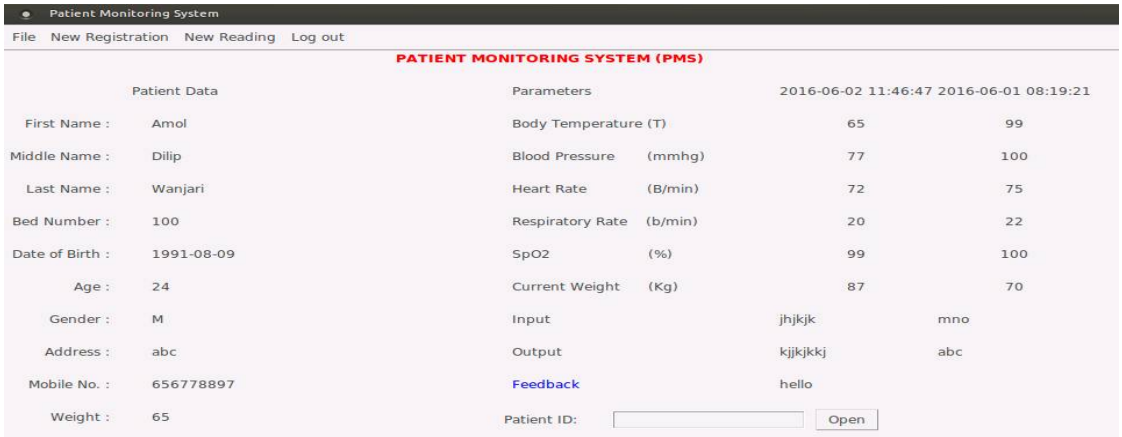

Fig 2 GUI for patient data

The above snapshot fig 2 shows the complete GUI display on the raspberry pi monitor screen, after filling all the required data. For comparison purpose two columns are given in the GUI which is useful for comparing the previous readings and current readings. The comparison will be helpful to know the exact condition of patient.

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There is also an OPEN ID function in which by entering the patient ID, one can access other patients' information. Feedback save here automatically and display on GUI. This feedback is given through webpage or android application.

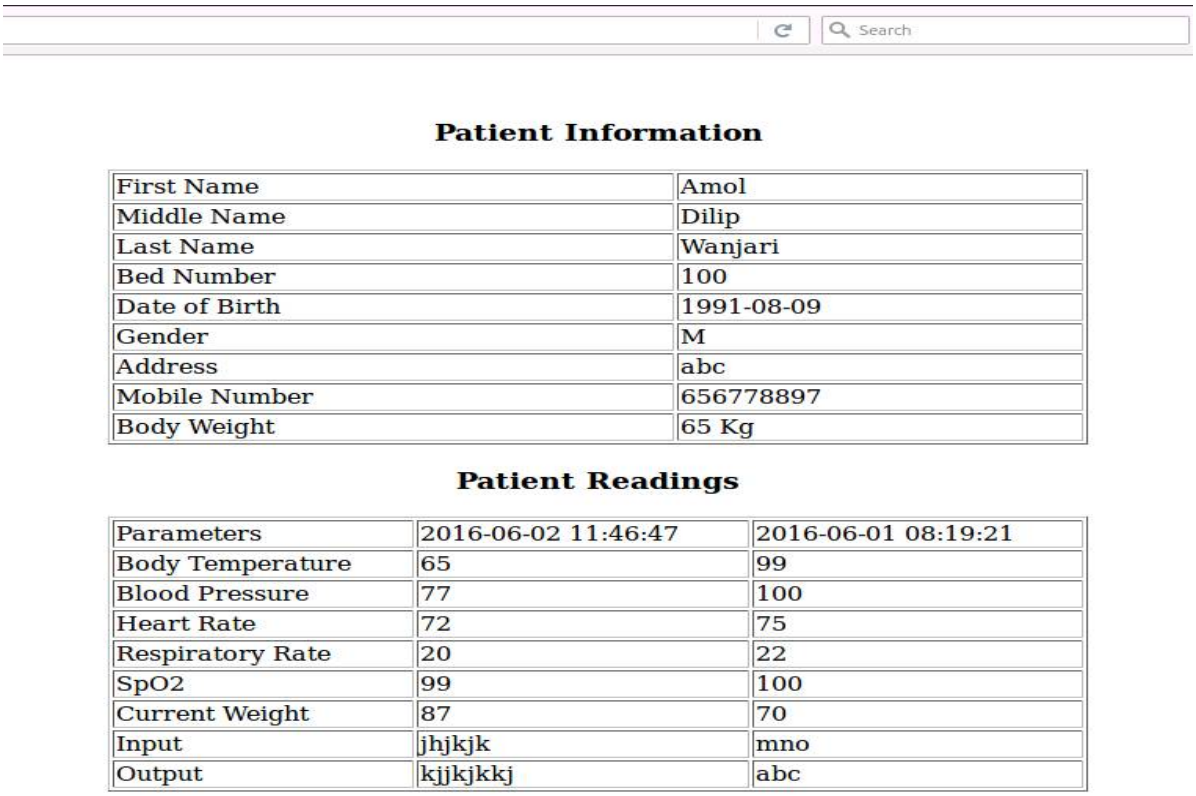

Fig 3 Webpage of patient monitoring system

The information sends from GUI display on the webpage with date and timing as shown in the fig 3 snapshot. This information can access from any remote place. Feedback system add here as an additional function. After clicking on the feedback below window open. This system opens for webpage as well as android application.

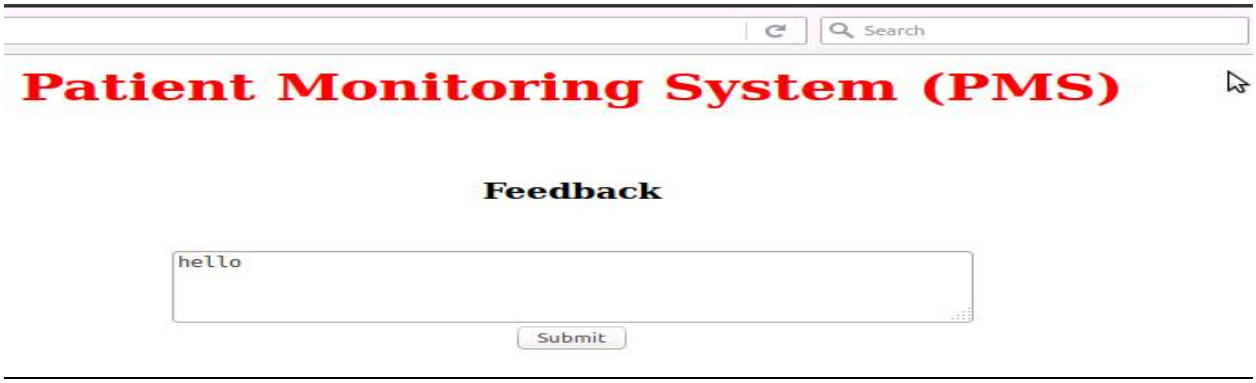

Fig 4 Feedback System

Additional function feedback as shown in snapshot 4. is useful if there require any emergency feedback from doctor to patient. When SMS is send from the hospital side, in that situation if any emergency suggestions require

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doctor gives that suggestion in this feedback system. Doctor can enter medicine names, timings of medical dose, daily routine.

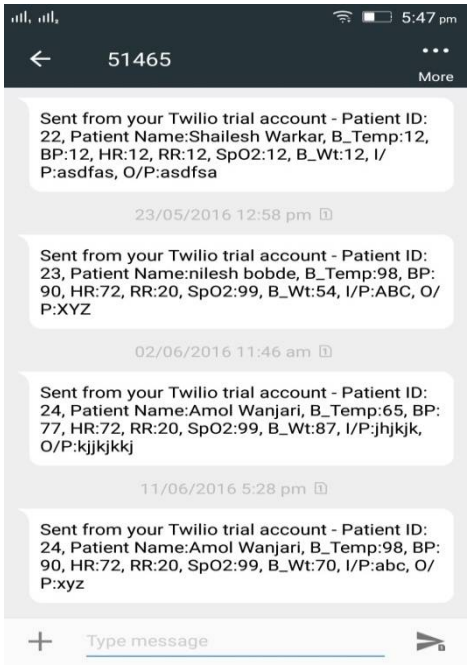

Fig 5 Emergency SMS Facility

An emergency SMS system as shown in snapshot above. This facility is useful, if the parameter readings cross the threshold values. This data also stored in the database. This acts as an emergency alert system and doctor can take further action if necessary.

V. CONCLUSION

The proposed patient monitoring system is useful mainly for patients in general ward. This is an alternative solution for paper based system. The current and previous values are helpful for comparing the patient's condition. Open ID function is useful, if any other patients' data wants to access. Feedback and SMS system are useful in case of emergency. Android is easily available for doctor and android application easy to use for accessing the data. Database information stored for long term use.

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REFERENCES

1. Pu Zhang, Yuichi kogure, Hiroki Matsuoka, Masatake Akutagawa, Yohsuke Kinouchi, Qinyu Zhang, "A Remote Patient Monitoring System Using A Java-Enabled 3G Mobile Phone", IEEE, 2007, pp. 3713-3716.
2. Anbumani.S, Kavin.R, Saranya.A, Dineshkumar.T, Premkumar. R, "An intelligent patient tele-monitoring system using android technology", IJRET, volume 04, issue 02, feb-2015, eISSN: 2319-1163.
3. Ping Wang1, "The real-time monitoring system for in-patient based on zigbee", IEEE, 2008, pp. 587-590.
4. Weibo Song, Hong Yu, Ce Liang, Qihua Wang, Yunfeng Shi, "Body monitoring system design based on android smartphone", IEEE, 2012.

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ISSN (Print) : 2320 - 9798

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5. Nitha V Panicker, Sukesh Kumar A, "Development of blood pressure monitoring system for home health application, IEEE, 2015.
6. Gunalan M.C, Satheesh.A, "Implementation of wireless patient body monitoring system using RTOS", International journal of engineering research and general science, volume 2, issue 6, october-november, 2014.
7. Prema Sundaram, "Patient Monitoring System using Android Technology" IJCSMC, Vol. 2, Issue. 5, May 2013, pg.191-201, ISSN 2320-088X
8. Deep Modi, Jignesh Vyas, Priyank Shah, "Android Based Patient Monitoring System", International Journal For technological Research In Engineering Volume 1, Issue 9, May-2014, ISSN (Online): 2347 – 4718.
9. A. Kassem, M. Hamad, C. E1- Moucary, E. Neghawi, G. Bou Jaoude, and C. Merhej, "Asthma care apps", IEEE, 2013.
10. Nitin P.Jain, Preeti N. Jain, Trupti P. Agarkar, "An embedded, GSM based, multiparameter, realtime patient monitoring system and control-an implementation for ICU patients", IEEE, 2012.
11. Stefan Grad1, Patrick Kugler, "Real-time ECG monitoring and arrhythmia detection using android-based mobile devices", IEEE, 2012.
12. Y. Kogure, H.Matsuoka, Y. Kinouchi, M.Akutagawa, "The development of a remote patient monitoring system using java-enabled mobile phones", IEEE, 2005.

BIOGRAPHY

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