

REMOTE HEALTH MONITORING & EMERGENCY NOTIFICATION SYSTEM WITH INTEGRATED GSM

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ABSTRACT

Remote Patient Monitoring (RPM) has garnered a lot of interest since the various emerging technologies made it possible to think of; and implement such a concept. Remote Patient Monitoring (RPM) solutions enable healthcare organizations to remotely monitor and manage patients with chronic diseases such as congestive heart failure, blood pressure and asthma. Remote monitoring concept raises a lot of interesting possibilities, and helps to address different issues continually faced with effective patient administration. Some notable issues are managing patients in remote areas, monitoring (elderly) patients in their own homes and saving hospital bills. The design presented in this thesis is creating portable embedded system based on ARM processor that facilitates RPM using wired, wireless communication. The proposed system use a body sensor which continuously monitor the patient heart rate and blood pressure, and generate alert when anything abnormal occur. The proposed system use wired and wireless communication standard along with GSM for remotely monitoring the patient. It is observed that, wired interface provides reliability in communication while wireless interface gives flexibility in patient movement.

Keywords-Alert, Remote, blood pressure, Monitoring, Heart rate

INTRODUCTION

This chapter briefly describes the Remote patient monitoring (RPM) technology. Under this technology here we have proposed a new Remote Health Monitoring and emergency notification system, provides a low cost technical solution. We create a virtual environment for designing Remote Patient Monitoring & Emergency notification System. In this system sensors continuously monitor the patient body and sense anything abnormal, alert is automatically generated. System monitors the location of patient using Google location API service.

1. REMOTE PATIENT MONITORING

Remote patient monitoring (RPM) is a technology to enable monitoring of patients outside of conventional clinical settings (e.g. in the home), which may increase access to care and decrease healthcare delivery costs. Incorporating RPM in chronic disease management can significantly improve an individual's quality of life. It allows patients to maintain independence, prevent complications, and minimize personal costs. [1] RPM facilitates these goals by delivering care right to the home. In addition, patients and their family members feel comfort knowing that they are being monitored and will be supported if a problem arises. This is particularly important when patients are managing complex self-care processes such as home hemodialysis. [2] Key features of RPM, like remote monitoring and trend analysis of physiological parameters, enable early detection of deterioration; thereby, reducing number of emergency department visits, hospitalizations, and duration of hospital stays. [3] The need for wireless mobility in healthcare facilitates the adoption of RPM both in community and institutional settings. The time saved as a result of RPM implementation increases efficiency, and allows healthcare providers to allocate more time to remotely educate and communicate with patients. [4] Remote Patient Monitoring (RPM) has garnered a lot of interest since the various emerging technologies made it possible to think of; and implement such a concept. Remote monitoring concept raises a lot of interesting possibilities, and helps to address different issues continually faced with effective patient administration. Some notable issues are managing patients in remote areas, monitoring (elderly) patients in their own homes and saving hospital bills. [5] Remote patient monitoring (RPM) uses digital technologies to collect medical and other forms of health data from individuals in one location and electronically transmit that information securely to health care providers in a different location for assessment and recommendations. [6] According to the National Broadband Plan drafted earlier this year by the Federal

Communications Commission (FCC), the use of remote patient monitoring technology in conjunction with electronic health records (EHR) could save the health care industry \$700 billion over 15 to 20 years.[7]

2. OVERVIEW OF PROPOSED SYSTEM REMOTE HEALTH MONITORING

As we know that modern life becomes too busy ,no one have enough free time .when in case your relative is heart patient and you have to take care of patient ,it's not possible to always stay with patient. Suppose patient is not on bed rest .He/She is moving from one location to another, suddenly patient have some heart problem and no one with patient at that time .The patient may die if he/she never got first aid on time. For solving that problem, the proposed system Remote Health Monitoring and emergency notification system, provides a low cost technical solution. We create a virtual environment for designing Remote Patient Monitoring & Emergency notification System. In the proposed System sensor device is always attached with patient body, which monitor the heart rate and blood pressure of patient. When something abnormal occur system will generate alert and alert mail is automatically sent to doctor and relatives of the patient with location of the patient .Also proposed create daily report of the patient and sent it to doctor, which will be used as electronic health record (EHR).

A Typical RPM system consists of three tiers. Each tier is characterized by its location and functionality. First tier of a RPM system is an embedded system consists of group of sensors that perceive signal of interest from patient and then transfer the information to Device database. Tier two is the advance wrist watch device which allows data storage or provides further processing before transmitting it to some remote location via GSM, internet or some wireless protocols. And the last tier is remote machine (Doctor Mobile/tablet & Relative Mobile/Tablet) where data is observed and analyzed .The tiers of the proposed system as follow-

2.1 First tier-In the proposed system first tier is Bio-medical sensors come in all forms, wired or wireless which forms Body Area Network (BAN).The Bio-medical sensor are always attached with patient body. "Heart rate" is the number of heart beats per minute; it helps to understand the overall physical condition of the body. Heart rate variability is one of the most promising quantitative indications of autonomic activity .It also measure the blood pressure of the patient. When sensor senses anything abnormal it will generate alert. After measuring the heart rate and blood pressure of the

patient, this information is transferred into device database by using wired interface.

2.2 Second tier-A personal Device that is attached with patient, functions as a local machine that will capture vital parameters received from the embedded system via wired or wireless serial interface. This information is stored in a database. It is after this step that the remote monitoring of the patient is possible. Once the data is stored in MS Access database, it is made accessible over the Internet. When alert is generated by the sensor ,then alert mail is generated and automatically sent to predefined Mail IDs .our system provide the location of the patient by using Google's location API. Now that information can be used by the Doctors to give medical protection to the patient. The Alert mail also sent to patients relatives with current location of the patient, in that way they are always connected with their patient. They can provide first aid to patient in case of any heart problem.

2.3 Third tier -The last entity of the proposed system is the remote machine which provides access to a patient's EHR using the Internet. The person sitting on the remote location is a doctor or Patients relative .the daily report of the patient is sent to doctor which gave current day health record of the patient .the report show the temperature, heart rate, and blood pressure of the patient. Alert mail in case of anything abnormal is sent to multiple persons at the same time with patient current location. So any relative can provide the first aid or hospitalized the patient in serious case. The administrator can add relative according to his/her choice by using update option.

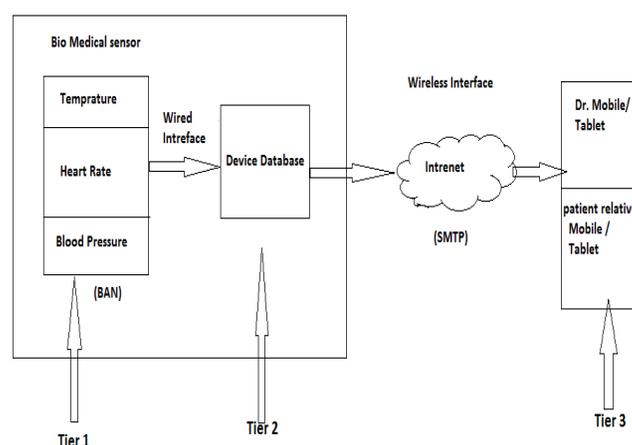


Fig -1: Proposed RPM system

3. SYSTEM DESIGN AND IMPLEMENTATION

We proposed a system which remotely monitors the health of patient. The system continuously monitors the

heart rate and blood pressure of the patient and send the daily report to doctor. The system also monitors the patient movement. In case BP/Heart rate become critical system generate alert mail and send it to predefined relative mail ID.

3.1 Flow chart of proposed system

The following flow chart describes the procedure of Remote Health Monitoring:-

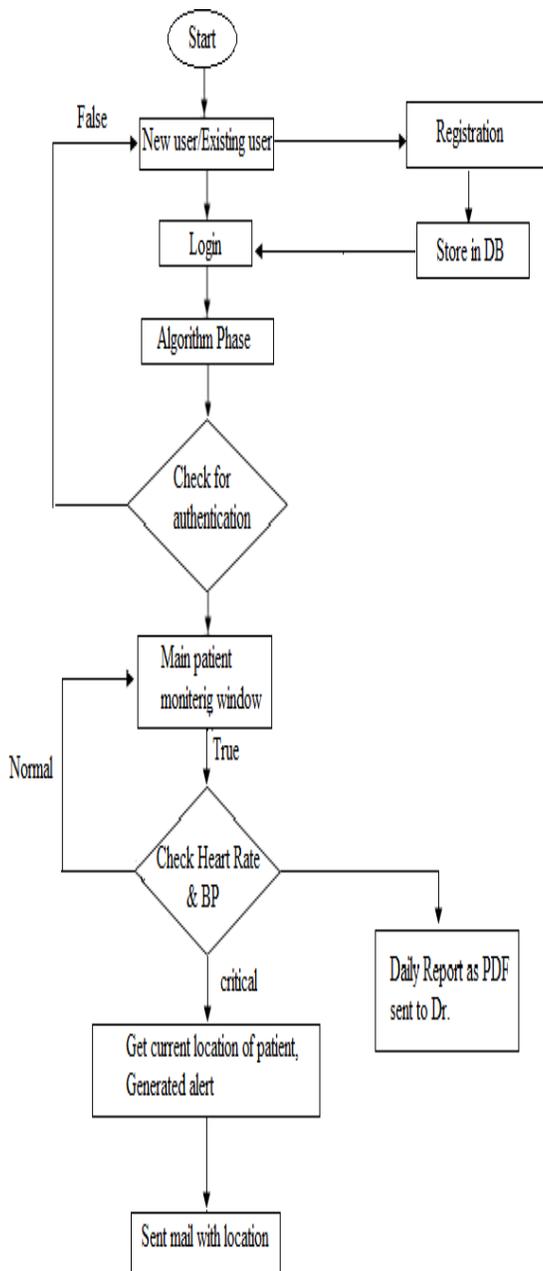


Fig -2: Flow chart of Proposed System

4. SIMULATION RESULTS OF REMOTE HEALTH MONITORING

Different results are calculated to resolve the above problem and objective of the research work. After system initialization, User can see new user/Existing user window

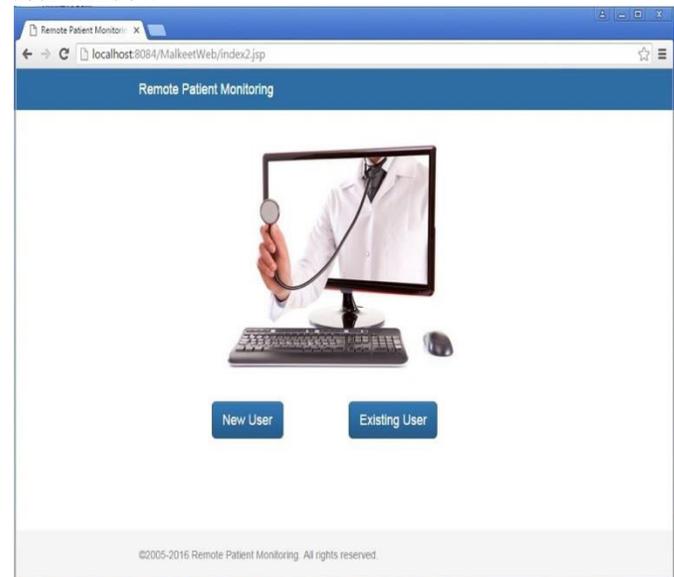


Fig -3: New user/Existing user window

If user is a new user, then click on new user button, if user already exists then click existing user button. When user click on Existing user button, then User Login page open. When user click New User button then New Registration window open

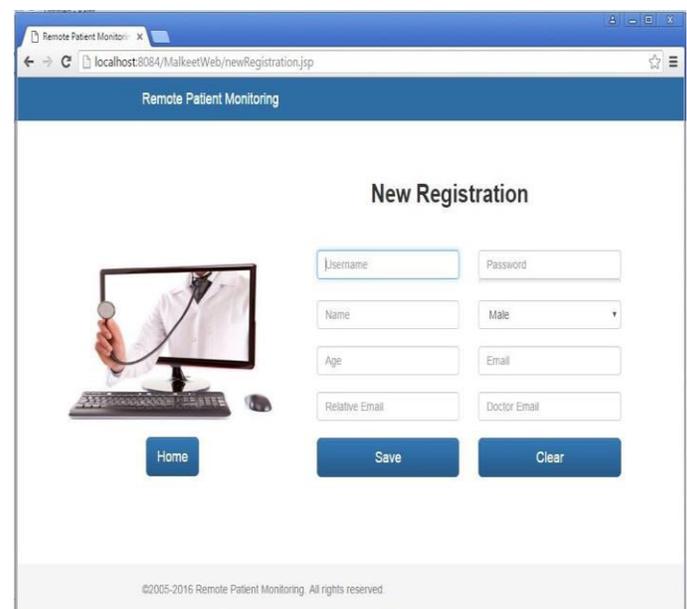


Fig -4: New Registration window

In this window enter the detail of the patient. Enter the user name and password. Enter the name of the patient, select male or female, age, Mail id. Here enter the Mail IDs of patient's relatives, and mail id of doctor on which alert mail and daily report has to be sent. After entering the detail click on save button, all the detail is stored on backend database. You can correct or reenter your detail by using Clear button. If you are the existing user click on Existing user button, then the following window appear.

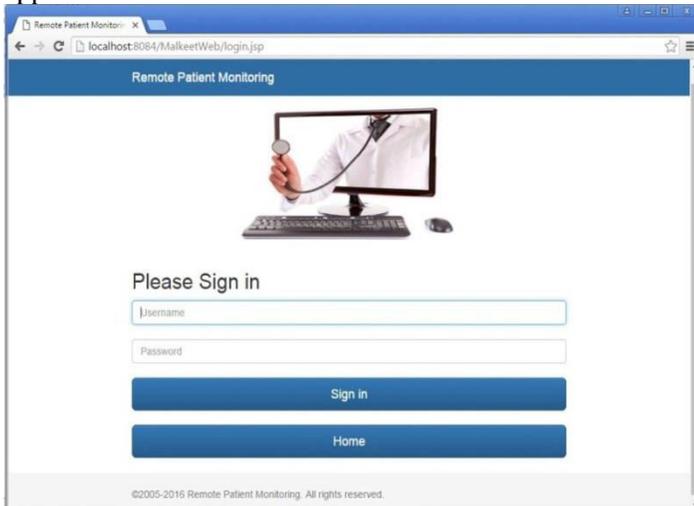


Fig -5: Sign In window

Here enter the given user name and password, then click the Sign in button. By using this user don't need to reenter his detail. System automatically process patient's personal detail from database. After that the Main page is open .where the patient health is monitored by Bio-Medical sensors. Sensor continuously senses the heart rate, and blood pressure of the patient, and stores it into the database.

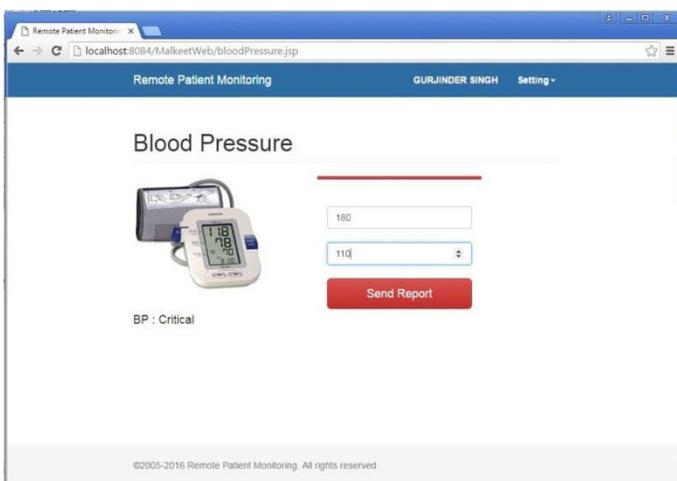


Fig -6: Blood Pressure Window

The blood pressure window shows the current blood pressure of the patient. Sensor sense the blood pressure, these values is automatically stored into the database. When become critical, BP report is sent to doctor, also mail is sent to patients relative, to predefined mail ids.

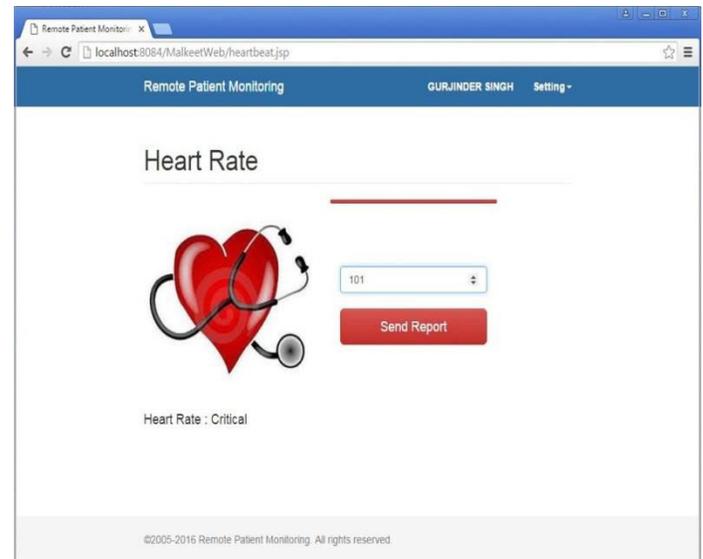


Fig -7: Heart Rate Window

The Heart rate window shows the current Heart rate of the patient. Sensor sense the Heart rate, these values is automatically stored into the database. When Heart rate become critical, Heart rate report is sent to doctor, also mail is sent to patients relative, to predefined mail IDs. The mail also tells the current location of the patient, which help the patients relative in Providing first Aid in case when patient is moving. The Daily patient report of the patient is given below-

| Remote Patient Monitoring | | |
|---------------------------|-------------------------|-----------------|
| Daily Patient Report | | Date: 22/7/2016 |
| Name | : Jabir Singh | Age: 35 |
| E-mail | :jabir263@gmail.com | Sex: Male |
| Heart Rate | : 75 (Normal) | |
| Location | :Warraich Punjab 143517 | |
| IP Address | :192.163.1.60 | |

Fig -8: Daily Patient Report

The above Patient report can be used as Electronic health Record (EHR).The information provided by the report can be used by Doctor for providing instructions to the patient .It also reduce the patient trips to the hospital.

5. CONCLUSION

In this research Paper, for continuously monitor the patient at low cost we Designed the Remote patient monitoring& emergency notification system.it save the unnecessary hospital bills, Number of nurses for caring the patient. Also reduce the hospital visits. In case of emergency system generate the alert. It continuously monitors the movement of the patient and gave the current location of the patient. The output provided by the system can be used as Electronic Health record. An EHR provides real-time reading of vital parameters along with patient demographics, which will help in patient health diagnosis and in critical health conditions.

REFERENCES

- [1]Bayliss, E., Steiner, J.F., Fernald, D.H., Crane, L.A., & Main, D.S. 2003. Descriptions of barriers to self-care by persons with comorbid chronic diseases. *Ann Fam Med*, 1(1), 15-21.] doi:10.1370/afm.4
- [2] Cafazzo, J.A., Leonard, K., Easty, A.C., Rossos, P.G., & Chan, C.T. (2009, February 14). Bridging the self-care deficit gap: remote patient monitoring and hospital at home. In *Electronic Healthcare First International Conference, eHealth 2008*. doi:10.1007/978-3-642-00413-1_8
- [3]Center for Technology and Aging. (2009, December). Technologies for remote patient monitoring in older adults discussion paper. Retrieved from <http://www.techandaging.org/RPMpositionpaperDraft.pdf>
- [4]Coye, M., Haskelkorn, A., & Demello, S. 2009. Remote patient management: technology-enabled innovation and evolving business models for chronic disease care. *Health Affairs*, 28(1), 126-135.
- [5]Web Based Remote Patient Monitoring System with Integrated GSM Nikita Patni, Kavita Sakhardande, Joanne Gomes
- [6]<http://cchpca.org/remote-patient-monitoring>
- [7]<http://searchhealthit.techtarget.com/definition/remote-patient-monitoring-RPM>