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Tele-Health System

Kanan Baheti[1], Ajit Gundale[2]

Master of Engineering, Electronics, Walchand Institute of Technology, Solapur, India[1]

Associate Professor, Electronics, Walchand Institute of Technology, Solapur, India[2]

Abstract: Under emergency situations like heavy rain, traffic, rural areas, it is not possible to get urgent remedies from physician. By using present telemedicine systems real-time monitoring of such patients is possible. This synopsis proposes the development and implementation of portable, low cost and advanced emergency telemedicine system based on Android Smartphone. By using sensors and controller board, the patient's data would be monitored on Android Application. Further it can be stored on SD Card in the form of screen shot of mobile device. Stored results can be shared with concerned physician via new communication techniques using an Android App. The main aim of this system is to provide emergency provisional help to patients before they get hospitalized which can save lives of many before the contact of expert doctors.

Keywords: Tele-health system, smartphones.

I. INTRODUCTION

In present scenario, the delivery of medical advice along with diagnostics and healthcare services facing two major issues, one is transportation and other time consumption. Because of these issues, the service to the needy person is not in time. Also the optimal ratio of doctor and people is 1:600 but as per the latest data in India the ratio is 1:1700. It is indeed difficult to increase the number of doctor by six times immediately in a country like India to meet medical quality. This is where telemedicine technology comes in picture. Telemedicine through hand held device becomes more appropriate, personalized and affordable because of mobile connectivity. Telemedicine deals with monitoring of patients primary health parameter like blood pressure, temperature, ECG.

Smartphones and mobile devices have rapidly become part of everyday life around the world. The availability of cheaper, faster and more capable mobile devices has led to a lot of innovations in every field where it can be applied. According to a recent Epocrates 2013 survey [1], more than 80% use smartphones today and 90% are expected to use tablets by 2014. Mobile phone use in particular is exploding across the developing world, offering the opportunity to leapfrog other applications and services on both the health and technology fronts [2]. Recent breakthroughs in communication technologies have stimulated the development and demonstration projects in telemedicine, which is therefore considered as an essential technology for reformed healthcare [3]. The success of various tele health care methods is due to the following factors.

Traffic and transport difficulties in big cities
Unequal geometric distribution of physicians [4]
Very low doctor to population ratio [5]
Poor socio-economic conditions of rural people, and
Severe shortage of trained doctors and nurses in rural areas.

All these factors can be eased to some extent by using smartphones with dedicated software. A mobile application which is known in short as 'mobile app', is a software application designed to run on smartphones, tablet computers and other mobile devices.

They are usually available through application distribution platforms, which are typically operated by the owner of the mobile operating system, such as the Apple App Store, Google Play (Android) Windows Phone Store and BlackBerry App World [6]. Some of the general mobile apps are email, calendar, stock market, banking, GPS and location based services, order tracking, ticket purchases, mobile games, and the list is increasing as the public demand is in rise. Medical field is no exception. They are changing the traditional way of doctors and patients approach of health care. Many 'apps' are designed for the doctors themselves and others are for the patients. Most of the commercially developed 'apps' designated for doctors are ranging from handy databases about drugs and diseases to sophisticated monitors that read a person's blood pressure, glucose levels, heart rhythms or other exclusive disease symptoms which are received from the patients Apps designated for the patients enable them to gather diagnostic data through portable devices by do-it-yourself procedure and they are transmitted to the doctor's app for further recommendations of treatments.

Indian Govt. has already initiated telemedicine programs in various States, to provide advanced medical help in rural developing areas. Organizations like (National Informatics Center) NIC, Indian Space Research Organization (ISRO), Center for Development of Advanced Computing (C-DAC) are working for Village Empowerment, Health Education, Empowerment of the disabled and Rural Connectivity with the help of Telemedicine Systems [3].

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The physiological parameters like temperature, heart rate, ECG, breathing rate and SpO2 are acquired from the patient monitoring system. The existing telemedicine devices can keep track of include blood pressure, blood glucose, heart rate, weight and hemoglobin. Tele-monitoring is effective for providing information about crucial signs, before reaching the necessary monitoring equipment at target location of patient. Relying on the severity of the patient's constraint, the provider may check these enumerations on a daily or weekly basis to determine the best course of treatment [5].

II. LITERATURE REVIEW

A. JAVA-ENABLED 3G MOBILE PHONE BASED PMS:

This system was developed in year 2007. The overview of the proposed System is shown in Figure 3.1. The system is mainly composed of three parts: patients monitoring system, Remote Information Server built in hospital and a Java-enabled 3G mobile phone. They are connected by the Internet and 3G mobile networks. The patients monitoring system is composed of Bedside Monitor, Central Station Monitor and PC used by Medical staffs in hospital. Conventionally, several patients' information can be collected by the Bedside Monitors and stored in the Central Station Monitor. In the proposed system, the patients' information in the Central Station Monitor, including numeric signal data, text data and real-time waveform data can be extracted by the Remote Information

Server and changed into the recognizable pattern for Java jiglet application on the mobile phone, by using a PHP web application. The 3G mobile phone used should carry multitasking function, such as using a Java based application during a voice call. Via the Internet and 3G mobile networks, the Java jiglet application on the mobile phone receives the data and displays the visual information on the screen of the mobile phone to the doctor [4].

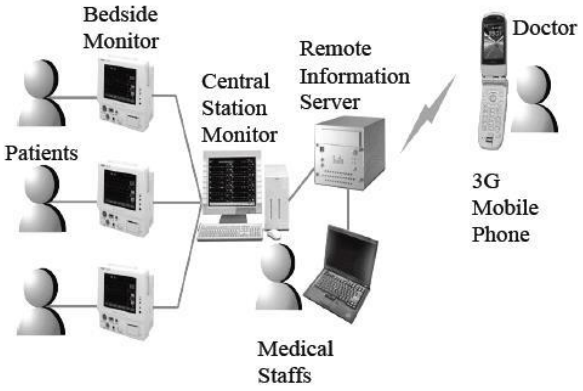

Fig 1. Java-enabled 3G mobile phone based PMS

B. UBIQUITOUS HEALTH MONITORING SYSTEM (UHMS):

This system was developed in a year 2008. This system was first developed by Japan people. Currently six types of biological signal data (ECG, blood pressure, glucose, temperature, weight) are monitored and collected from the U-house. Figure 3.2 shows the overall architecture of UHMS. It consists of two main servers: the U-house server and the central repository server. We named the central repository server as BIRD (Biometric Integrated Repository Database). The main role of U-house server is to compress the bio-signal data and upload it to the BIRD. The main roles of BIRD are to store the bio-signal data and provide easy-to-use interface to access the data for the health practitioners and U-house tenants [5].

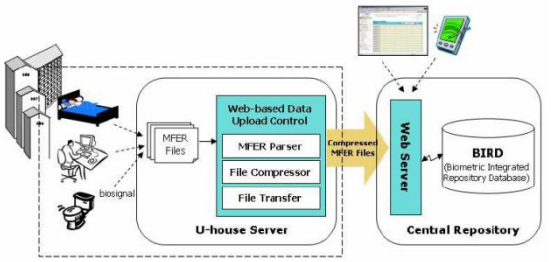

Fig 2 Ubiquitous Health Monitoring System (UHMS)

C. ZIGBEE BASED PMS:

The system is mainly made up of two sub-systems: patient physical states data acquisition and communication system based on Zigbee technology, and hospital monitoring and control centre, it is showed in Figure 3.3. The main function of the system include: On the basis of keeping the patient movement intact, the main physical states and movement parameters of patient can be continuously monitored and recorded real-time with wireless multi-sensors‟ terminal, and then the doctor can analyze the trend of the patient with the physical parameters. The measured data can be sent to hospital monitoring and control centre with wireless communication system.

The hospital monitoring centre receives the measured data from each patient and saves them to database, and then diagnoses the patient automatically with the intelligent diagnosis software to find emergency of the patient. The doctor can watch the parameters change as graph or numeric on computer and analyze these data to get more information about the patient, thus the doctor can know the physical states or movement parameters of patient, and then it is helpful to get the correct diagnosis result of doctor [3].

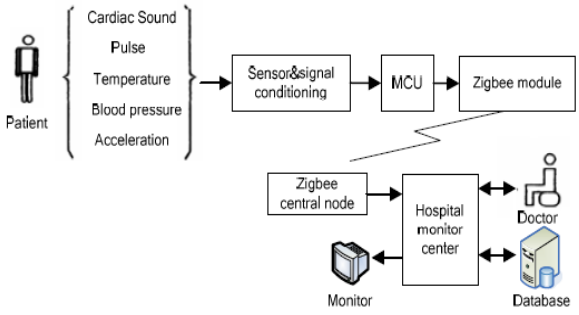

Figure 3.3The monitoring system for cardiac patient

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III. PROBLEM STATEMENT

In present scenario, the delivery of medical advice along with diagnostics and healthcare services facing major issues as India is characterized by low penetration of healthcare services. The issues include transportation and time consumption. Because of these issues, the service to the needy person is not in time. Also the one more major concern is very low doctor to population ratio. Thus, there is a need to design such a system that will assist patients, especially in rural are in reaching the doctors at the time they need and will help doctors to monitor the health of patients irrespective of time and location.

IV. OBJECTIVES

The objective of the proposed system is to develop assistive, cost effective, efficient and interactive android-based Tele-Health System that will assist doctors in accessing the patient's vital parameters at any time, diagnose and prescribe the required medication.

V. SCOPE

The scope of work can be outlined as below:

1. The patients having android devices with active internet connection will only be able to take advantage of the proposed tele-health system.
2. It may be possible that the available telemedicine system in the health centers may not function because of the interruption in power supply and data connection.
3. The delay in transmission of data may be of critical importance in tele-monitoring.
4. Telemedicine is a new emerging field, there is lack of training facilities with regards to application of IT in the field of medicine.
5. Many healthcare professionals are reluctant to engage in such practices due to unresolved legal and ethical concerns.
6. There are many issues that should be considered regarding the security, privacy and confidentiality of patient data, in telemedicine consultations.

VI. METHODOLOGY

A. TELEHEALTH SYSTEM:

The E-Health Mobile Phone Based Patient Compliance System is an Android application.

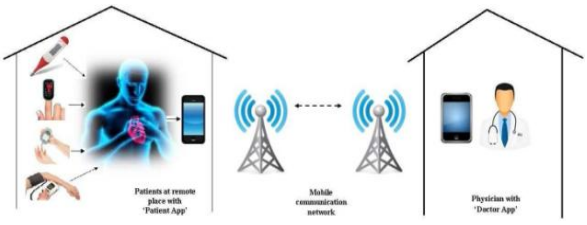

Fig 4 Tele Health Andro System

By this application doctor and patient can communicate online or patient can get online treatment. This application is a part of Telemedicine. By this application patients will be able to measure their body parameters with the help of sensors and send those parameters to the doctor via internet.

B. BLOCK DIAGRAM:

The proposed system can be depicted in brief as shown in figure.

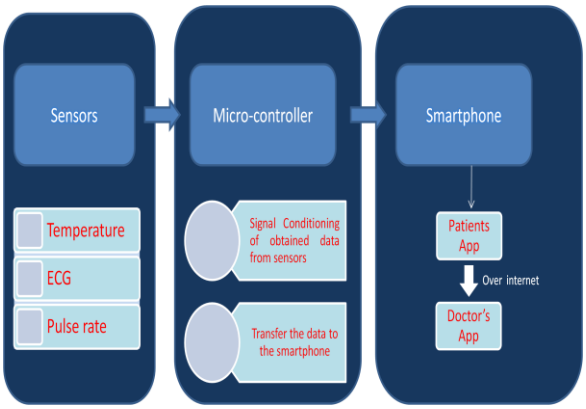

Fig 5. Tele-Health System

This system uses Open Source platforms in combination with different biomedical sensors, analog and some digital interfaces. The main task is to capture the real-time data from them and plot the proper graph along with some calculations based on obtained values.

Sensors:

For the measurement of body parameters of the patients, sensors will be used. We will be using temperature sensor, ECG sensor, Pulse and Blood Pressure sensor. Whenever the patient will feel uneasy, he will be able to measure his/her body parameters.

Micro-controller:

The sensed data from sensor will be sent to microcontroller for further processing such as signal conditioning, filtering if required. The microcontroller will then send the data to the android device when requested by the user with the help of wired or wireless connection.

Smartphone_Patient's App:

The body parameters that are sensed from the sensor will be now available to patient in his Patient's app. The GUI of the patient's app will be so designed such that, he will be able to insert some extra fields such as Blood glucose, etc. He will be able to add any comments if he want to. And then he will send his details to the doctor.

Smartphone_Doctor's App:

Whenever the patient will send his data to the doctor, he will get a notification. Doctor will analyze the data obtained from the patient, will diagnose and will prescribe

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the required medication to the patient. He may call patient to meet him if any direct check-up is required.

VII. CONCLUSION

The proposed system aims at meeting the main objective of telemedicine to cross the geographical barriers and provide healthcare facilities to rural and remote areas (health for all) so that it will be beneficial for the population living in isolated communities. Besides this, it will be a better solution to lessen the inconvenience and/or cost of patient transfers and reduce unnecessary travel time for health professionals. It will facilitate patients and rural practitioners to have access to specialist health services and support.

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