Patient Health Monitoring Using Android Application

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ABSTRACT: Recently, there is a need to incorporate the use of mobile computing devices in hospitals to enhance patient care. Many health care organizations maintain the records on desktops and papers. To reduce the overhead and provide flexibility to access the data, we introduce a system consisting of a wearable device that will monitor the patient health. We also use an android application to analyze the health so that the doctor can diagnose the patient appropriately. The wearable device will consist of different sensors such as temperature sensors and pulse sensor. The device will send its data to the server through the android application of the nurse, wherein all the processing will take place. This data will be available to the doctor through his android application.

KEYWORDS: Arduino Uno, LM35 temperature sensor, Pulse sensor, Bluetooth module HC05

I. INTRODUCTION

In today's world, everyone is busy with their professional lives and they rarely pay attention to their health. With time technology has been evolving and getting cheaper day-by-day.There is an increasing need to have easily deployable and autonomous technical devices to support safety and well-being of people. Additionally and not negligibly, these new devices should also ease the burden of the respective professionals in their daily routines. Our everyday life is enriched by the impact of the smartphone, bringing data mobility. Wearable sensors with wireless data communication capability can be incorporated with the smartphone to collect current user's health status. A typical Android smartphone is equipped with the wireless connectivity to the Internet and also a Bluetooth module.An example of a wearable sensor can be an Electrocardiography (ECG) sensor to determine instant heart beat rate (HBR). Measurements of body temperature and current geographical location of the patient can be other valuable sources for remote diagnosis. Therefore,sensor data fusion and real-time information processing is highly desirable for remote health monitoring. Also, the Internet connection provides the flexibility and allows mobility in transferring the collected data to a central database. A central database can be used to store and analyze patients' health status. Also, it can be a server for medical experts to remotely access patients' data. Anembedded in typical smartphone contains a powerful processing unit and multiple concurrent wireless communication capabilities. This processing unit the smartphone can be used for various signal processing techniques, preliminary data analysis and patient diagnosis. However, utilizing these multiple sensors and the information that they provide is not straightforward, as the data is not easily accessible or available.In this paper, we present an idea to prepare a wearable device that will help to integrate the patient's current data with the Android Smartphone. Now-a-days hospitals access the data on the computers. So, inorder to make the work paperless and to reduce the overhead, we introduce the idea of developing an Android application which will allow the concerned doctor to store and monitor the patient data.

II. RELATED WORK

In paper [1] the author focuses on the Mobile-Phone-based Remote Patient's Vital Signs Monitoring and Intelligent Alerts System and an intelligent data record system with validation and transmission of health tips to the patients as well as to the guardians. The system consists of different components that perform monitoring of patient's vital parameters like body temperature, heart-rate, breathing rate, activity and posture as well as carry out remedial actions in emergency condition. The system will provide the real time intelligent Content Management System (CMS), installed at respective hospital and capable of making intelligent decisions based on patient's medical status and information generated from patient side. This system is beneficial for specialists to monitor their patient remotely via mobile application

In paper [2] the author describes, Android Java-DSP (AJDSP) as a mobile application which interfaces with sensors and also enables simulation. This system also provides visualization of signal processing.In this system firstly there is creation of interface between both external sensors and on-board device sensors for monitoring the physiological parameters of human being.This paper explores the trend of mobile sensing and adapts it towards improving digital signal processing (DSP).In this paper SHIMMER is used. It is a small wireless low-power sensor platform that can record and transmit physiological (Health related like ECG) and kinematic data in real-time.

In [3],the author proposes a system of wearable devices where the patient can roam outdoor and his health parameters can be monitored using wireless sensors and the connectivity to the Android phone can be done through Bluetooth. Their main scope is to monitor the people in real time even if they are outside of their house. In [3], the authors have provided a facility of alerting the doctor according to the risk level of the patient. This facility makes it convenient at the emergency times to contact the doctor. The testing of the system in [3] is done indoor, outdoor and at different floor levels. The use of GPS makes the system dependent on internet connectivity. Monitoring can be difficult if the internet service is temporarily unavailable. This is the major drawback of the system.

In paper [4], an android based application is developed for the medical staff to diagnose the disease. The paper uses wireless technology to bring unprecedented mobility for the medical staff to access the patient information. Digital filtering is used to extract the wanted signal. The wanted signal is then processed to detect the disease and hence get the output on the screen.

In [5], the authors have proposed a system of monitoring the patient parameters in rural areas because there is a need for such systems in those areas due to the unavailability of doctors and health professionals in rural areas. The system in [3] monitors the blood pressure and ECG. Two levels of analysis are performed in this system: First level at the android phone where the data is stored at SQLite and an analysis algorithm is used to analyse the data and send an emergency warning to the health professional in the form of a normal SMS. Then he will retrieve the data from the central database using a patient id and his name. Then after getting the data, the second level of analysis is performed by the health professional. The drawback of the system proposed in [5] is that if the patient is in a critical condition, he will not be able to use the android phone, as well as the radiations coming out from the android phone will endanger his life even more. This is a serious issue as the health of the critical patients is concerned.

In paper [6] ,an Android based application is developed that monitors various sensor data such as body temperature, body posture, electrocardiography, current geographical location and fall detection data are collected using concurrent Bluetooth connections to the Android smartphone. The sensor data is collected and send to the remote server for processing. In case of emergency a notification is send to the concerned doctor and a contact person. The disadvantage here is that the sensors are directly mounted onto the patient body and it is uncomfortable for the patients.

III.   PROPOSED SYSTEM

Now-a-days, whenever a patient visits hospital for his regular checkup, a nurse has to bring several devices such as thermometer to check temperature, sphygmomanometer to check the pulse rate and so on. Inorder to reduce the number of devices carried by the nurse in this paper we are introducing a new hardware device which will be helpful for nurse to carry a single device which will sense temperature ,pulse rate as well as heart rate can be calculated. Also now-a days when a nurse checks a patient she has to bring a paper for keeping records which becomes an overhead. So in this proposed system we also introduced an Android application in which all patient data can be stored also it will be helpful for doctor to access the data at any time.Also the drawbacks discussed in the previously discussed papers are serious as it deals with the health issues of the patient.

THIS SYSTEM CONSISTS OF TWO MAIN MODULES

The first and main module is the wearable device. It will mainly consist of Arduino micro controller, sensors and Bluetooth module. The Arduino consists of ATMega128 microcontroller. The temperature sensor is LM35 temperature

sensor. And pulse sensor is used to sense the pulse.The Android application is the second module. It consists of two profiles; one for the nurse and one for the doctor.

Sr no	Name of Hardware used	Use
1	Arduino Uno micro controller	Interfacing with sensors
2	LM35 temperature sensor	To sense temperature
3	Pulse Sensor	To sense the pulse of the patient.
4	Bluetooth	To communicate with the Android device.

TABLE I: HARDWARE INFORMATION

The system architecture consists of wearable device which includes the above hardware.Whenever patient is ill or if he wants to visit a hospital for daily checkup, nurse will put a wearable device on patient's arm. Then nurse will login the android application and register for the new patient if the patient is new else she will open the profile of already existing patient.
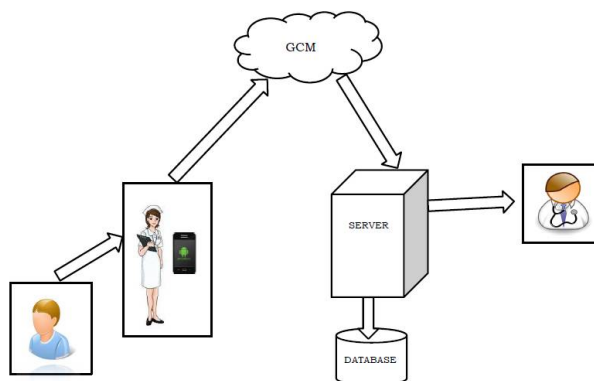

FIGURE 3.1: SYSTEM ARCHITECTURE

After successful registering , the nurse will click on connect button for communication between an Android application and Arduino .After connecting, the sensors that are mounted on device will start sensing the patient's data such as temperature and pulse rate. This data will be stored on nurse Android phone. Further these sensed data is send to central repository.Central repository stores the patient health record in a database. If the sensed data of the patient is greater than threshold the nurse's Android application will send a notification to doctor regarding the status of patient health and then it will be easy for doctor to analyse the data and will further take the necessary action.

IV.DATA ANALYSIS

1. BODY TEMPERATURE:

The normal body temperature of a person varies depending on gender and fluid consumption,time of day.The normal body temperature is between 36.5 degrees to 37.2 degrees for a healthy adult.There are many ways to measure a body temperature .For example:Using a thermometer.

In these proposed system, we will use Uno temperature sensor to measure body temperature.Here we have set a threshold value as 38 degrees.

2. PULSE RATE:

The pulse rate is proportional to measurement of heart rate.The pulse rate varies according to age as shown in following table:

V.OUTCOMES

We have developed two Android Applications: one for the nurse and other for the doctor. Both the doctor and nurse have to login to perform the necessary actions. Following are some screenshots of the Application:
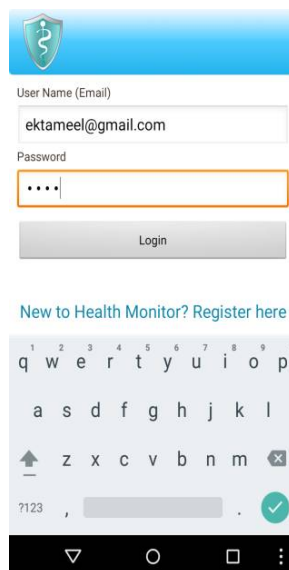

Fig 5.1: Doctor/Nurse Login
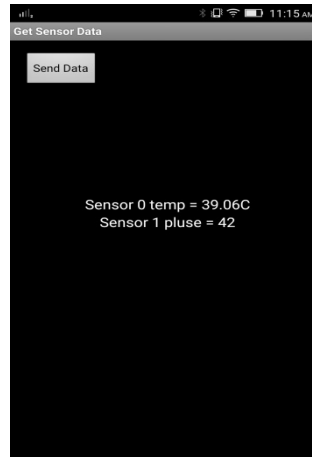

Fig: 5.2 Successful Doctor Login

Fig 5.3: Collect sensor data of patient on Nurse app
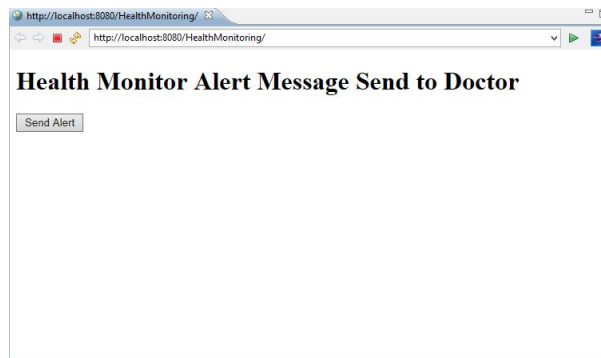
Fig 5.4: Web Services to handle notifications
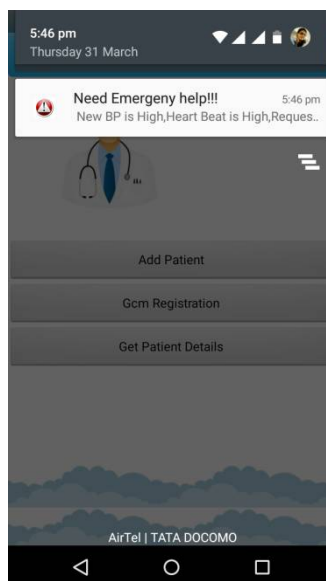
Fig 5.5: Doctor receives the notification

VI.RESULTS

These proposed system aims at preparing a sensing device and developing an Android application that focuses on measuring the temperature and heart rate. The sensing device will consist of a microcontroller i.e. ArduinoUno, a temperature sensor i.e. Uno temperature sensor; and a pulse sensor to measure the pulse rate thereby heart rate.This idea successfully reduces paper work as all the data is available on Android device and on central server. The device makes use of cost effective and user friendly micro controller, Arduino Uno which provides much functionality. Also it makes use of LM35 temperature sensor which is relatively small in size and can be integrated with Arduino Uno easily, and we can make use of pulse sensor.The android application will show basic output like temperature in Celsius, heart rate in beats per minute and pulse rate.

VII.CONCLUSION

These proposed system, mainly consist of a device and an Android application. The device mainly consists of an Arduino Uno microcontroller, a LM35 temperature sensor as well as pulse sensor. As soon as the device is mounted on the patient's wrist, the device will start sensing the vitals of the patient and send this data to the Android device of the nurse, who will analyse the patient data. She will further send it to the central server so that the doctor will be able to access the patient data accordingly. The application will consist of two profiles: the doctor and the nurse. The nurse will do the patient registration on the application and the doctor will be able to check the data using a patient id and diagnose the patient appropriately .When the value crosses a threshold, a notification will be sent to the particular doctor. The doctor will be then able to analyze the patient data. Thus, paper work is also reduced.

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