“Mr. Wellness- Your Health Monitor”

By: - IOT(B) Group -06

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CERTIFICATE

This is to certify that this report entitled "Mr. Wellness- Your Health Monitor" submitted by group 6 of CSE IOT group-B during May 2021 at Chandigarh University is an authentic work performed under the supervision and guidance of Dr.Suniti Dutt mam.

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Abstract:

Online telemedicine systems are useful due to the possibility of timely and efficient healthcare services. These systems are based on advanced wireless and wearable sensor technologies. The rapid growth in technology has remarkably enhanced the scope of remote health monitoring systems. In this paper, a real-time heart monitoring system is developed considering the cost, ease of application, accuracy, and data security. The system is conceptualized to provide an interface between the doctor and the patients for two-way communication. The main purpose of this study is to facilitate the remote cardiac patients in getting latest healthcare services which might not be possible otherwise due to low doctor-to-patient ratio. The developed monitoring system is then evaluated for 40 individuals using wearable sensors while holding an Android device. The performance analysis shows that the proposed system is reliable and helpful due to high speed. The analyses showed that the proposed system is convenient and reliable and ensures data security at low cost. In addition, the developed system is equipped to generate warning messages to the doctor and patient under critical circumstances.

Index terms:

1. Introduction
2. Materials and methods
3. System Requirements Specifications
4. Software Requirements
5. Hardware Requirements
6. Results and discussions

INTRODUCTION

During the recent decade, rapid advancements in healthcare services and low cost wireless communication have greatly assisted in coping with the problem of fewer medical facilities. The integration of mobile communications with wearable sensors has facilitated the shift of healthcare services from clinic-centric to patient-centric and is termed as “Telemedicine” in the literature. In the larger perspective, telemedicine can be of two types: live communication type, where the presence of the doctor and patient is necessary with additional requirements of high bandwidth and good data speed, and store and forward type, which requires acquisition of medical parameters such as vital signs, images, videos, and transmission of patients data to concerned specialist in hospital .According to existing medical surveys, telemedicine has been adopted to take care of the patients with cardiac diseases, diabetes, hypotension, hypertension, hyperthermia, and hypothermia The most promising application is in real-time monitoring of chronic illnesses such as cardiopulmonary disease, asthma, and heart failure in patients located far from the medical care facilities through wireless monitoring systems . Heart diseases have become one of the leading causes of human fatalities around the world;

for instance, approximately 2.8 million people die each year as a result of being overweight or obese as obesity can lead to adverse metabolic effects on blood pressure and cholesterol which ultimately increases the risks of coronary heart disease, ischemic stroke, diabetes mellitus, and a number of common cancers According to WHO, it has been estimated that heart disease rate might increase to 23.3% worldwide by the year 2030 The treatment of such chronic diseases requires continuous and long term monitoring to control threat.

The ubiquitous social connectivity can be used in telemedicine for remote monitoring and offsite diagnoses. It should be noted that over 94% of the world population, that is, 6.8 billion people, are the subscribers of cell phone and about 2.7 billion subscribers are using Internet .Cell phone subscription is increasing rapidly and might reach the level of 8.5 billion by the end of 2016 with 70% of smartphone users from developing countries. In addition, smartphones technology comprises various services such as location tracking, short message service, and access of WLAN/GPRS/3G which provides ubiquitous connectivity. There are extensive studies on use of mobile phones in healthcare and clinical practices illustrating the use of inbuilt applications of smartphones like GPS and location enabled services which offer independent survival of old age patient with fragilities. Existing studies have also highlighted the uses of inbuilt apps in continuous monitoring and maintaining individual records; for instance, in another study, the authors discussed the benefits of existing smartphone health apps considering their credibility for continuous data flow, feasibility, portability, and power consumption. Nevertheless, the discrepancies such as battery consumption, calibration, and generation of false alarms have challenged the capabilities of smartphone apps in the implementation of real-time health monitoring and diagnosis.

An alternative to inbuilt smartphone sensors is wearable sensors that have been used for continuous monitoring, storing, and sending medical data to healthcare givers over distance.

Existing studies with wearable sensors offer monitoring in applications like physiological, biochemical, and motion sensing These sensors have been used in monitoring health indicators and body positions of the patients, as well as in keeping track of sports and other activities These wearable sensors are becoming promising due to the fact that these sensors are low cost, easily available, user friendly, accurate, and reliable. Many studies explored the clinical applications of wearable sensors in cardiovascular, neurological, asthma, and hypertension diseases [24, 25]. For instance, [26] developed a system to monitor congestive heart failure in patients, comprising a biosensor in the form of a ring that monitors heart data. Similarly, systems have been designed to monitor respiratory diseases which record acoustic signals by placing a microphone on the neck of the patient while breathing The framework consisted of a band-pass filter to reduce noise and other distortions in signals which helped to achieve approximately 90% of measurement accuracy. The research work was then extended for detecting apneas using algorithms .Wearable technology is also useful in solving the issues of monitoring in motion artifacts by using multiple sensors integrated on a single chip. Integration of different sensors on same platform (tight fitting in garment) in order to monitor respiratory diseases is another kind of application. These systems are found to be better than spirometry but still require advancements to minimize motion artifacts

The current study addresses the issue of integrating a wearable sensor with mobile technology by developing a remote monitoring system for heart patients. In this study, we propose a location based real-time monitoring system comprising a wearable sensor, mobile application, and a web interface to overcome some of the issues, as mentioned in the literature. The wearable sensor has been used to generate patient’s diagnostic information which is then transferred to a smartphone wirelessly via Bluetooth low energy technology. Further, the collected information on the smartphone is transferred to a web interface via Wi-Fi/3G.

The proposed system has the ability to generate emergency alerts on the basis of predefined values by comparing patient’s data to inform the doctor if there is a requirement of checkup or investigation. Furthermore, various types of sensors have been used and results are compared to identify the most promising sensor providing most accurate results close.

Materials and Methods

This study develops a remote monitoring diagnostic framework to detect underlying heart conditions in real-time which helps avoiding potential heart diseases and rehabilitation of the patients recovering from cardiac diseases. The proposed real-time monitoring system is compatible to use various wearable sensors to extract medical information which helps finding out multiple parameters such as heart rate, blood pressure, and body and skin temperature at the same time. These cardiac parameters help early detection of diseases such as arrhythmia, hypotension, hypertension, and hyperthermia through alarming system based on upper and lower threshold values. Similar to the existing monitoring systems, the developed system has two interfaces, one for patients and other for the doctor. The patient interface is comprised of wearable sensors which extract medical information of the patients and transmit to an Android based listening port via Bluetooth low energy. The listening port transfers this information to web server which processes data to show reports on doctor interface. The details of the system architecture, components, data processing, and alarming system are explained as follows.

Modules of Web Interface

Patient Data. This module consists of the patient's personal and medical records. Real-time data acquired by wearable sensors has been shown with respect to time. It contains the medical history of individual patient after getting registered at Android listening port device.

Alarming Messages. This module contains alarming messages generated at Android handheld listening port. Extracted physiological parameters give the alarming signals after comparison with assigned threshold values. These alarming signals indicate abnormalities like arrhythmia, hypotension, hypertension, fever, and hypothermia. Some real-time alarms from patients

System Requirements Specifications

To develop a prototype of the proposed health monitoring system the hardware and software requirements are described below.

Software Requirements: The software tools required for the project work are:

- ESP32 web server (ubidots stem) to hold the sensor data.

Hardware Requirements:

- Esp 8266 board.
- Max30100/102 Pulse Oximeter sensor.
- LM35 Temperature sensor.
- DHT11Humidity and Temperature sensor.
- 4.7k resistor

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3. Result and Discussions:

In this study, a real-time heart monitoring system is developed for chronic disease management. Various cardiac parameters such as heart rate, blood pressure, and temperature are being acquired using wearable sensors. Android listening port has been created to receive and store medical information of the patient which is then transmitted to the web interface using wireless communication. Web interface has been designed to be on the doctors' side so as to inform them of the medical status along with location of the patient in real-time. The accumulated data is stored in data server which pushes the information to doctor's web interface and ultimately, data of the patient located in remote area is made visible to the doctor sitting in super specialty hospital.

In this section, the practical implementation of the proposed real-time monitoring system is examined to determine the ability, accuracy, and performance of the system. The practical implementation process is comprised of real-time implementation of the system to heart prone patients in hospitals.

Prior to the integration of wearable sensors into the system, calibration of the wearable sensors has been done with respective conventional measuring devices, used in hospitals. In detail, Bluetooth based blood pressure sensor is evaluated with manual mercury column meter which shows that blood pressure sensor is more accurate on left-hand side. Heart rate sensors are tested with conventional machine and also with one-minute manual reading and results obtained are found to be accurate. Similarly, temperature sensor is calibrated with mercury thermometer and found to be accurate.

The practical implementation process of the system involves the participation of forty heart patients. Each patient was fitted with various wearable sensors to obtain medical information. Each subject was tested with respective conventional machines for evaluation. The testing protocol directed for each subject continued for a 10-minute acclimation period. Two data sets (wearable sensor and conventional devices) were assumed to have normal distribution and the resulting value was 0.0003 (paired -test). Statistical information of patients.

THANK YOU!