Journal of The Gujarat Research Society
ISSN: 0374-8588
Volume 21 Issue 8, August 2019

SMART FITNESS WATCH FOR MONITORING OF HEALTH PARAMETER

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Abstract

Smartphone and smart watch technology is changing the transmission and monitoring landscape for patients and research participants to communicate their healthcare information in real time. Flexible, bidirectional and real-time communication management enables a rich range of healthcare applications to be built that can provide participant interactivity and respond dynamically to their evolving environment. In addition, smart watches have a number of sensors appropriate for physical activity and location data collection. The combination of all these features enables the data collected to be transmitted to a remote server and thus to be tracked in real time for physical activity and potentially social activity. Therefore, the purpose of this study was to develop a smart watch-based framework for real-time and online assessment and mobility monitoring (ROAMM). The proposed ROAMM framework will include a smart watch application and server. The smart watch application will be used to collect and preprocess data. The server will be used to store and retrieve data, remote monitor, and for other administrative purposes. With the integration of sensor-based and user-reported data collection, the ROAMM framework allows for data visualization and summary statistics in real-time.

Keywords: *Smart watch, Health, Monitoring, IoT, GSM, Health care, Life style, Technology.*

I. INTRODUCTION

As technology continues to evolve, more and more physical devices are being integrated with sensors and connectivity. This growing network of devices capable of linking and sharing data has been called the Internet of Things, and will eventually contribute to the collection of high-fidelity data on a range of population-level health-based outcomes. Currently, such connected computers, in the absence of direct physical interaction with the device or participant, give

researchers the immediate advantage of free-living data collection. Modern mobile devices actually have a convenient platform that includes power processing capabilities, high-speed networking, ample storage, and a wide range of sensors. In addition, this technique offers some significant benefits as well [1]. The ability to customize unconventional approaches, including apps, a screen interface via the Application Program Interface (API), for viewing data and connecting with participants, a large number of sensors, the physical input choice (e.g. switch dial bezel), and the ability to provide sensor remote access and control. Smart watches can be worn easily and have the ability to continuously collect data provided that the battery is charged periodically speaking.

There has been a rising interest in the adoption of smart watches for behavior and mobility trends analysis. While their wear comfort and ongoing data collection capability already make them a lucrative testing tool, their ability to remotely access and control sensors along with the ability to interact directly with a user provides seemingly unlimited possibilities for additional applications. For example, it is possible to integrate ecological momentary assessments (EMA) to explain health, symptoms, and potential episodic health events that are difficult in real time to record. The concomitant collection of location information via GPS to understand community mobility patterns, physical activity data from an accelerometer and reported health symptoms or events is ideal for creating a narrative of personal health information in a remote and interactive manner. Several smartphone-based frameworks have been implemented in free-living environments to track health conditions. In order to collect critical information from patients in real time, these mobile healthcare or mHealth systems rely on communication means and provide notifications and recommendations remotely when data deviates from the expected value. There are some holes in phone-based ascertainment, though such systems carry merit. Smartphones are typically carried in a pocket or in hand-held pockets, which is not an appropriate place for behavior detection. Therefore, sensor data obtained from these devices do not provide the requisite information for the identification of operation. Smart watches offer a more logical choice because they possess the same sensors and connectivity and are fixed to the body. Despite the benefits, the development of smart watch apps for data collection has not progressed since their initial consumer release [2].

In sum, the purpose of this study is to develop the framework for a novel remote monitoring system through the integration of a smart watch- based application and a remotely-connected server. Such a framework will pave the way for additional applications that simultaneously collect data in the target domains of physical activity, mobility, EMA, patient-reported outcomes, and intervening health events. To accomplish this goal, we present the Real-time Online Assessment and Mobility Monitoring (ROAMM) framework that offers: (1) a convenient approach for long-term assessment in the context of varying health, (2) the ability to synchronize sensor data with reports of health events and symptoms (e.g., pain, fatigue), and (3) interactive communication in real time, providing an active channel for patient reported outcomes, health events and future intervention delivery. Knowledge of these domains in real-

world scenarios will help understanding the inter and intra-personal factors that contribute to episodic health even.

The smart watch application has the following unique features and advantages:

1. At defined and adjustable frequencies, the programmer collects sensor data (e.g. accelerometer, gyroscope, position, and heart rate) and sends them to the server. Using the HTTPS communication protocol, data uploading is carried out to ensure the security of data transmission. In addition, the address to which data is transmitted is only disclosed to registered smart watches.
2. Using a Wi-Fi or 4G network link, data is uploaded to the server. The use of Wi-Fi or cellular data for data transmission allows the collected data to be made accessible in real-time and in a minimally intrusive manner on the server.
3. The programmer asks the server to receive configuration parameters in addition to submitting its collected data, and changes the usage of its sensors accordingly. Using the configuration parameters that include the list of sensors for data collection, their sampling rates, the description of feature vectors (i.e. measured variables from sensor data) and PROs, the server may customize the function of the watch application.
4. The application is sufficiently versatile to handle various kinds of studies with a range of target variables and performance. Variables can be computed instantly and on the watch from the raw data. The application reduces the data cleaning time by integrating the data collection and variable construction steps, and thus speeds up the analysis. In addition, transmitting variables instead of raw data results in a considerable decrease in the size of the data sent to the remote server, thus reducing the cost of transmission [3].
5. The computing power and available sensors of Smart watches are adequate for instantly and accurately detecting non-wear time. Non-wear periods are defined as the times when the device is not worn on the wrist, such as when the device needs to be charged during showering and times. Identifying times of non-wear helps to enhance the study. In addition, real-time non-wear time detection is used to achieve a data collection that is power-efficient. The educated decision to collect data only during wear time increases the battery life and allows the structure to be ideal for longer periods of monitoring of operation.
6. The watch allows for the development of interactive interfaces, such as prompting the user to report symptoms or asking them to charge the watch [4].

Body temperature of patient, heartbeat rate, movements of body & blood pressure. Further it is to improve the previous system to predict when the patient is suffering from any disease or chronic disorder with the help of various health related parameters & various other characteristics that are obtained by the proposed system.

1. Section for Health Monitoring

2. Section for Emergency Alert
3. System for Health Status Prediction

A. **Section for Health Monitoring: -**

This module consists of components related to hardware of the system which makes the proposed system enable for IoT & is used to document the parameters of health of the patient with the help of various sensors. Here, microcontroller works as a central server to which various sensors are connected to collect various parameters with the help of GPIO pins or with the help of analog-to-digital converter if sensor output is in the form of analog signal because microcontroller works only on digital signals. The microcontroller observes real-time values and updates them to a database which is further used to upload all collected data on the web server [5].

B. **B. Emergency Alert Section: -**

This section of the proposed system in particular works with the initiative to be taken when sensors detect abnormality in a patient's health by informing patient family members as well as the doctor. In the proposed system threshold values are set in the program when the patient health parameter will cross a particular fixed value system will generate an alert and notify the family or doctor of the patient.

C. **C. System for Health Status Prediction: -**

This section is the most important module of this proposed system. In this module, health data of patients is recorded by the proposed system along with any symptoms. Patients may have feelings when doctors ask a few simple questions and compare that relevant answer with the existing data which is stored in a database for further analysis on that base doctor to predict if any disease/disorder the patient may have thus making it an efficient Expert System with proper data mining techniques.

II. CONCLUSION & DISCUSSION

IoT in healthcare is the key player in providing better medical facilities to the patients and facilitates the doctors and hospitals as well. Here, the proposed system consists of multiple medical devices such as sensors and web-based or mobile-based apps that communicate through network-connected devices and help track and record health data and medical information for patients. The proposed outcome of the paper is to build a system to provide patients with world-class medical assistance even in the most remote areas without hospitals in their areas by communicating over the internet and collecting information about their health status via the wearable devices included in the kit using a raspberry pi microcontroller that would be able to record the heart rate, blood rate of the patient. In the event of any medical emergency, the system will be wise to advise the patient's family members and their doctor about the current health status of the patient and complete medical records. The data collected

can be used to evaluate and forecast chronic illnesses or other conditions, such as heart attacks, using data mining techniques in the preliminary stage itself, which would also have an advantageous decision-making strategy.

III. REFERENCES

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