NOVEL IDEA FOR REAL-TIME HEALTH MONITORING USING WEARABLE DEVICES

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ABSTRACT

There is lack of reliable patient monitoring system so that the healthcare professionals can monitor their patients who are either hospitalized or executing their normal daily life activities. For a patient who is living in remote area, it would be difficult for such patients to regularly visit hospitals or go for checkups on regular basis. Thus, increasing acceptance of wearable devices in recent years leads to the fact that a varied range of physiological and functional data are captured continuously by these devices which can be used for real time health monitoring by using these wearable devices. With the help of technology, a wearable device will be used for health monitoring using a RNN with LSTM based system.

Keywords – RNN, LSTM, sensors, deep learning


1. INTRODUCTION

Five components of this system architecture are Input, Data Processing, Machine Learning, Decision Making and Output. By the help of this type of system and wearable sensor, health monitoring can be done for a patient who is living in remote area because it would be difficult for such patients to regularly visit hospitals or go for checkups on regular basis. So this system can reduce the risk of life and improve the health status of a person. This motion sensor band will use Wireless Medical Telemetry Services (WMTS), unlicensed Industrial Scientific and Medical (ISM), Ultra-wideband (UWB) and Medical Implant Communications Service (MICS) bands for data transmission and will measure pressure, blood sugar, pulse rate, body temp.

This system will also make use of body area network (BAN) as an emerging Technology for providing health information. As an expected output of this project some chronic diseases like diabetes, heart diseases can be treat in a better way with proper care which will improve patient’s health.
2. BACKGROUND
In health-related research using wearables previously technologies like wireless body area network were used. WBAN traffic is categorized into On-demand, Emergency, and traditional traffic Real-time health monitoring using wearable devices uses classification method for time-series analysis. The main challenge is of selecting a suitable set of features for subsequent classification. Previously, ZigBee was also used to communicate between mobile system and physiological devices. Recording the link quality, packet delivery and Received Signal Strength Indicator (RSSI) values in time period is done and then health status is checked.

Recent surveys of research in this field shows that a wide range of internet of things based devices, wearable sensors in the form of watch, band, and cloth are used. Most of the research reports have implemented several routing techniques like ZigBee, Wi-Fi, RFID, Bluetooth for Real time health monitoring used in wearable devices.

In this type of research, generally used tools are Striiv Fusion Bio Fitness Tracker, Fitbit Charge HR Fitness Tracker, Garmin vivosmart, HR Fitness Tracker, Smart Shoes, Smart Jacket, and smart Gloves.

3. LITERATURE REVIEW
Lei Clifton et.al. (2014), “Predictive Monitoring of Mobile Patients by Combining Clinical Observations with Data From Wearable Sensors”, IEEE Journal of Biomedical and Health Informatics, Health monitoring systems use wearable sensors that produce continuous data and generate many false alerts.


S. Babu, et.al. “Cloud-enabled remote health monitoring system,” in Int. Conf. on Recent Trends in Inform. Tech. (ICRTIT), July 2013: proposes a system that recruits wearable sensors to measure various physiological parameters such as blood pressure and body temperature. L. Wei et.al.,“A practical tool for visualizing and data mining medical time series,” in Proc. 18th IEEE Symposium on Computer-Based Med. Sys: For data gathering, storage and access, medical data analysis and visualization are critical components of remote health monitoring systems.

4. DEFICIENCIES IN EXISTING SYSTEM
After going through various literatures, it has been observed that existing models are facing various deficiencies. Some of the deficiencies are given below:

- Accuracy in decision making
- Power consumption & delay in data transfer
- Security of data and signals using
- Only two parties (patient & doctor) involved
- Complex hardware structure.
- No approach for choosing recipient of alert signal
- Text message or alarm is used for alerting

5. PROPOSED MODEL
The proposed model will be having several advantages such as:

- Improvement in accuracy in decision making using (Deep Learning algorithms)
- Low power consumption during data transfer & Security of data and signals using (ZigBee protocol, Bluetooth protocol & Zephyr BT is a wearable sensor)
• Minimizing delay in data transfer from smart phone to server and server to medical professionals using (4G / 5G technology)
• Registration of nominee and specialist doctors for alert signaling (manually initial entry).
• Minimizing the hardware by combining transmitter, receiver, and local monitoring unit in one device.
• Appropriate channeling of alert signal to the intended physician rather than to all registered medical professionals (NOSQL data analytics).
• Text / audio message alerting system for uneducated or physically challenged humans (NLP)
• Proposed system will be flexible enough to accommodate more options as per user demand

6. DEVELOPMENT OF MODEL
Collection of physiological signals will be measured using wearable devices that contain motion sensors, then the input data must be processed into a set of features before becoming suitable inputs for RNN based system. Preprocessing will be applied on dataset processing by noise reduction, feature extraction and data normalization.

In second step a machine learning algorithm RNN will be designed for the calculation of a decision regarding patient health status. The RNN is chosen because of its ability to construct a robust classifier because the time series form data will be generated.

In addition, it has good generalization properties allowing it to classify new data that is coming continuously. In third step, the health monitoring model that is machine learning algorithm will be trained on the dataset to do the monitoring of health accurately and notify the patient.

![Figure.1](model-development-steps.png)

7. CONCLUSION
Integrating a wearable sensor with mobile technology by developing a remote monitoring system for heart patients. A location based real-time monitoring system has been proposed comprising wearable sensor, mobile application, and a web interface to overcome some of the issues. 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. The collected information on the smartphone is transferred to a web interface via Bluetooth/4G. The proposed system will have the ability to generate emergency alerts. Sensors will be used for providing most accurate data close to the conventional systems. The developed system will be evaluated under the supervision of the experts.
REFERENCES


