AN EFFICIENT IOT-BASED REMOTE HEALTHCARE MONITORING SYSTEM

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ABSTRACT:

In this paper, The method involves fast Fourier transform (FFT) based discrete wavelet transform (DWT) for extracting the features from the heartbeats which involves less computational complexity in terms of additions and multiplications operations for higher order filter lengths. These features extracted are recognized using particle swarm optimization (PSO) tuned twin support vector machines (TSVM) classifier. The TSVM classifier is four times faster than the standard SVM while the PSO technique is employed to gradually tune the classifier parameters to achieve more accuracy. The proposed methodology is implemented on IoT based microcontroller platform and validated on the benchmark Physionet data to classify 16 categories of ECG signals. Once an abnormality is detected, the platform generates a pop-up message as a warning and sends the information to a remote platform allowing hospitals to take preventive measures. The platform reported a higher overall accuracy of 95.68% than the existing studies.

KEYWORDS: FFT,DWT, IoT, twin support vector machines (TSVM).

INTRODUCTION

IoT based health monitoring system is the best solution for such an epidemic. Internet of Things (IoT) is the new revolution of internet which is the growing research area especially in the health care. With the increase in use of wearable sensors and the smart phones, these remote health care monitoring has evolved in such a pace. IoT monitoring of health helps in preventing the spread of disease as well as to get a proper diagnosis of the state of health, even if the doctor is at far distance. In this paper, a portable physiological checking framework is displayed, which can constantly screen the patient's heartbeat, temperature and other basic parameters of the room. We proposed a nonstop checking and control instrument to screen the patient condition and store the patient information's in server utilizing Wi-Fi Module based remote correspondence. A remote health monitoring system using IoT is proposed where the authorized personal can access these data stored using any IoT platform and based on these values received, the diseases are diagnosed by the doctors from a distance.

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mainly Internet of Things (IoT), data analytics, availability of personalized services and Artificial Intelligence (AI). IoT is an evergrowing technology that has the ability to use distributed computing and the capability to exchange information to make rapid decisions for system needs within a vast distributed network. This technology connects everyday objects (smartphone, smart watch, smart light, etc.) such as sensors, actuators, and things to the Internet via existing networks to facilitate the diagnosis and follow-up of patients while increasing the efficient use of hospital resources. IoT applications are developed to use this connected network, relying on a digital environment. This offers new opportunities to provide fast and accurate responses by obtaining relevant information. This intelligent network can receive data from several sources, process data locally using the decreased computing power and/or in a centralized manner with higher digital computing resources to make smarter decisions.

PROBLEM DEFINTION

Healthcare is an essential part of life. Unfortunately, the steadily aging population and the related rise in chronic illness is placing significant strain on modern healthcare systems [1], and the demand for resources from hospital beds to doctors and nurses is extremely high [2]. Evidently, a solution is required to reduce the pressure on healthcare systems whilst continuing to provide high-quality care to at-risk patients.

LITERATURE SURVEY

S. B. Baker, W. Xiang and I. Atkinson, "Internet of Things for smart healthcare: Technologies challenges and opportunities", *IEEE Access*, vol. 5, pp. 26521-26544, 2017.

Internet of Things (IoT) technology has attracted much attention in recent years for its potential to alleviate the strain on healthcare systems caused by an aging population and a rise in chronic illness. Standardization is a key issue limiting progress in this area, and thus this paper proposes a standard

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model for application in future IoT healthcare systems. This survey paper then presents the state-of-the-art research relating to each area of the model, evaluating their strengths, weaknesses, and overall suitability for a wearable IoT healthcare system. Challenges that healthcare IoT faces including security, privacy, wearability, and low-power operation are presented, and recommendations are made for future research directions.

S. Raj and K. C. Ray, "A personalized point-of-care platform for real-time ECG monitoring", *IEEE Trans. Consum. Electron.*, vol. 66, no. 4, pp. 452-460, Dec. 2018.

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Rashed et al. developed a medical platform for remote health monitoring systems. The concept of IoT proved remote monitoring with decreased residuals and decreased medical management expenses. Additionally, they found increased patient satisfaction and disease forecasting to improve treatment. Their IoT infrastructure was divided into three layers which were called perception, which included physical interface and data collection, network gateway and integrated application which included data analytic, data visualization, cloud and service- databases. Catarunucci et al. developed an IoTbased smart hospital system architecture for automatic monitoring of patients, staff and biomedical devices in hospitals.

An *et al.*, designed a non-conventional pulse sensor using an RF array module in [38], with the aim of measuring several locations on the wrist in case the received pulse signal at one point becomes noisy due to movement. Reasonable pulse readings were achieved when compared to a reference signal, but still do not appear as clear as those obtained with the traditional sensor types. This type of pulse sensor shows promise, but further work is clearly required to make it reliable in a critical healthcare scenario.

PROPOSED APPROACH

Implementation of a smart patient health tracking system. Fig.1 shows the overview of the proposed system. The sensors are embedded on the patient body to sense the temperature and heartbeat of the patient. Two more sensors are place at home to sense the humidity and the temperature of the room where the patient is staying. These sensors are connected to a control unit, which calculates the values of all the four sensors. These calculated values are then transmitted through a IoT cloud to the base station.

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WEARABLE HEALTHCARE SYSTEMS

Pulse Sensors

Perhaps the most commonly read vital sign, pulse can be used to detect a wide range of emergency conditions, such as cardiac arrest, pulmonary embolisms, and vasovagal syncope. Pulse sensors have been widely researched, both for medical purposes and for fitness tracking.Pulse can be read from the chest, wrist, earlobe, fingertip, and more. Earlobe and fingertip readings provide high accuracy, but are not highly wearable. A chest-worn system is wearable, but wrist sensors are generally considered most comfortable for a long-term wearable system.

Body Temperature Sensors

Blood Pressure

Pulse Oximetry Sensors

INTERNET OF THINGS HEALTHCARE

Research in related fields has shown that remote health monitoring is plausible, but perhaps more important are the benefits it could provide in different contexts. Remote health monitoring could be used to monitor non-critical patients at home rather than in hospital, reducing strain on hospital resources such as doctors and beds. It could be used to provide better access to healthcare for those living in rural areas, or to enable elderly people to live independently at home for longer. Essentially, it can improve access to healthcare resources whilst reducing strain on healthcare systems, and can give people better control over their own health at all times.In fact, there are relatively few disadvantages of remote health monitoring. The most significant disadvantages include the security risk that comes with having large amounts of sensitive data stored in a single database, the potential need to regularly have an individual's sensors recalibrated to ensure that they're monitoring accurately, and possible disconnections from healthcare services if the patient was out of cellular range or their devices ran out of battery. Fortunately, these issues are all largely solvable, and are already being addressed in the literature, as will be highlighted throughout the remainder of this paper. As progress continues to be made to reduce the disadvantages, IoT-based systems for remote health monitoring are becoming an increasingly viable solution for the provision of healthcare in the near future.

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CONCLUSION

In this paper, proposed a unique model for future IoT-based healthcare systems, which can be applied to both general systems and systems that monitor specific conditions. We then presented a thorough and systematic overview of the state-of-the-art works relating to each component of the proposed model. Several wearable, non-intrusive sensors were presented and analyzed, with particular focus on those monitoring vital signs, blood pressure, and blood oxygen levels. Short-range and long-range communications standards were then compared in terms of suitability for healthcare applications. BLE and NB-IoT emerged as the most suitable standards for short-range and long-range communications in healthcare respectively.an IoT based health monitoring system was developed. The system monitored body temperature, pulse rate and room humidity and temperature using sensors, which are also displayed on a LCD. These sensor values are then sent to a medical server using wireless communication. These data are then received in an authorized personals smart phone with IoT platform. With the values received the doctor then diagnose the disease and the state of health of the patient.

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