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IOT Based Health-Care Monitoring System

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ABSTRACT

Scientific research in recent years has focused heavily on building wearable biosensor technologies including their advanced biosensors for an efficient healthcare monitoring system. Furthermore, this cutting-edge healthcare system prioritises excellent quality and extremely low cost, and it is expected to be dependable and secure. The present practise of ignoring potential problems in favour of addressing the existing ones has made access to quality medical care difficult to get. This study provides a concise summary of the advantages of telemetric & Holter ECG Warehouse (THEW) technology to scientific community, which is interested in the prospect of progress in the area of ECG & cardiac safety. In addition, this section is dedicated to the Virtus Middleware implemented in the medical applications under discussion. The key benefits are the sensors' low power consumption and the early warning system, which is especially useful in hospital wards for notifying patients of critical health defects. This literature study provides context for the notion of a wireless sensor patient-monitoring system, which allows for instantaneous input to both patient & caregiver. As a result, patients and caregivers may benefit from receiving warnings via Short Message Service and from having access to their data stored in cloud for analysis.

Key words: Cloud storage, electrocardiograph, internet of things, pulse sensor, security, temperature sensor

1. Introduction

Since the goal of developing wearable sensors for healthcare monitoring has been met, there has been a surge of interest in using these cutting-edge sensors in other fields, such as manufacturing. In this case, smart connected healthcare system is one of the main areas of concentration within the IoT. Data transfer, cloud storage, security, message warnings, and instant response from several writers are discussed in this survey. The results of a survey on cardiac monitoring and the development of more accurate electrocardiograms (ECGs) are presented here. Here, Virtus functions as a wireless sensor application layer middleware. At addition, an EWS will be implemented to provide efficient patient monitoring in healthcare facility. Information mining may be seen as investigation of patient data.

2. Literature Survey

1. Pantelopoulos and Bourbakis[1] provided details on state of art in wireless biosensors system development for efficient healthcare monitoring. The system is comprised of ultra-low power, wireless sensors that make use of ZigBee networking. This technology also allows for wireless communication in the form of wireless body area networks (WBANs), adapting to each user's unique physiological state with the help of an artificial neural network. For purpose of patient monitoring, these wearable devices must be dependable, multipurpose, and simple to use; the 2360–2400 MHz band is used for medical BAN services to prevent interferences from wireless technology. The technology has to be used in the here and now.

2. Milenkovi *et al*.[2] discussed the need of constant health care monitoring, including alerting medical professionals to any changes and giving input to the system. In this system, a wireless wearable body area networking chip incorporates physical sensors, integrated microcontrollers, & radio interfaces. It's also incredibly inexpensive and easy to transport.

It also instantly updates user's medical information and offers feedback on the user's current health state. Continuous health monitoring is supported by system, which also helps patient. Where QoS for wireless communications, sensor dependability, security, interface standards, and overall interoperability all require work.

3. Kumar *et al*.[3] described the extensive deployment of wireless sensor networks for real-time monitoring of patients, cloud-based data storage, and uninterrupted transmission of patient data. For the purpose of keeping tabs on the patient's data by comparing it to what's already in the system through some slick apps. Both the medical staff and the person in charge of the patient are notified through Short Message Service when an emergency arises. There is a need for high-quality, cost-effective health-care services that incorporate analysis of data with cloud computing in order to ensure safety and privacy of patient data & mobile computing.

4. Nithin *et al*.[4] explained how sensors may capture not just today's but also yesterday's data. The information gathered by the sensors is rich in longitudinal detail, which is useful to the doctor in taking preventative measures. Put simply, WBAN is a network of wearable sensors used to monitor a wide range of biometric variables. The data collected by the sensor is sent over Bluetooth to a gateway server. The data collected by clinics is sent through the gateway server to a distant server. Continuous, around-the-clock tracking in real time. Integration with a database management system & cloud storage are logical extensions. Patients' records are easily accessible to doctors.

5. Chou *et al*.[5] said that data gathering by wireless sensor nodes needs access to adequate energy. Although the data obtained by current adaptive compressive sensing techniques is of high quality, these methods cannot be integrated into the WSN. So, to realise energy efficacy in completely gathering data in WSN, techniques such as a data gathering framework as well as responsive prediction vectors are employed to iteratively quantify forecasts which also maximise the proportion of data which stands to gain to energy needed to obtain information.

6. Couderc[6] discusses the state of the art in ECG monitoring and the tools at scientists' disposal, including Telemetric and Holter ECG Warehouse (THEW), an effort which has helped the field of ECG and cardiac safety improve thanks to its focus on sharing data. In addition, progress has been made quickly on this front, as well as the number of people and departments inside the company that make use of data warehouse principles keeps expanding. Therefore, advances in ECG technology are necessary to ensure cardiac safety.

7. Bazzani *et al*.[7] provided details on the Internet of Things technology that allows for untethered, round-the-clock monitoring of patient behaviour from afar. In addition, an IoT paradigm may be used to manage a patient who activates from home. In this case, the Internet of Things (IoT) idea is related to the middleware architectural layer. IoT concepts into e-health are discussed in detail by VIRTUS event-driven middleware.

8. Kocabas *et al*.[8] said that the advent of internet healthcare will usher in the next great revolution. In this case, data is stored in several locations throughout the system, which is divided into two super levels called front end & back end. The front end here is the point of contact between the user and the system. Also, the back end is the connection among system & physician. Here, we have privacy and security features, & system also discovers economic opportunities that arise from data exchange and analytics..

9. Page *et al*.[9] said that a full monitoring system is necessary for accurate clinical diagnoses of cardiovascular disorders such chronic heart failure for which there is currently no reliable predictor. For the patient's long-term status report, this system may keep constant watch and provide feedback through an automated alert. A revolutionary virtualization method in this system enables doctor to watch real-time activities of several patients, which is especially useful for monitoring high-risk patients such as those requiring continuous ECG monitoring. So, it's important to integrate data transfer to a good database, ideally with real-time changes.

Table 1: Comparative analysis of technology in healthcare monitoring system

Author	Years	Technology	Existing problem	Proposed system
Pantelopoulos and Bourbakis	January 2010	1. ZigBee wireless 2. Ultra-low power technology	1. Biosensors system for effective health-care monitoring 2. Wireless communication for WBANs	1. Reliable 2. Multifunctional 3. Ease to use
Milenkovi *et al.*	2006	1. Embedded microcontrollers 2. Radio interfaces	1. Providing feedback 2. Alert medical	1. QOS
Kumar *et al*	January 2014	1. Cloud environment	1. Comparing with lookup table 2. SMS	1. Security 2. Privacy
Nithin *et al*	October 2014	1. Bluetooth	1. Record not only the current day's data but also the previous day's	1. Database management 2. Cloud storage
Chou *et al*	October 2009	1. Sufficient energy required for the data collection by a wireless sensor network	1. Adaptive compressive sensing algorithm	1. Heuristics algorithm
Couderc	2010	1. ECG-related technology	1. THEW	1. Improvement needed in ECG technology for cardiac safety
Bazzani *et al*	June 2012	1. Bluetooth 2. ZigBee wireless	1. IoT paradigm 2. Virtus	1. Focusing more on advantages of Virtus
Kocabas *et al*	October 2013	1. Cloud storage 2. Radio communication	1. Two super layers named the front end and the back end 2. Front end acts as an interface between the patient and the system. Also, back end acts as interface between the system and the doctor	1. Privacy 2. Security 3. Analytics
Page *et al*	2015	1. ZigBee 2. Cloud	1. Continuous monitoring 2. Feedback 3. Automatic alarm	1. Database 2. Automatic updates from the live data itself
Mao *et al*	April 2014	1. Data mining	1. EWS 2. Novel data mining framework	1. Bucketing technique

EWS: Early warning system, SMS: Short Message Service, QoS: Quality of service, WBAN: Wireless body area network, THEW: Telemetric and Holter ECG Warehouse, IoT: Internet of things

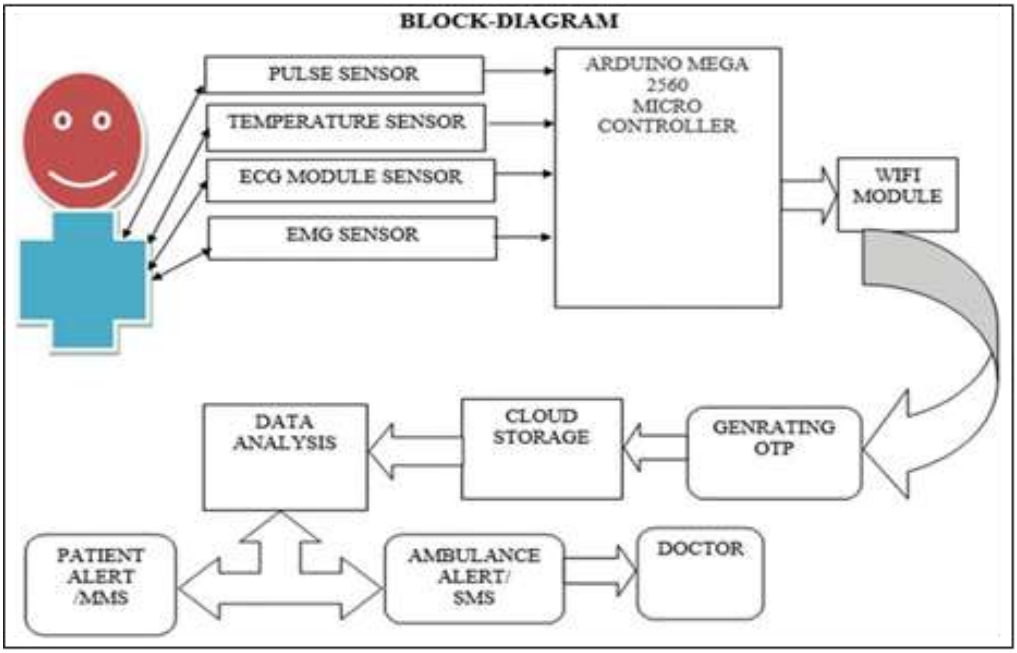

Figure 1: Shows block diagram of patient healthcare monitoring system

10. Mao *et al.*[10] informed on the EWS, which is meant to spot the warning indications of medical degradation & sound the alarm before anything catastrophic happens in the hospital. As a result, a unique data extraction architecture is employed to examine common medical data. This innovative data mining allows us to perform earlier forecast & preventive based on system data, which is very useful for General Hospital Beds. Moreover, these patient-focused technologies have been created for use in making accurate early predictions. These factors motivated development of the bucketing technique, which records shifts in critical system signals.

3. Proposed System

In this example, as shown in Fig 1, patient's body has been matched up with the appropriate biosensors. All of the aforementioned biosensors work together to collect data, with their respective programmes included into system for backup and to ensure the user is aware that the sensors are in fact gathering data. In addition, the Raspberry pi microcontroller connects all of the sensors through an integrated Wi-Fi module, allowing for data to be securely sent to a near host utilizing Tomcat version 7 and the Advanced Encryption Standard (AES). As a result, data analytics, which is dependent on data stored in the cloud (Sqlyog) and can be accessed for regular use with a graphical representation, will enter the picture. Here, in the event of an emergency, a message alert is sent to both the doctor and the patient's guardian. Both the patient and the doctor share the same user password and ID for verification purpose. This allows the doctor to check the patient's information and provide accurate treatment. In this article, we'll talk about how the public and private sectors are using the Internet of Things:

Apple: The introduction of apps and gadgets like the Apple Watch, which displays information about user's accelerometer and heart rate, has made it easier to maintain one's health while going about one's everyday activities. Performance data from body is also available via health applications.

Navy health: We have created hydraulic suction-based nursing pump that may be used into place of standard electric vacuum pump. The new pump is less expensive than older one.

Sunshine: Mobile phone tracking and crowdsourcing are used to get user data. Compared to other options, Sunshine provides its customers with the highest chance of making a positive life choice. Stressors may be detected by tracking client attitude each day.

Orbita: It works with other popular smart home systems like the Amazon Echo and the Google Home. They contribute to the betterment of the lives of those receiving and providing chronic care.

The health-awareness-providing solutions offered by Orbita will include the integration of wearables, home care monitoring, and smart home technology.

Some IT companies have a vision for future of healthcare on the internet of things.

4. Conclusion

This article provides a summary of research on the use of biosensors in healthcare monitoring. The development of better cardiac & ECG monitoring is centred on THEW technology. Security concerns, message attentiveness, & modeling for performance estimates should be included to this survey.

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