



Real Time Healthcare Monitoring and Analysis System Using IoT: A Review

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Abstract— The advancement of the Internet of Things technology is playing a key role in developing the health sector by making it much more accessible and affordable through easy-to-use applications for virtual and distant interactions with patients. Taking the capability of IoT technology into account, it is possible to overcome the difficulties faced by physically unstable patients in consulting a doctor physically on a regular basis. This work has led to a prototype of IoT Based Remote Health Monitoring System for Patients. This prototype consists of health sensors: heart pulse sensor, body temperature sensor. All these sensors were merged together into a single system with Arduino microcontroller. The data acquired from the sensors is shown on text file. An Android phone also these data can be shown. The data also be sent on Google Drive or Cloud. The graphical representation of the health parameters also shown. IoT integrated with the health wearables can overcome the need of visiting hospitals for primary health issues. This also reduces the medical expenses for patients significantly. In addition, the doctors can prescribe necessary medications by observing the patient's health stats over time through an application. Detailed analysis of the signals was obtained with respect to variations in physical and environmental activities to understand the functioning of the sensors used.

Keywords—IoT, ESP8266 Node MCU, CP-ABE, BWSN

I. INTRODUCTION

Staying in a hospital is expensive, monotonous, and sometimes it has been observed that patients only need to stay in the hospital for regular physical condition monitoring. During these observations, healthcare professionals primarily regularly monitor vital signs: heart rate, blood pressure, temperature, and respiratory rate [1]-[4]. Patients are relieved when they are at home or during medical observations. In other cases, access to the intensive care unit is strictly prohibited, impeding communication between the patient and related relatives. In addition, heart disease and stroke are responsible for almost one-third of all deaths worldwide [5], [6]. One of the main reasons for this large number of deaths is delay in detection and lack of qualified support. Vital signs are closely associated with health and their regular monitoring is essential for critical patients [7], [8]. With the introduction of remote patient monitoring (RPM) technology, these issues can be resolved. This technology uses unconventional methods to monitor patients. It improves access to care, reduces hospitalization costs, hospital traffic, wasted time, and helps healthcare providers overcome staff shortages. With this system, the patient's physical condition is remotely monitored by medical personnel or relatives of the patient.

Location using wireless technology. Today, remote health monitoring systems in the medical sector are growing rapidly. This technology is well known in developed countries, but in developing countries like Bangladesh, deployments are very sporadic.

II. LITERATURE REVIEW

The Internet of Things (IoT) and cloud computing play a key role in today's remote surveillance healthcare systems. The system tracks patient physiological parameters by collecting body sensor data using a Raspberry Pi board. The patient's health card is created by the doctor and displayed on a website where the doctor and the patient can access and communicate with each other without physical presence [9]. With the help of cloud computing, your data can be stored, updated and accessed from anywhere in the world. Very suitable for rural areas where medical facilities are not available. Remote health monitoring systems using the IoT use the Body Wireless Sensor Network (BWSN) to wirelessly send patient health parameters collected via a Raspberry Pi microcontroller to doctors and caretakers [10]. Because it is a long-range wireless technology, emergencies to the patient's health are quickly recognized and timely interventions can save the patient's life. The concept of home patient monitoring systems has evolved in recent years due to more expensive medical care and longer waiting times in hospitals. The system collects data on various body parameters via biosensors, wearable devices, and smart textiles, and secures the data to a central node server via ciphertext policy attribute-based encryption (CP-ABE). I will send. The server shares the collected data with the hospital for further treatment. The server alerts the ambulance [11] in the event of an emergency. It is very beneficial for the elderly and chronic patients who need continuous monitoring. In an aging society, there is an increasing need for health monitoring systems specialized for the elderly. The system regularly measures body parameters and conveys the data to a doctor for basic health examinations. The resulting data is displayed as a statement in a web application where doctors and patients can interact [12]. The evaluation consists of two parts: 1) qualitative research and 2) quantitative research. The biggest challenge is to provide the elderly with new technology and become accustomed to smartphones and computers. IoT-based intelligent healthcare using smart devices and objects effectively improves healthcare monitoring systems, thereby reducing the inefficiencies of existing healthcare systems. Smart devices with new and improved technologies improve the accuracy of collected data, real-time access to patient conditions, intelligent

integration of collected data, intelligent maintenance of integrated data via cloud services, and more. [13]. The combination of IoT and smart devices reduces the complexity and complexity of healthcare systems. The penetration of healthcare systems through mobile technologies and smart devices is having a major impact on the world. By taking full advantage of M-Health and e-Health applications in today's world, people can find that they can improve and maintain quality lives. In addition to regular monitoring of the patient's condition by the M-Health System, the main goal is through recommendations on healthy eating habits and effective exercise routines to improve his healthy quality of life. It is to educate the patient [14]. The mobile remote monitoring system collects patient health parameters from smartphones by eliminating additional hardware and sending data over a web interface [15]. It facilitates the end-to-end monitoring screen in three steps. First, real-time health parameters are measured by wearable sensors and sent to your smartphone. The smartphone displays the patient's health status in a graphical interface. Second, the system makes data available to families and doctors via a web interface for further monitoring. Third, it alerts in real time when

patients are in an emergency such as a heart attack. Despite monitoring, there are few challenges with long-term use of handheld recorders. First, the daily use of the handheld locator is primarily based on its small size, rough use, and low power consumption [16]. Second, the biggest challenge is the accuracy, validity, and consistency of measurement data with other devices. Third, the ease of use and user experience of the device and its user-friendly support software play an important role in the regular and long-term use of handheld tracking devices. The use of the Internet of Things (IoT) and its e-health applications in telemedicine healthcare systems leads to a seamless flow of information between doctors and patients, making healthcare more cost-effective and patient care. Improves the quality of. The system uses the K53 Tower system platform for e-health applications to demonstrate the benefits of IoT in healthcare systems.

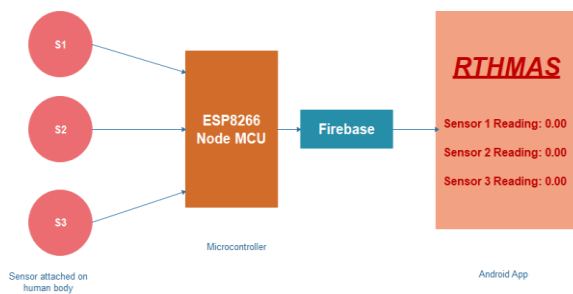
Table 1 Comparison of Methodologies used in the survey

References	Techniques/ Methodology	Advantages	Disadvantages
[9]	Wellbeing monitoring through Wireless Sensor Network and cloud computing using IoT	Cost efficient technique and ubiquitous monitoring	Not easy to deploy WSN nodes compared to wired networks.
[10]	Health monitoring through Wireless Body Area Sensor Network (WBASN)	Easy addition of new sensors to existing system.	Sensors should be low in complexity, small in size, light weight and easy configurable.
[11]	Cipher text Policy Attribute Based Encryption (CP-ABE) for data security	Access based policy towards data protection.	Difficult to implement in non-interactive group of networks.
[12]	Technology Acceptance Model	Widely recognized technologies to be used for easy access	Adoption of new technologies is difficult to equip with for elders
[13]	IOT with smart devices IOT with smart devices Context Model through OWL and SWRL (Semantic Web Rule Language)	Real-time data access and intelligent data integration. Contextual recommendations such as workout routine and healthy eating habits apart from regular monitoring	Constant updating and upgradation of devices is needed. Recommendations are so general and not personalized for each treatment.
[14]	Monitoring through Smartphone by Indoor Localization Algorithm	Wifi-fingerprints are used to find the location of patients in indoor environment during emergency situation.	Data may not be accurate always due to environmental interference by Wifi-signals.
[15]	Wearable Monitoring devices	Portable and user-friendly	Inaccurate data due to wrong positioning of devices
[16]	K53 Tower System platform for	Custom monitoring through single platform of hardware and software	Multiple applications lead to complexity

The two fundamental aspects in monitoring people at risk are: 1) Prevention 2) Effective and early intervention during medical emergency [9]. Table 1 compares the various methodologies /techniques that are used in IoT in the survey with advantages and short comings that need to be addressed in the future for betterment of the healthcare monitoring system.

III. PROPOSED SYSTEM

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Figure 1 Real Time Health Monitoring and Analysis System (RTHMAS)

Firstly, we are using open-source microcontroller, by using this microcontroller various sensors are attached to it (Here we are using max 2-3 sensors). These sensors provide us various numerical values as per its function, using firebase the data can be fetched. The fetched data processed and will shows the cause of patient. For example, if we use Blood Pressure sensor then it will show the BP of patient if its high then it will display on Android screen that is BP is high. The data will not be stored anywhere, only live data can be fetched and display. No database for this system. The data retrieved from Firebase only, so IOT can be achieved. Here we will get online data only not offline.

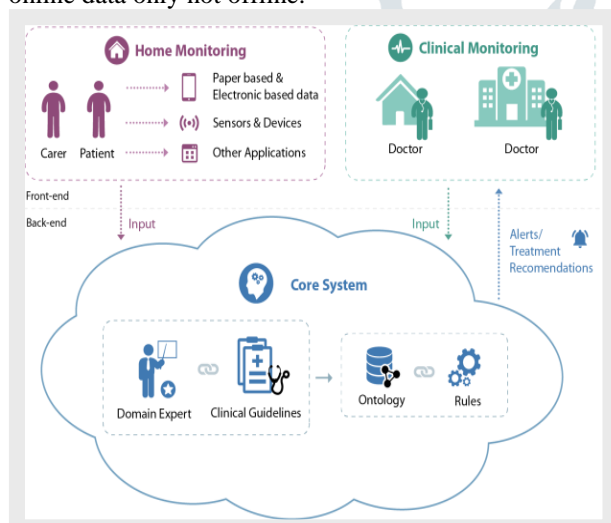


Figure 2 Overall Architecture

CONCLUSION

This paper emphases on a real-time healthcare monitoring system using WSN which are more valuable for elders and chronic diseases' patients. The current approaches available for realization of Healthcare services are surveyed and the challenges that are part of realization are also emphasized. This paper proposes a real-time patient monitoring system that monitors the subject's vital parameters such as temperature, pressure, fall detection, breath activity and ECG through WSN as well as detects any abnormality accurately. Appropriate medications are recommended based on the diagnosis of the provided set of symptoms. The system sends an alert message to the caretakers and doctors in case of any abnormality through WBAN. The system enables the clinicians to optimize the usage of available medical resources and minimize the costs in monitoring the patients. In the future, we will focus on improving wearing sensor experience by using softer materials and enabling controlled sharing of information among the doctors, the patient, and the patients' family through social networking paradigm.

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