International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 2s, 2025
https://theaspd.com/index.php

Iot-Based Remote Health Monitoring Systems

Dr. F Rahman[1], Sachin Pradhan[2], Gajendra Singh Negi[3]
[1]Assistant Professor, Department of CS & IT, Kalinga University, Raipur, India. ku.frahman@kalingauniversity.ac.in, 0009-0007-7167-188X
[2]Assistant Professor, Department of Pharmacy, Kalinga University, Raipur, India. ku.sachinpradhan@kalingauniversity.ac.in, 0009-0009-4095-1496
[3]Assistant Professor, New Delhi Institute of Management, New Delhi, India., E-mail: gajendra.negi@ndimdelhi.org, https://orcid.org/0009-0007-6916-5291

Abstract
Smart homes, smart cities, transportation, healthcare, education, and the military are some of the creative uses of the Internet of Things (IoT). IoT applications improve people's quality of life by providing safe, real-time remote patient monitoring, which makes them very useful in the healthcare industry. This review study looks at the most recent advancements in Internet of Things-based healthcare monitoring systems. Using sensor data and telecommunications, the Internet of Things (IoT) offers a useful and efficient way to track the health of senior citizens in real time. According to studies, the Internet of Things can provide a number of improved services when combined with smart technologies. Using technologies that allow for intelligent and remote wireless communication, researchers have developed a variety of emergency response systems. These developments have been used in many medical applications, especially in the field of older adult health monitoring, which has allowed for the collection of vital sign data and the detection of potentially hazardous situations.
Keywords: *IoT, healthcare, monitoring, remote, applications*

1. INTRODUCTION

To reduce the need for doctor visits and the risk of receiving unneeded or inappropriate medical treatments at clinics or hospitals, patients can improve their at-home healthcare practices [1]. As a result, overall healthcare expenses may go down while patient safety and the quality of medical care may rise [2]. The healthcare industry stands to benefit greatly from the Internet of Things (IoT). It is anticipated that we will soon have access to a home-based health monitoring system to help streamline hospital operations [9]. Many IoT sensors must be installed in order to provide continuous monitoring of the body and the environment.

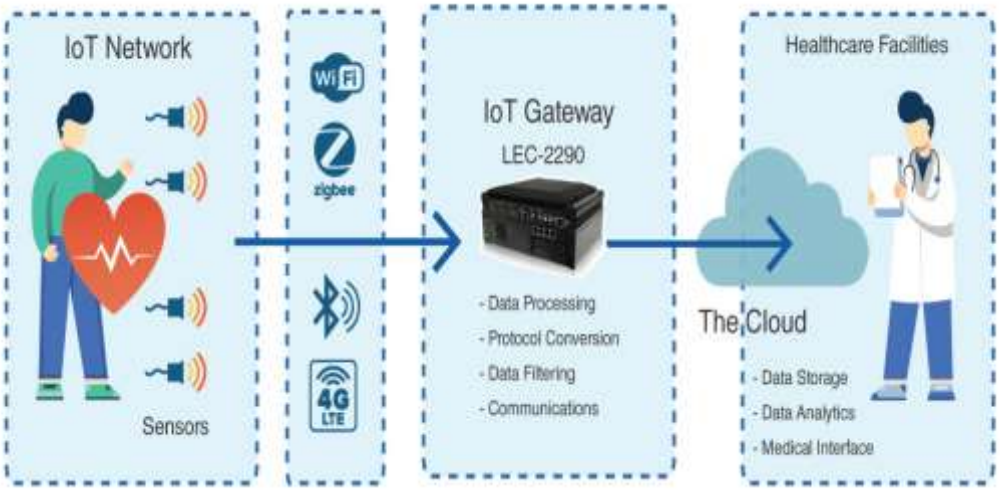

Figure 1: IOT based Health monitoring

This program will support the tracking of rehabilitation progress and the management of chronic diseases. It is expected that the Internet of Things would establish efficient data links between various locations in the area of remote healthcare virtual consultations [3]. Most IoT research and implementations are still in their infancy and mostly concentrate on setting up and deploying

technologies in different contexts. However, these methods are not being used widely enough at the moment [4]. In order to improve quality of life, this study aims to evaluate pertinent studies on the development and deployment of an Internet of Things-based healthcare monitoring system [13]. These systems primarily use IoT devices and sensors to match patients with the most appropriate healthcare professionals for their requirements [10].

2. NEED OF THE STUDY

In order for future researchers, scientists, and scholars to swiftly navigate the systems' current frameworks and provide enhancements and corrections for these crucial applications, the main goal of this research study is to provide a thorough review of IoT-based healthcare monitoring systems [5]. Along with a review of the literature, the study meticulously provides an overview of IoT-based healthcare monitoring systems, emphasizing their benefits and significance. Furthermore, we examine wearable technology's function in healthcare systems from an Internet of Things perspective[6]. Along with classifying healthcare monitoring sensors, the publication also looks at security protocols and measures relevant to IoT healthcare monitoring systems and describes the difficulties and unsolved problems in this area. Additionally, we suggest possible ways to deal with these problems and difficulties going future [11].

3. MATERIALS AND METHODS

Researchers and medical professionals are becoming increasingly interested in the development of healthcare monitoring systems. There have been numerous successful research projects in this field, and there are still a lot of ongoing ones [12]. The increasing number of gaps in care provided by healthcare professionals is a direct cause of the sharp rise in the population of elderly and chronically ill individuals [14]. One major drawback is that most healthcare services are provided in hospital settings, which might not be sufficient to meet the needs of elderly people and people with disabilities [7].

The healthcare sector is composed of a wide range of elements. Clinical offices, hospitals, pharmacies, long-term care facilities, home health services, pharmaceutical companies, and manufacturers of medical devices are all part of the healthcare delivery system. Included are insurance companies, government organizations that provide services to end users, and goods and services associated with wellness and health. A thorough assessment and analysis of current research on Internet of Things-based medical monitoring systems is provided in this section. It provides an overview of some current studies on these systems. Because all the elements are included into a structured framework, the interaction between people and remote monitoring programs is intended to be user-friendly.

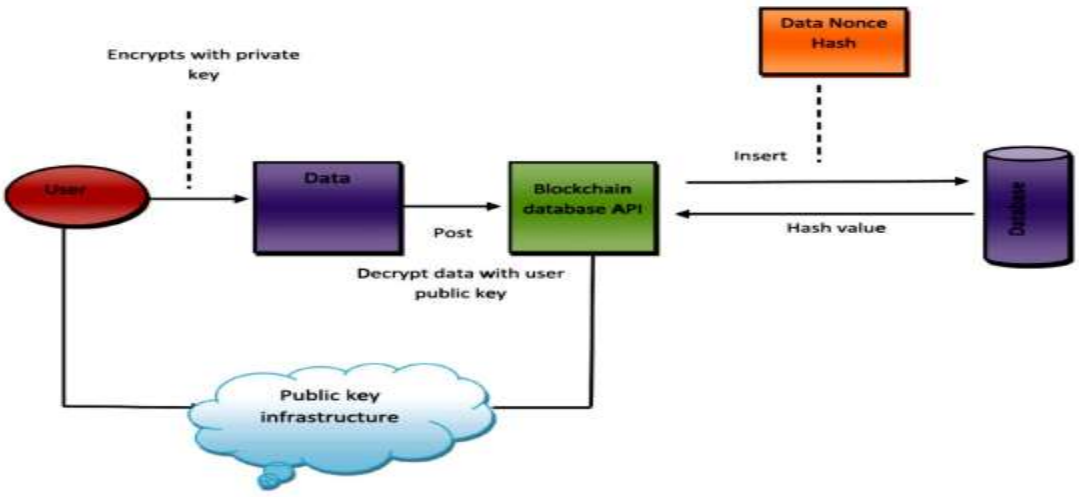

Figure 2: Flow diagram

To ensure privacy and safe transmission, the data is encrypted by the gateways and the sensor patch [8]. The wearable sensor system connects to the cloud using a smartphone, with a Raspberry Pi module serving as a gateway, enabling data retrieval and analysis from the cloud [15].

4. RESULT AND DISCUSSION

The Internet of Wearable Things (IoT) aims to improve people's everyday quality of life. It tracks health indicators, personal activities, and other factors using sensors built into wearable technology. But even with its energy economy, BLE technology isn't the best for high data rates or long-distance wireless communication.

Figure 3: Efficiency analysis

Accurate assessments of certain physiological indicators are made possible by these devices' wireless communication capabilities and low battery consumption. A BLE module can be used to wirelessly send physiological data to a gateway.

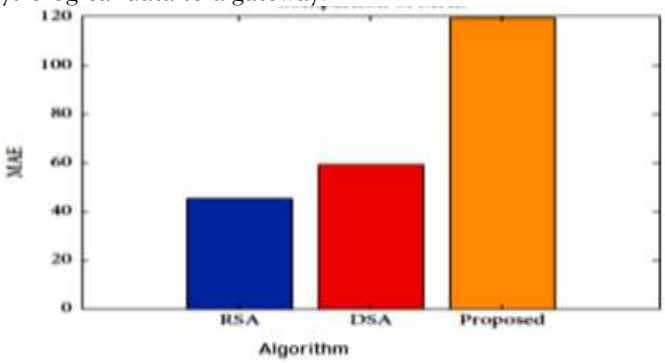

Figure 4: Result of MAE

The integration of IoT-gathered data into medical systems allows medical staff to access patient data remotely while they go about their daily lives. There are now efforts underway to establish a new integrative framework that builds upon the existing IoT architecture.

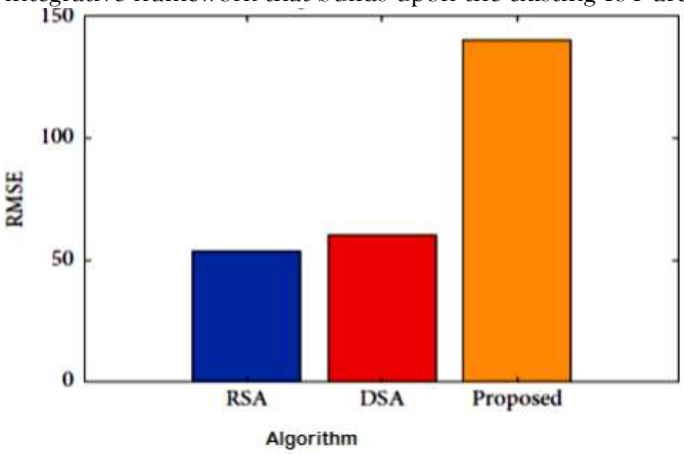

Figure 5: Comparison of RMSE

By creating a framework for automated telehealth services, this cutting-edge technology has the potential to drastically alter the healthcare industry. The three primary components of the Internet of Things architecture are the cloud, the Internet-connected gateway, and the Wireless Body Area Network (WBAN).

5. CONCLUSION

The contemporary healthcare systems exhibit a success rate of approximately 95% in aligning monitored data with actual outcomes across various scenarios. Healthcare professionals have the capability to access this data in real-time, whether they are present on-site or operating remotely. In theory, this technology could prove invaluable during medical emergencies and outbreaks, as it would provide medical staff with near-instantaneous access to essential data. The developed prototype is notably user-friendly and straightforward to construct. Such devices could play a crucial role in managing outbreaks of infectious diseases, including COVID-19. More lives could be saved if this approach improves the effectiveness of the current healthcare system. Nevertheless, it is important to note that the system currently lacks certain sensors related to epidemics, which will require assessment once the system is operational.

REFERENCES

1. Archip, Alexandru, Nicolae Botezatu, Elena Şerban, Paul-Corneliu Herghelegiu, and Andrei Zală. "An IoT based system for remote patient monitoring." In 2016 17th international Carpathian control conference (ICCC), pp. 1-6. IEEE, 2016.
2. Yunes, W., & Alsaif, K. I. (2022). Deep Learning for Fire Detection in Simulated Augmented Reality Videos. International Journal of Advances in Engineering and Emerging Technology, 13(2), 60–72.
3. Maqbool, Sidra, Muhammad Waseem Iqbal, Muhammad Raza Naqvi, Khawaja Sarmad Arif, Muhammad Ahmed, and Muhammad Arif. "IoT based remote patient monitoring system." In 2020 international conference on decision aid sciences and application (DASA), pp. 1255-1260. IEEE, 2020.
4. Reddy, S., & Thomas, E. (2024). Green Finance Mechanisms and their Impact on Sustainable SME Development. International Journal of SDG's Prospects and Breakthroughs, 2(2), 14-16.
5. Sam, Dahlia, S. Srinidhi, V. R. Niveditha, S. Amudha, and D. Usha. "Progressed iot based remote health monitoring system." International Journal of Control and Automation 13, no. 2s (2020): 268-273.
6. Sharma, A., & Desai, P. (2024). AI-Driven Fault Detection in Electrical Networks: Applications Explored in the Periodic Series of Technological Studies. In Smart Grid Integration (pp. 1-5). Periodic Series in Multidisciplinary Studies.
7. Hamim, Mohd, Sumit Paul, Syed Iqramul Hoque, Md Nafiur Rahman, and Ifat-Al Baqee. "IoT based remote health monitoring system for patients and elderly people." In 2019 International conference on robotics, electrical and signal processing techniques (ICREST), pp. 533-538. IEEE, 2019.
8. Rahman, S., & Begum, A. (2024). Applied Mechanics for Mechanical Engineers: Principles and Applications. Association Journal of Interdisciplinary Technics in Engineering Mechanics, 2(1), 13-18.
9. Yew, Hoe Tung, Ming Fung Ng, Soh Zhi Ping, Seng Kheau Chung, Ali Chekima, and Jamal A. Dargham. "Iot based real-time remote patient monitoring system." In 2020 16th IEEE international colloquium on signal processing & its applications (CSPA), pp. 176-179. IEEE, 2020.
10. Rao, A., & Chatterjee, S. (2025). Application of Pressure-Driven Membrane Systems in Sustainable Brewing Practices. Engineering Perspectives in Filtration and Separation, 2(2), 1-4.
11. Valsalan, Prajoona, Tariq Ahmed Barham Baomar, and Ali Hussain Omar Baabood. "IoT based health monitoring system." Journal of critical reviews 7, no. 4 (2020): 739-743.
12. Khaydarova, S., Khujamova, Y., Toshbaeva, M., Muhitdinov, D., Mamanazarova, G., Tukhtakulova, O., & Karimov, N. (2024). The Vital Role of Libraries in Enriching Tourism Experiences. Indian Journal of Information Sources and Services, 14(2), 11–16. https://doi.org/10.51983/ijiss-2024.14.2.02
13. BC, Kavitha, Katamreddy Vinaykumar Reddy, Udaya Kumar, Kovuri Sivakrishna, K. Sakthidasan Sankaran, and G. Vimala Rani. "IOT Based Remote Health Monitoring System." In 2021 International Conference on Computational Performance Evaluation (ComPE), pp. 209-212. IEEE, 2021.
14. Etuk, H. S., Ebong, G. A., Ekot, A. E., Ekpo, B. O., & Ayi, A. A. (2024). Mineral and elemental compositions of suspended particulate matter (SPM) and sediments from major rivers in the Southeastern Nigeria. International Journal of Aquatic Research and Environmental Studies, 4(1), 71-89. http://doi.org/10.70102/IJARES/V4I1/7
15. Khoi, Ngo Manh, Saguna Saguna, Karan Mitra, and Christer Åhlund. "IReHMo: An efficient IoT-based remote health monitoring system for smart regions." In 2015 17th international conference on e-health networking, application & services (HealthCom), pp. 563-568. IEEE, 2015.