WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Remote Health Monitoring System using IOT: A REVIEW

Priya Sanjay Kande[1], Prof. Krishna S. Ingle[2]

[1],[2]Department of Electronics & Telecommunication Engineering, Deogiri Institute of Engineering & Management Studies, Aurangabad, Aurangabad, Maharashtra, India

ABSTRACT:

The Internet of Things (IoT) is essential in innovative applications such as smart cities, smart homes, education, healthcare, transportation, and defense operations. IoT applications are particularly beneficial for providing healthcare because they enable secure and real-time remote patient monitoring to improve the quality of people's lives. This explores the latest trends in healthcare-monitoring systems by implementing the role of the IoT. The literature review compares various systems' effectiveness, efficiency, data protection, privacy, security, and monitoring. Using IoT, we can capture data and transmit data through the internet, providing data interoperability methods. Nowadays, IOT plays a vital role in capturing data and monitoring, analyzing a series of data, recording storage, and display. We analyze parameters such as Spo2, pulse sensor in this project. We use the WIFI module to transmit data over the internet for analysis. This analyzed data is stored and used for flexible purposes. Results are automatically sent to the doctor when a critical condition is detected. It simultaneously sends the data to the Blynk clouds using internet. User can monitor the pulse oximeter reading in a smart phone using Blynk app.

Keyword: ESP8266, Wi-Fi module, Blynk cloud, Iot and MLX30100.

INTRODUCTION :

The Internet of Things (IoT) represents a transformative technological paradigm where physical devices are interconnected to communicate and exchange data through the internet. These "smart" devices are embedded with sensors, software, and connectivity features, enabling them to collect and analyze data autonomously. In the context of healthcare, IoT has revolutionized traditional medical practices by enabling real-time health monitoring, enhancing diagnosis accuracy, and promoting personalized patient care. The relevance of IoT in healthcare is underscored by its ability to address critical challenges such as increasing healthcare costs, accessibility to medical facilities, and the growing prevalence of chronic diseases. By integrating IoT into healthcare systems, patients and healthcare providers can seamlessly track vital health metrics, receive timely alerts for potential health risks, and ensure proactive intervention, significantly reducing the burden on healthcare infrastructure.

Remote health monitoring systems, a vital application of IoT in healthcare, have become indispensable in the modern medical landscape. These systems facilitate continuous monitoring of patients' health without the need for frequent hospital visits, ensuring timely medical attention while reducing the strain on healthcare facilities. Particularly during global health crises, such as the COVID-19 pandemic, remote monitoring systems have proven essential in minimizing physical contact while maintaining efficient patient care.

The objective of this review paper is to provide a comprehensive analysis of IoT-based remote health monitoring systems. This includes examining the underlying technologies, exploring their current applications, identifying challenges, and discussing future advancements. Through this review, we aim to highlight the transformative potential of IoT in revolutionizing healthcare and improving patient outcomes.

Remote health monitoring systems use IoT devices to collect data on a patient's vital signs, such as heart rate, blood pressure, and blood sugar levels. This data is then transmitted to a central server, where it is monitored by healthcare professionals. If the data indicates a potential problem, the healthcare professional can contact the patient and provide advice or treatment. The use of IoT in healthcare is still in its early stages, but it has the potential to revolutionize the way healthcare is delivered. Remote health monitoring systems offer a number of benefits for both patients and healthcare providers.

LITERATURE SURVEY :

M. Hamim et al. (2019): This paper discusses the design and implementation of an IoT-based remote health monitoring system tailored for patients and elderly individuals. It focuses on integrating various health sensors for continuous data collection, enabling real-time monitoring and early detection of health issues. The system emphasizes user-friendly interfaces for caregivers and family members to ensure better health management. The paper presents a prototype demonstrated at the 2019 International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST). [1]

Ghosh, A.M., Halder, D., & Hossain, S.A. (2016): This study presents a remote health monitoring system based on IoT that collects vital health data from patients in real time. The system features a combination of wearable sensors and communication protocols to transmit health data to healthcare professionals. It aims to improve patient care by allowing continuous health monitoring outside hospital settings. The approach is discussed in detail in the 2016 International Conference on Informatics, Electronics, and Vision (ICIEV). [2]

Nafisa Shamim Rafa et al. (2023): This paper explores an IoT-based health monitoring system designed to assist asthma patients during the COVID-19 pandemic. It employs smart sensors for tracking respiratory conditions and monitoring vital signs. The system provides continuous monitoring, helping healthcare providers detect changes in health status early, especially under the pandemic's limitations. The study highlights the system's potential for improving patient outcomes in crisis situations. [3]

Islam, M.R. et al. (2023): This paper focuses on a deep learning-based IoT system for real-time remote health monitoring and early detection of health issues. It combines IoT technology with machine learning models to analyze health data and predict potential risks. The system aims to enhance proactive healthcare by offering real-time analytics. The approach is published in Sensors, providing insights into integrating AI for predictive health monitoring. [4]

Hamim, M. et al. (2019): This paper revisits the IoT-based remote health monitoring system for elderly patients and discusses its features in the context of real-time health data collection. The system integrates multiple sensors to track various health parameters and ensures continuous health monitoring. The study emphasizes the integration of smart technologies for improving patient care outside hospital settings, as presented at ICREST 2019. [5]

Prajoona Valsalan et al. (2020): This research focuses on an IoT-based health monitoring system that provides continuous monitoring of patients' health through sensors integrated with microcontrollers. The paper highlights the system's flexibility in collecting diverse health data and transmitting it to healthcare providers. The system aims to reduce hospital visits by offering reliable, real-time health information to medical professionals. [6]

Hamim, M. et al. (2019): This paper discusses an IoT-based system designed for remote health monitoring, focusing on elderly patients and their specific health challenges. The system provides real-time monitoring of vital signs using sensors and ensures that caregivers and healthcare providers receive continuous updates. The study emphasizes the role of IoT in improving patient care for vulnerable populations. [7]

Abdulmalek S. et al. (2022): This review paper explores various IoT-based healthcare monitoring systems, focusing on how these systems contribute to improving the quality of life. It discusses the integration of wearable devices, cloud computing, and machine learning for comprehensive health monitoring. The paper highlights the potential benefits and challenges of IoT in healthcare, including the need for secure data handling and scalability. [8]

P. S. Akram et al. (2021): This paper presents an IoT-based remote health monitoring system designed to track patient health remotely. The system integrates sensors for vital signs such as heart rate, temperature, and blood pressure, providing healthcare professionals with real-time updates. It emphasizes the system's role in managing chronic diseases and improving healthcare accessibility, presented at the 2021 International Conference on Advanced Computing and Communication Systems (ICACCS). [9]

Tejas Patel et al. (2020): This paper details an IoT-based remote health monitoring system designed to monitor the health parameters of patients in real-time. It integrates a range of sensors to collect and transmit health data to healthcare providers, aiming to reduce hospital visits and improve patient care. The system's primary goal is to enhance healthcare accessibility and efficiency, as discussed in the International Research Journal of Modernization in Engineering Technology and Science. [10]

TECHNOLOGIES INVOLVED :

IoT-based remote health monitoring systems leverage various technologies to enable efficient data collection, communication, storage, and analysis.

- Hardware includes sensors such as heart rate monitors (e.g., MAX30100), blood pressure sensors, glucose monitors, and motion sensors for tracking vital signs and activities. Microcontrollers like ESP32 and Arduino boards serve as processing units, while communication devices, including GSM and GPS modules, ensure seamless data transfer.

- Communication Protocols such as Bluetooth, Wi-Fi, ZigBee, and LoRa enable connectivity. Bluetooth is ideal for short-range communication, Wi-Fi supports high-speed data transfer, ZigBee offers low-power, low-data-rate wireless communication, and LoRa ensures long-range connectivity, particularly in rural areas.

- Cloud Integration platforms like AWS IoT, Azure IoT, and Google Cloud IoT store, analyze, and manage health data. These platforms also support advanced analytics and machine learning for predictive health monitoring.

- Software tools include Edge AI for real-time data processing on devices, data visualization platforms like Grafana for insightful reporting, and mobile applications that provide users and healthcare providers with interfaces to monitor and manage health data effectively.

CURRENT TRENDS :

- **Use of AI and Machine Learning**: Artificial intelligence (AI) and machine learning (ML) enhance IoT-based health monitoring systems by enabling predictive analytics. These technologies analyze vast amounts of health data to identify patterns, predict potential health issues, and recommend preventive measures, improving patient outcomes.
- **Edge Computing**: Real-time health monitoring is achieved through edge computing, which processes data locally on IoT devices. This reduces latency, ensures faster response times, and minimizes dependency on cloud services, making it ideal for time-sensitive healthcare applications.
- **Blockchain**: To address data security concerns, blockchain technology is increasingly being integrated into health monitoring systems. It provides a decentralized and tamper-proof ledger for storing sensitive health data, ensuring privacy and secure data sharing between stakeholders.

CHALLENGES AND LIMITATIONS :

- **Data Security and Privacy Issues**: The collection and transmission of sensitive health information expose systems to cybersecurity threats. Ensuring robust encryption and compliance with privacy regulations is a critical challenge.
- **Scalability and Interoperability**: IoT devices from different manufacturers often lack standardization, making it challenging to integrate them seamlessly into a unified system as the network scales.
- **High Initial Costs and Maintenance**: The deployment of IoT-based health monitoring systems involves significant initial investment in hardware, software, and cloud infrastructure. Additionally, maintaining and updating the system adds to the ongoing costs.
- **Reliability in Rural and Remote Areas**: Limited access to high-speed internet and infrastructure in rural regions hampers the reliability and effectiveness of IoT-based health systems, restricting their reach and usability in underserved areas.

CONCLUSION :

IoT-based remote health monitoring systems have demonstrated significant potential in transforming healthcare delivery by enabling continuous, real-time monitoring of patients' vital signs. Through the integration of advanced technologies such as AI, machine learning, edge computing, and secure cloud platforms, these systems offer a proactive approach to patient care, improving outcomes and reducing the strain on healthcare facilities. The use of IoT has proven invaluable in chronic disease management, elderly care, and post-operative monitoring, particularly during times of crisis such as the COVID-19 pandemic. However, challenges remain, including data security and privacy concerns, the scalability and interoperability of devices, high implementation costs, and the reliability of these systems in rural and remote areas. Addressing these challenges will be essential for maximizing the impact of IoT in healthcare. As technology continues to evolve, the future of remote health monitoring systems looks promising, with the potential for further advancements in predictive analytics, real-time decision-making, and secure data exchange. By overcoming current limitations, IoT can revolutionize healthcare systems globally, making healthcare more accessible, efficient, and personalized for all.

REFERENCES :

[1] M. Hamim, S. Paul, S. I. Hoque, M. N. Rahman and I. -A. Baqee, "IoT Based Remote Health Monitoring System for Patients and Elderly People," 2019 International Conference on Robotics,Electrical and Signal Processing Techniques (ICREST), Dhaka, Bangladesh, 2019, pp. 533-538, doi: 10.1109/ICREST.2019.8644514.

[2] Ghosh, A.M., Halder, D., & Hossain, S.A. (2016). Remote health monitoring system through IoT. 2016 5th International Conference on Informatics, Electronics and Vision (ICIEV), 921-926.

[3] Nafisa Shamim Rafa, Basma Binte Azmal, Abdur Rab Dhruba," IoT-Based Remote Health Monitoring System Employing Smart Sensors for Asthma Patients during COVID-19 Pandemic", Wireless Communications and Mobile Computing, Volume 2023Issue 1Wireless Communications and Mobile Computing First Published online: September 27, 2023.

[4] Islam, M.R.; Kabir, M.M.; Mridha, M.F.; Alfarhood, S.; Safran, M.; Che, D. Deep Learning-Based IoT System for Remote Monitoring and Early Detection of Health Issues in Real-Time. Sensors 2023, 23, 5204. https://doi.org/10.3390/s23115204.

[5] Hamim, Mohd et al. "IoT Based Remote Health Monitoring System for Patients and Elderly People." 2019 International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST) (2019): 533-538.

[6] Prajoona Valsalan1, Tariq Ahmed Barham Baomar2, Ali Hussain Omar Baabood, "IOT BASED HEALTH MONITORING SYSTEM", Received: 05.12.2019 Revised: 08.01.2020, Accepted: 10.02.2020.

[7] Mohd. Hamim, Sumit Paul, Syed Iqramul Hoque, "IoT Based Remote Health Monitoring System for Patients and Elderly People", 2019 International Conference on Robotics,Electrical and Signal Processing Techniques (ICREST).

[8] Abdulmalek S, Nasir A, Jabbar WA, Almuhaya MAM, Bairagi AK, Khan MA, Kee SH. IoT-Based Healthcare-Monitoring System towards Improving Quality of Life: A Review. Healthcare (Basel). 2022 Oct 11;10(10):1993. doi: 10.3390/healthcare10101993. PMID: 36292441; PMCID: PMC9601552.

[9] P. S. Akram, M. Ramesha., S. A. S. Valiveti, S. Sohail and K. T. S. S. Rao, "IoT based Remote Patient Health Monitoring system," 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2021, pp. 1519-1524, doi: 10.1109/ICACCS51430.2021.9441874.

[10] Tejas Patel, Pradeep Sharma, Vikas Yadav, Prof. Saurabh Suman, "IOT BASED REMOTE HEALTH MONITORING SYSTEM", International Research Journal of Modernization in Engineering Technology and Science Volume:02/Issue:03/March-2020.

[11] B. Aieshwarya and Chavan Patil, "An IoT Based Health Care and Patient Monitoring System to Predict Medical Treatment using Data Mining Techniques: Survey", International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), vol. 6, no. 3, March 2017.

[12] V Tamilselvi, S Sribalaji, P Vigneshwaran, P Vinu and J. GeethaRamani, "IoT Based Health Monitoring System", 2020 6th International Conference on Advanced Computing & Communication Systems (ICACCS).

[13] Taniya Shirely Stalin and Abey Abraham, "IOT BASED HEALTH MONITORING SYSTEM AND TELEMEDICINE", International Research Journal of Engineering and Technology (IRJET), vol. 07, no. 03, Mar 2020.