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WIRELESS HUMAN PULSE MONITORING USING IOT

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Abstract: In the realm of healthcare and wearable technology, the integration of Internet of Things (IoT) devices has revolutionized the way we monitor vital signs and ensure timely medical interventions. This abstract presents a comprehensive wireless human pulse monitoring system that amalgamates various sensors, a mobile application, and robotics for enhanced functionality and mobility.The core components of the system include a pulse rate sensor, a pulse oximeter, an ECG sensor, a humidity sensor, and a temperature sensor. These sensors collectively provide a holistic view of the individual's physiological parameters, enabling real-time monitoring and analysis. Additionally, the integration of a Blynk application facilitates remote monitoring and data visualization, empowering users to track their vital signs seamlessly.Furthermore, the inclusion of an ESP32 Cam enhances the system's capabilities by enabling video streaming for visual monitoring and analysis. The ESP32 Cam captures live footage, which can be transmitted to the Blynk application for remote viewing, allowing caregivers or healthcare professionals to assess the user's condition more comprehensively.

Moreover, to augment the system's mobility and engagement, a robotics component is incorporated utilizing an L298N motor driver. This component enables the implementation of a robot chase scenario, where a robot equipped with sensors and actuators responds to the user's physiological signals. For instance, the robot could be programmed to approach the user in case of abnormal vital signs or to provide assistance in emergency situations.Overall, the proposed wireless human pulse monitoring system offers a multifaceted approach to healthcare monitoring, leveraging IoT technology, mobile applications, video streaming, and robotics. By seamlessly integrating various sensors and devices, the system provides a comprehensive solution for real-time health monitoring, ensuring prompt intervention and personalized care.

Keywords: Wireless,IoT (Internet of Things),Wearable Technology,Remote Monitoring,Healthcare

1. INTRODUCTION

The fusion of Internet of Things (IoT) technology with healthcare has ushered in a new era of personalized and remote patient monitoring, significantly enhancing the quality of care and patient outcomes. In this context, the development of a wireless human pulse monitoring system represents a significant advancement in healthcare technology, offering real-time monitoring of vital signs in a non-intrusive and efficient manner.

This paper presents a comprehensive wireless human pulse monitoring system that integrates various sensors, a mobile application, and robotics to provide a holistic approach to healthcare monitoring. The system aims to address the growing need for continuous monitoring of physiological parameters, such as pulse rate, blood oxygen levels, and electrocardiogram (ECG) signals, in both clinical and non-clinical settings.

The core components of the system include a pulse rate sensor, a pulse oximeter, an ECG sensor, a humidity sensor, and a temperature sensor, which collectively capture essential physiological data. These sensors are strategically placed to ensure accurate and continuous monitoring of the user's vital signs. Additionally, the integration of a Blynk application enables remote access to the collected data, allowing caregivers or healthcare professionals to monitor the user's health status in real time.

Furthermore, the incorporation of an ESP32 Cam adds a visual dimension to the monitoring system by enabling live video streaming of the user's surroundings. This feature enhances situational awareness and allows for visual assessment of the user's condition, complementing the data obtained from the physiological sensors.

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To further enhance the system's functionality and engagement, a robotics component is introduced utilizing an L298N motor driver. This component enables the implementation of a robot chase scenario, where a robot equipped with sensors and actuators responds to the user's physiological signals. This interactive aspect not only adds a layer of entertainment but also facilitates timely assistance in emergency situations.
Overall, the proposed wireless human pulse monitoring system represents a significant advancement in healthcare technology, offering a multifaceted approach to real-time monitoring of vital signs. By leveraging IoT technology, mobile applications, video streaming, and robotics, the system provides a comprehensive solution for personalized and remote patient monitoring, ultimately leading to improved patient outcomes and quality of care.

1.1 Key Components:

PULSE RATE SENSOR: Monitors the user’s heart rate by detecting the pulsation of blood vessels.

PULSE OXIMETER: Measures the user’s blood oxygen saturation levels by analyzing the absorption of light.
ECG Sensor: Records the user’s electrocardiogram signals, providing insights into heart rhythm and abnormalities.

HUMIDITY SENSOR: Measures the humidity levels in the surrounding environment, which can impact respiratory health.

TEMPERATURE SENSOR: Monitors the user’s body temperature, providing indications of fever or hypothermia.
These sensors form the backbone of the monitoring system, capturing essential physiological data for analysis and interpretation.
These components are strategically placed to ensure accurate and continuous monitoring of the user’s vital signs, providing a comprehensive view of their health status.
These sensors enable real-time monitoring of key physiological parameters, allowing for timely intervention and personalized care.
These sensors are essential for remote patient monitoring, enabling caregivers or healthcare professionals to assess the user’s health status from a distance.
These sensors are integrated seamlessly into the monitoring system, ensuring reliable and accurate data collection in various environments and conditions.

1.2 Project Goals:

Real-Time Monitoring: The primary goal of the project is to develop a system capable of real-time monitoring of key physiological parameters, including pulse rate, blood oxygen levels, ECG signals, humidity, and temperature. This enables timely detection of any deviations from normal values, facilitating prompt intervention and healthcare delivery.
Remote Accessibility: Another objective is to create a system that allows for remote accessibility of the collected data. By integrating a mobile application, such as Blynk, users, caregivers, or healthcare professionals can access the monitored data from anywhere, facilitating remote patient monitoring and management.
Comprehensive Data Analysis: The project aims to implement algorithms for comprehensive data analysis, including trend analysis, anomaly detection, and predictive modeling. By analyzing the collected data, the system can provide insights into the user’s health status, identify potential health risks, and offer personalized recommendations for healthcare management.
Enhanced User Engagement: Incorporating interactive elements, such as video streaming and robotics, aims to enhance user engagement and compliance with the monitoring system. Features like live video streaming and robot chase scenarios not only add a layer of entertainment but also foster a sense of involvement and motivation in the user.
Scalability and Flexibility: The project seeks to develop a scalable and flexible system that can accommodate future expansions and customizations. This includes the ability to integrate additional sensors, functionalities, or platforms to adapt to evolving healthcare needs and technological advancements.
Reliability and Accuracy: Ensuring the reliability and accuracy of the monitoring system is paramount. The project focuses on calibrating sensors, optimizing algorithms, and implementing quality control measures to minimize errors and discrepancies in the collected data, thereby enhancing the system’s overall performance and effectiveness.
User-Friendly Interface: Designing a user-friendly interface for both the hardware and software components is essential to ensure ease of use and accessibility for users of all levels. Intuitive interfaces, clear visualizations, and streamlined workflows aim to enhance the user experience and encourage regular utilization of the monitoring system.

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2. LITURE REVIEW

IoT-Based Healthcare Monitoring Systems:

Numerous research studies have proposed IoT-based healthcare monitoring systems that incorporate various sensors to monitor vital signs such as heart rate, blood pressure, and temperature. These systems aim to provide real-time monitoring and early detection of health abnormalities.

For example, a study by Li et al. (2018) developed an IoT-based wearable device for continuous monitoring of physiological parameters, including heart rate and body temperature. The device transmitted data to a mobile application for remote monitoring by healthcare providers.

Remote Patient Monitoring:

Remote patient monitoring (RPM) has gained traction as a cost-effective approach to managing chronic diseases and enhancing patient outcomes. IoT-enabled RPM systems allow patients to be monitored from the comfort of their homes, reducing the need for frequent hospital visits.

Research by Al-Fuqaha et al. (2015) explored the potential of IoT in RPM, highlighting the benefits of continuous monitoring for patients with chronic conditions such as diabetes and hypertension. The study emphasized the importance of data analytics in interpreting the collected data and providing actionable insights.

Wearable Sensors and Devices:

Wearable sensors and devices play a crucial role in IoT-based healthcare monitoring systems, enabling continuous tracking of physiological parameters in real-time. These devices offer convenience and mobility, allowing users to carry out their daily activities while being monitored.

Studies by Gao et al. (2016) and Patel et al. (2012) investigated the accuracy and reliability of wearable sensors for monitoring vital signs such as heart rate and activity levels. These studies emphasized the need for sensor calibration and validation to ensure accurate data collection.

Integration of Robotics and IoT:

Recent research has explored the integration of robotics with IoT technology to enhance healthcare monitoring and assistance. Robotics platforms equipped with sensors and actuators can interact with users, providing support and companionship in addition to monitoring vital signs.

For example, a study by Zhang et al. (2020) developed a robotic system for monitoring elderly individuals in home environments. The system utilized IoT sensors for health monitoring and robotic assistance for activities of daily living, demonstrating the potential for synergistic integration of robotics and IoT in healthcare.

Challenges and Future Directions:

Despite the promising advancements in IoT-based healthcare monitoring, several challenges remain, including data security and privacy concerns, interoperability issues, and regulatory compliance. Addressing these challenges is crucial for widespread adoption and acceptance of IoT technology in healthcare.

Future research directions include exploring advanced data analytics techniques, such as machine learning and artificial intelligence, for predictive modeling and personalized healthcare interventions. Additionally, integrating IoT with emerging technologies like 5G networks and edge computing could further enhance the scalability and efficiency of healthcare monitoring systems.

3. EXISTING & PROPOSED SYSTEM

3.1 EXISTING

The existing system typically involves traditional healthcare monitoring methods, which often rely on periodic visits to healthcare facilities for check-ups or hospitalization for continuous monitoring in critical cases. These methods are often labor-intensive, time-consuming, and may not provide real-time insights into the patient's health status. Furthermore, they may lack the ability to monitor patients remotely, leading to potential delays in intervention and increased healthcare costs.

3.2 PROPOSED SYSTEM:

The proposed system introduces a comprehensive IoT-based healthcare monitoring solution that revolutionizes the way vital signs are monitored and managed. It integrates various sensors such as pulse rate, pulse oximeter, ECG, humidity,

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and temperature sensors into a wearable device or a home-based monitoring system. These sensors continuously monitor the patient's vital signs in real-time, providing accurate and timely data for analysis.

The proposed system also incorporates a mobile application, such as Blynk, which allows users, caregivers, or healthcare professionals to remotely access and monitor the collected data. This remote accessibility ensures that patients can be monitored from the comfort of their homes, reducing the need for frequent hospital visits and improving patient experience.

Additionally, the proposed system includes an ESP32 Cam for live video streaming, enabling visual monitoring of the patient's surroundings. This feature enhances situational awareness and allows for visual assessment of the patient's condition, complementing the data obtained from physiological sensors.

Moreover, the system integrates robotics using an L298N motor driver, enabling the implementation of interactive scenarios such as robot chase. The robot equipped with sensors and actuators can respond to the patient's physiological signals, providing assistance or intervention as needed.

4. COMPONENT SPECIFICATION

4.1Pulse Rate Sensor:

- ✓ Type: Optical or piezoelectric
- ✓ Measurement Range: Typically 30 to 240 beats per minute (BPM)
- ✓ Accuracy: ±1 BPM
- ✓ Output: Analog or digital signal

4.2 Pulse Oximeter:

- ✓ Type: Photoplethysmography (PPG)
- ✓ Measurement Range:
- ✓ Oxygen Saturation (SpO2): 70% to 100%
- ✓ Heart Rate (HR): 30 to 250 BPM
- ✓ Accuracy:
- ✓ SpO2: ±2% (70% to 100%)
- ✓ HR: ±2 BPM
- ✓ Output: Digital signal (SpO2 and HR values)

4.3 ECG Sensor:

- ✓ Type: Electrocardiography (ECG/EKG)
- ✓ Measurement Range: Typically ±5 to ±10 mV
- ✓ Frequency Response: 0.05 Hz to 150 Hz
- ✓ Sampling Rate: ≥250 samples per second (sps)
- ✓ Accuracy: Depends on the specific sensor; typically ±1 to ±2 mV
- ✓ Output: Analog or digital signal (ECG waveform)

4.4 Humidity Sensor:

- ✓ Type: Capacitive or resistive
- ✓ Measurement Range: 0% to 100% relative humidity (RH)
- ✓ Accuracy: ±2% RH
- ✓ Operating Temperature: -40°C to 125°C
- ✓ Output: Analog or digital signal (humidity value)

4.5 Temperature Sensor:

- ✓ Type: Thermistor, resistive temperature detector (RTD), or semiconductor-based (e.g., thermocouple)
- ✓ Measurement Range: Typically -40°C to 125°C
- ✓ Accuracy: ±0.5°C to ±1°C
- ✓ Response Time: <1 second
- ✓ Output: Analog or digital signal (temperature value)

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4.6 L298N MOTOR DRIVER:
- ✓ Operating Voltage: 4.5V to 46V, recommended 7V to 35V.
- ✓ Maximum Output Current: 2A per channel, peak of 3A per channel.
- ✓ Channels: Dual H-bridge design for controlling two motors independently.
- ✓ Control Logic: TTL-compatible, suitable for microcontrollers and digital control systems.
- ✓ Protection Features: Includes flyback diodes, thermal shutdown, and overcurrent protection.
- ✓ Control Inputs: Two inputs per channel for controlling direction (forward, reverse, or braking).
- ✓ Enable Inputs: Enable/disable inputs for each motor channel.
- ✓ Applications: Robotics, motorized vehicles, industrial automation, hobbyist projects.

4.7 ESP32-CAM:
- ✓ Microcontroller: Espressif ESP32-S chip
- ✓ Operating Voltage: 5V DC
- ✓ Wi-Fi: Integrated Wi-Fi (802.11b/g/n)
- ✓ Bluetooth: Integrated Bluetooth 4.2 BLE
- ✓ Camera: OV2640 camera module with 2MP resolution
- ✓ Memory:
- ✓ RAM: 520KB SRAM
- ✓ Flash: 4MB (32Mbit) Flash memory
- ✓ GPIO Pins: 26 general-purpose input/output (GPIO) pins
- ✓ Interfaces:
- ✓ SD card slot (supports up to 4GB)
- ✓ UART, SPI, I2C, I2S interfaces
- ✓ PWM and ADC pins
- ✓ Operating Temperature: -40°C to 85°C
- ✓ Dimensions: Approx. 28mm x 18mm
- ✓ Programming: Arduino IDE, ESP-IDF (Espressif IoT Development Framework)
- ✓ Power Consumption:
- ✓ Deep-sleep mode: < 6mA
- ✓ Light-sleep mode: < 20mA

Applications:
- ✓ IoT projects,Surveillance cameras,Image recognition,Home automation
- ✓ Features:
- ✓ Supports real-time image processing and encoding
- ✓ Can be programmed to capture images or videos and transmit them over Wi-Fi or store them locally
- ✓ Integration with Arduino IDE and vast community support
- ✓ Low-power modes for energy-efficient operation
- ✓ Compact form factor suitable for small-scale projects

4.8 Arduino Uno:
- ✓ Microcontroller: ATmega328P
- ✓ Operating Voltage: 5V
- ✓ Input Voltage (Recommended): 7-12V
- ✓ Digital I/O Pins: 14 (of which 6 provide PWM output)
- ✓ Analog Input Pins: 6
- ✓ DC Current per I/O Pin: 20mA
- ✓ DC Current for 3.3V Pin: 50mA
- ✓ Flash Memory: 32KB (0.5KB used by bootloader)
- ✓ SRAM: 2KB
- ✓ EEPROM: 1KB

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- ✓ Clock Speed: 16MHz
- ✓ Voltage Regulator: AMS1117 5V
- ✓ USB Interface: ATmega16U2
- ✓ Dimensions: 68.6mm x 53.4mm
- ✓ Programming: Arduino IDE
- ✓ Power: Can be powered via USB connection or external power supply
- ✓ Operating Temperature: 0°C to 85°C
- ✓ Features:
- ✓ Versatile and widely-used microcontroller board for prototyping and projects
- ✓ Open-source platform with a large community and extensive libraries
- ✓ Support for various sensors, actuators, and communication modules
- ✓ Easy to use and program, suitable for beginners and experienced users alike
- ✓ Compatible with a wide range of shields and expansion boards

5. MERITS

Real-Time Monitoring: The proposed system enables real-time monitoring of vital signs, allowing for prompt intervention in case of abnormalities or emergencies.
Remote Accessibility: With the integration of a mobile application, caregivers and healthcare professionals can remotely access and monitor patient data, improving accessibility to healthcare services.
Comprehensive Data Collection: The system collects data from various sensors, providing a comprehensive view of the patient's health status and enabling better-informed medical decisions.
Enhanced Patient Comfort: Patients can be monitored from the comfort of their homes, reducing the need for frequent hospital visits and enhancing their overall experience.
Visual Monitoring: The inclusion of video streaming capabilities allows for visual assessment of the patient's surroundings, enhancing situational awareness and facilitating better care.
Interactive Features: The integration of robotics adds an interactive element to the monitoring system, providing assistance and engagement for patients, particularly in emergency scenarios.
Personalized Care: By continuously monitoring vital signs and providing real-time data, the system enables personalized healthcare interventions tailored to the individual needs of the patient.
Improved Efficiency: The automated nature of the system reduces the burden on healthcare professionals and streamlines the monitoring process, leading to improved efficiency in healthcare delivery.

6.DEMERITS

Cost: The initial setup and maintenance costs of the proposed system, including the sensors, mobile application, and robotics components, may be prohibitive for some healthcare facilities or patients.
Complexity: Integrating multiple components such as sensors, mobile applications, video streaming, and robotics can increase the complexity of the system, requiring specialized expertise for implementation and troubleshooting.
Data Security: Remote accessibility of patient data raises concerns about data security and privacy, requiring robust measures to safeguard sensitive information from unauthorized access or breaches.
Reliability: The reliability of the system depends on the accuracy and performance of the sensors and technology used, which may vary depending on environmental factors and technical limitations.
User Acceptance: Some patients may be hesitant to adopt new technology or may find the monitoring system intrusive, leading to challenges in user acceptance and compliance.
Interoperability: Ensuring interoperability between different components and platforms used in the system, such as sensors, mobile applications, and robotics, may present technical challenges that need to be addressed.
Maintenance: Regular maintenance and updates are required to ensure the proper functioning of the system, including sensor calibration, software updates, and hardware repairs, which may incur additional costs and resources.
Regulatory Compliance: Compliance with healthcare regulations and standards, particularly regarding data privacy and medical device regulations, is essential but may pose challenges in the deployment and operation of the system.

7. APPLICATIONS

Home Healthcare Monitoring: The system can be used for continuous monitoring of elderly individuals or patients with chronic conditions in their homes, allowing caregivers and family members to remotely track their health status and provide timely assistance if needed.

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Hospital Patient Monitoring: In hospital settings, the system can be deployed to monitor patients in real-time, providing healthcare professionals with accurate data to assess their condition, detect any abnormalities, and intervene promptly if necessary.

Remote Rural Healthcare: In rural or underserved areas with limited access to healthcare facilities, the system can serve as a cost-effective solution for remote patient monitoring, enabling healthcare providers to monitor patients' vital signs from a distance and deliver timely interventions.

Telemedicine and Virtual Consultations: The system can facilitate telemedicine consultations by allowing healthcare providers to remotely monitor patients' vital signs during virtual appointments, enabling more comprehensive and personalized healthcare delivery.

Emergency Response and Disaster Relief: During emergencies or natural disasters, the system can be deployed to monitor the health status of affected individuals in real-time, enabling rapid response teams to prioritize and allocate resources based on the severity of their condition.

Athletic Performance Monitoring: The system can be used to monitor athletes' physiological parameters during training sessions or competitions, providing coaches and trainers with valuable insights into their performance, recovery, and overall health.

Occupational Health Monitoring: In industrial or hazardous work environments, the system can be used to monitor workers' vital signs and environmental conditions in real-time, helping to identify and mitigate health risks and ensure workplace safety.

Clinical Trials and Research Studies: The system can be utilized in clinical trials and research studies to monitor participants' health status and collect real-time data on their physiological responses to treatments or interventions, enhancing the accuracy and efficiency of data collection.

Health and Wellness Programs: The system can be incorporated into health and wellness programs to monitor individuals' health metrics over time, track progress towards fitness goals, and provide personalized recommendations for diet, exercise, and lifestyle modifications.

Long-Term Care Facilities: In long-term care facilities such as nursing homes or assisted living facilities, the system can be deployed to monitor residents' vital signs continuously, enabling caregivers to provide proactive and personalized care to meet their unique needs.

8. FUTURE SCOPE

The wireless human pulse monitoring system using IoT has significant potential for further development and enhancement in several areas:

Advanced Data Analytics: Future research can focus on implementing advanced data analytics techniques, such as machine learning and artificial intelligence, to analyze the vast amount of data collected by the monitoring system. These techniques can enable predictive modeling for early detection of health risks, personalized healthcare interventions, and optimized treatment plans.

Integration with Wearable Technology: The system can be integrated with wearable technology, such as smartwatches and fitness trackers, to provide seamless and continuous monitoring of vital signs in daily life. This integration can enhance user engagement, promote proactive health management, and facilitate long-term wellness monitoring.

Expansion of Sensor Capabilities: Research can explore the integration of additional sensors and biometric measurements into the monitoring system to provide a more comprehensive view of the patient's health status. For example, incorporating sensors for blood pressure, respiratory rate, glucose levels, and sleep patterns can further enhance the system's capabilities for holistic health monitoring.

Telemedicine and Remote Consultations: The system can be leveraged for telemedicine consultations and remote healthcare delivery, enabling healthcare providers to remotely monitor patients' vital signs, conduct virtual consultations, and deliver personalized care. This approach can improve access to healthcare services, particularly in rural or underserved areas.

Enhanced User Interfaces: Future iterations of the system can focus on enhancing user interfaces and user experience, making the monitoring system more intuitive, user-friendly, and accessible to individuals of all ages and technological backgrounds. Clear visualizations, personalized notifications, and interactive features can enhance user engagement and compliance with the monitoring regimen.

Scalability and Interoperability: Efforts can be made to ensure the scalability and interoperability of the monitoring system, allowing for seamless integration with existing healthcare infrastructure, electronic health records (HER) systems, and other IoT devices. This interoperability can facilitate data sharing, collaboration between healthcare providers, and continuity of care across different healthcare settings.

Validation and Clinical Trials: Further validation studies and clinical trials are needed to assess the effectiveness, reliability, and safety of the monitoring system in diverse patient populations and healthcare settings. These studies can

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provide valuable insights into the system’s performance, identify areas for improvement, and support regulatory approval and commercialization.

CONCLUSION

The development of a wireless human pulse monitoring system using IoT represents a significant advancement in healthcare technology, offering a comprehensive solution for real-time monitoring of vital signs and personalized healthcare delivery. By integrating various sensors, a mobile application, video streaming capabilities, and robotics, the proposed system addresses the growing need for continuous monitoring, remote accessibility, and proactive intervention in healthcare settings.The system's ability to monitor physiological parameters such as pulse rate, blood oxygen levels, ECG signals, humidity, and temperature in real-time provides valuable insights into the patient's health status, enabling timely detection of abnormalities and prompt intervention when needed. Additionally, the remote accessibility of patient data through a mobile application enhances accessibility to healthcare services, particularly in remote or underserved areas.The inclusion of video streaming capabilities allows for visual monitoring of the patient's surroundings, enhancing situational awareness and facilitating better care. Moreover, the integration of robotics adds an interactive element to the monitoring system, providing assistance and engagement for patients, particularly in emergency scenarios.While the proposed system offers numerous benefits in terms of real-time monitoring, remote accessibility, and personalized care, it also poses challenges such as cost, complexity, data security, and regulatory compliance. Addressing these challenges will be crucial for the successful deployment and adoption of the system in healthcare settings.

REFERENCES

[1]. Li, Shancang, et al. "An Internet of Things-Based Personalized Healthcare System for Chronic Disease Management." IEEE Internet of Things Journal, 2018.
[2]. Al-Fuqaha, Ala, et al. "Internet of Things (IoT) in Healthcare: A Comprehensive Survey on Technologies, Applications, and Security Challenges." IEEE Access, 2015.
[3]. Gao, Yang, et al. "A Review of Wearable Sensors and Systems with Application in Rehabilitation." Journal of Neuroengineering and Rehabilitation, 2016.
[4]. Patel, Shyamal, et al. "Wearable Sensors for Remote Health Monitoring." IEEE Engineering in Medicine and Biology Magazine, 2012.
[5]. Zhang, et al. "Robotic System for Monitoring Elderly Individuals in Home Environments." Robotics, 2020.
[6]. Sharma, Vikas, et al. "IoT-Based Smart Health Monitoring: Technologies, Applications, and Future Prospects." Journal of Ambient Intelligence and Humanized Computing, 2020.
[7]. Dey, Nilanjan, et al. "A Survey of Internet of Things in Healthcare." International Journal of Computer Applications, 2016.
[8]. Bhattacharya, Mahua, and A. S. S. Pillai. "Internet of Things in Healthcare: Review of Literature and Applications." International Journal of Computer Applications, 2016.
[9]. Islam, Shama Naz, et al. "Challenges and Opportunities of Internet of Things in Healthcare: A Systematic Review." Journal of Medical Systems, 2019.
[10]. Deshmukh, S. B., and P. P. Bafna. "Smart Healthcare Monitoring System Using IoT and Cloud Computing." International Journal of Computer Applications, 2018.