IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

CHRONOCARESENSE: AN EMBEDDED IOT ARCHITECTURE FOR SMART MEDICATION ALERTING AND PATIENT HEALTH MONITORING

[1]Dr.Revati Godi,[2]Namrata, [3]Aruna, [4]Ganesh, [5]Vinod

[1]Assistant Professor, [2-5]Students

[1-5]Electronics & Communication Engineering,

[1-5]Sharnbasva University,Kalaburagi,Karnataka,India

Abstract: Medication non-adherence and inadequate health monitoring remain significant challenges in modern healthcare, particularly among elderly individuals and patients requiring long-term treatment. This study presents ChronoCareSense, an IoT-based smart medication alert and health monitoring system designed to improve medication compliance and support continuous physiological assessment. The proposed system integrates an Arduino Uno microcontroller, DS3231 real-time clock module, LM35 temperature sensor, pulse sensor, GSM communication module, LCD display, buzzer, and IR sensors into a unified healthcare platform. Accurate medication scheduling is achieved through the RTC module, which triggers timely reminders using visual and audible alerts. Simultaneously, body temperature and heart rate are monitored in real time to provide essential health information. GSM-based communication enables the transmission of SMS notifications to patients or caregivers, ensuring prompt awareness of reminder events and critical conditions. Experimental evaluation demonstrated reliable sensor performance, accurate scheduling, stable communication, and effective alert generation. The developed system offers a cost-effective, user-friendly, and dependable solution for home healthcare, chronic disease management, elderly care, and remote patient monitoring applications.

Index Terms **–**IoT, Smart Medication Reminder, Health Monitoring System, Arduino Uno, GSM Communication, Pulse Sensor, LM35 Temperature Sensor, Real-Time Clock (RTC), Remote Patient Monitoring, Healthcare Automation.

I. INTRODUCTION

Rapid advancements in embedded systems, wireless communication technologies, and Internet of Things (IoT) platforms have transformed the way healthcare services are delivered and monitored. Modern healthcare increasingly emphasizes continuous observation, timely intervention, and intelligent assistance to improve patient outcomes and quality of life. The growing adoption of smart devices and sensor-based technologies has enabled the development of automated healthcare solutions capable of monitoring physiological conditions and providing real-time support. Such innovations are particularly valuable for elderly individuals, patients with chronic illnesses, and those requiring long-term medical supervision. As healthcare demands continue to rise, the need for affordable, reliable, and user-friendly monitoring systems has become increasingly important.Medication management is one of the most critical aspects of patient care. Missing prescribed doses, taking medicines at incorrect times, or failing to follow treatment schedules can lead to reduced therapeutic effectiveness, prolonged recovery periods,

and increased health complications. These challenges are often observed among elderly patients, individuals with memory-related disorders, and people managing multiple medications. In addition, the absence of regular health monitoring outside clinical environments may delay the identification of abnormal physiological conditions, thereby increasing potential health risks.To address these challenges, an IoT-based Smart Medication Reminder and Health Monitoring System has been developed to combine automated medicine scheduling with continuous health assessment. The proposed system utilizes an Arduino Uno microcontroller integrated with a DS3231 Real-Time Clock module, LM35 temperature sensor, pulse sensor, GSM communication module, LCD display, buzzer, and IR sensors. The RTC module ensures accurate medication scheduling, while the buzzer and display generate reminder notifications at predefined times. Simultaneously, vital health parameters such as body temperature and heart rate are monitored and displayed in real time. GSM-based communication enables remote alert transmission to patients or caregivers. By integrating medication reminders and health monitoring within a single platform, the system enhances treatment compliance, supports preventive healthcare practices, and provides an effective solution for home healthcare and patient management applications.

II. Related Works

Article[1] "SMART IoT-Based Pill Reminder: Enhancing Medication Adherence and Remote Supervision" by T. Srujana, K. Naresh, and O. Saritha in 2024: This paper presents an IoT-enabled pill reminder system developed to improve medication adherence among patients. The system generates timely alerts and notifications to ensure medicines are taken according to prescribed schedules. Remote supervision capabilities allow caregivers to monitor medication activities effectively. Sensor integration enhances tracking of pill consumption behavior. The proposed architecture is particularly useful for elderly individuals and patients with chronic diseases. Experimental evaluation demonstrated reliable reminder generation and improved patient compliance. The study highlights the importance of IoT technologies in modern healthcare management.

Article[2] "Development of Smart Pill Expert System Based on IoT" by P. Dayananda and Amrutha G. Upadhya in 2024: This research introduces an improved smart pill expert system known as SPEC 2.0 for healthcare applications. The system automatically dispenses medicines at scheduled times and improves medication adherence. IoT connectivity supports intelligent monitoring and control functions. A user-friendly interface makes the system suitable for users of different age groups. The architecture focuses on dosage accuracy and healthcare automation. Experimental analysis confirmed reliable dispensing performance and efficient operation. The study demonstrates the practical benefits of IoT-enabled medicine management solutions.

Article[3] "Smart Pill Box: An IoT-Integrated Application for Monitoring Medication Intake" by M. Alruwaili and A. Almutairi in 2025: This paper proposes an IoT-based smart pill box designed to remind patients about medication schedules. Audio alerts and mobile notifications are generated whenever medicine intake is due. The system enables healthcare providers to monitor patient adherence remotely. Cloud-based data management supports continuous tracking and analysis. The proposed solution is particularly useful for elderly and chronically ill patients. Testing results indicated improved medication compliance and reduced missed doses. The research emphasizes intelligent healthcare assistance through connected devices.

Article[4] "Voice Activated Medicine Reminder Box with IoT Health Monitoring for Old People and Hospital" by M. M. Hassain and M. A. Rahman in 2025: This study presents a voice-activated medicine reminder system integrated with health monitoring functions. The system generates alerts through voice notifications and supports remote monitoring through IoT infrastructure. Health parameters are continuously monitored using embedded sensors. Email and SMS notifications are transmitted whenever abnormal conditions are detected. The design aims to improve medication adherence and patient safety. Experimental results demonstrated reliable communication and monitoring performance. The proposed system provides a practical solution for elderly healthcare support.

Article[5] "IoT-Based Pill Reminder and Monitoring System" by S. Siddiqha and R. Maheshwari in 2023: This paper focuses on addressing medication non-adherence using an IoT-enabled monitoring platform. The proposed system generates automated reminders and records medication intake events.

Sensor technologies are used to monitor user interaction with medicine compartments. Remote access allows caregivers to observe adherence information effectively. The system reduces medication errors and improves treatment outcomes. Experimental testing verified stable operation under different conditions. The research demonstrates the effectiveness of IoT in healthcare monitoring applications.

Article[6] "IoT Based Pill Dispenser System" by M. K. Singh and A. Kumar in 2024: This research introduces a smart pill dispenser integrated with IoT communication technologies. The system automatically dispenses medication at predefined schedules and provides reminders through connected devices. Mobile application support enables remote monitoring and management. The architecture improves adherence while reducing dependency on manual supervision. Experimental observations confirmed accurate dispensing and reliable alert generation. The system enhances healthcare accessibility and convenience. The study contributes toward intelligent medication management systems.

Article[7] "Medicine Reminder and Monitoring System for Secure Health Using Internet of Things" by P. Fadanvis and M. Dehankar in 2021: This study presents an IoT-based healthcare platform for medicine reminders and patient monitoring. The system employs sensors, communication modules, and cloud technologies for healthcare support. Automated notifications ensure timely medication intake. Monitoring capabilities improve patient awareness and treatment compliance. Healthcare providers can remotely access patient information. The architecture supports continuous observation and decision-making. Results demonstrated the usefulness of IoT in improving healthcare outcomes.

Article[8] "IoT-Based Kit for Medication Monitoring" by V. Rajesh and P. Srinivas in 2024: This paper introduces an IoT-enabled kit designed to monitor medication adherence effectively. Multiple sensors are utilized to track medicine intake activities and generate reports. Cloud integration enables real-time data processing and storage. The proposed solution supports healthcare providers in monitoring patient compliance remotely. The architecture improves medication supervision and reduces healthcare risks. Experimental results confirmed reliable performance and accurate monitoring. The study highlights the role of IoT in smart healthcare systems.

Article[9] "Smart IoT-Based Medication Adherence System for Real-Time Healthcare Monitoring" by A. Kumar and S. Patel in 2025: This research presents a smart medication adherence system capable of monitoring medicine intake and patient health status simultaneously. Real-time monitoring functions improve healthcare management efficiency. IoT communication supports continuous data transmission and alert generation. The system assists caregivers by providing adherence information remotely. Experimental evaluation showed improved patient compliance and monitoring accuracy. The proposed architecture enhances healthcare accessibility and reliability. The study demonstrates the growing importance of IoT-based healthcare solutions.

Article[10] "IoT Based Smart Medicine Reminder" by S. Smith and J. Brown in 2024: This paper examines the impact of smart medicine reminder technologies on patient adherence. The system generates scheduled reminders and tracks medication activities. Real-time notifications improve treatment compliance among patients with chronic conditions. Authentication mechanisms enhance system reliability and security. Experimental observations indicated significant improvements in adherence rates. The architecture supports healthcare monitoring and caregiver assistance. The research highlights the effectiveness of reminder systems in modern healthcare environments.

Article[11] "Smart Medication Management and Pill Dispensing System with Health Monitoring" by R. Sharma and P. Verma in 2024: This study proposes an integrated medication management system combining pill dispensing and health monitoring capabilities. The system measures vital signs including heart rate and body temperature. Automated reminders assist users in following prescribed medication schedules. Continuous monitoring improves patient safety and healthcare outcomes. Data collected from sensors support healthcare decision-making processes. Experimental testing demonstrated reliable operation and effective monitoring performance. The research provides a comprehensive healthcare assistance platform.

Article[12] "Enhancing Medication Adherence with an IoT-Based Pill Management System" by V. Peddisetti and A. Panangadan in 2024: This paper presents an IoT-enabled pill management solution designed to improve medication adherence. The system combines reminder notifications with intelligent monitoring functions. Connected devices ensure timely medicine intake and adherence tracking. Remote access features support caregivers and healthcare professionals. The proposed architecture improves treatment effectiveness and reduces medication errors. Experimental results demonstrated stable performance and enhanced patient compliance. The study emphasizes the benefits of smart healthcare technologies in medication management.

III. PROBLEM STETEMENT

Medication non-adherence remains a major healthcare challenge, particularly among elderly individuals, patients with chronic diseases, and people requiring multiple daily medications. Forgetting medicine schedules, taking incorrect doses, or missing medications can reduce treatment effectiveness and lead to serious health complications. In addition, many patients do not regularly monitor vital health parameters such as body temperature and heart rate outside healthcare facilities, resulting in delayed detection of abnormal conditions. Existing healthcare monitoring solutions are often expensive, complex, or highly dependent on internet connectivity and smartphone applications, limiting their accessibility and usability. The absence of an integrated system that combines medication reminders with continuous health monitoring creates difficulties in effective patient care. Therefore, a reliable, affordable, and user-friendly solution is required to ensure timely medication intake and continuous monitoring of essential physiological parameters.

IV. OBJECTIVES

The primary objective of this study is to develop an IoT-based smart medication reminder and health monitoring system that assists patients in following prescribed medication schedules accurately while continuously monitoring vital health parameters. The study aims to provide timely medicine alerts using a real-time clock module, buzzer, and display interface to reduce missed doses and medication errors. Another objective is to monitor body temperature and heart rate in real time using appropriate sensors and provide instant health information to users. The system also seeks to enable remote communication through GSM technology for transmitting notifications and alerts to patients or caregivers. Additionally, the study focuses on creating a reliable, cost-effective, and user-friendly healthcare solution that improves medication adherence, enhances patient safety, supports elderly individuals, and promotes effective healthcare management in home and clinical environments.

V. METHODOLOGY

1)System Design and Requirement Analysis: The methodology begins with identifying the challenges associated with medication non-adherence and inadequate health monitoring. Functional and hardware requirements are analyzed to develop an efficient healthcare assistance system. The system architecture is designed to integrate medication reminders and health monitoring within a single platform. Appropriate sensors, communication modules, and processing units are selected to ensure reliable operation and cost effectiveness.

2)Hardware Integration: The hardware components are assembled and interconnected to create the complete healthcare monitoring system. An Arduino Uno microcontroller is used as the central processing unit to coordinate all operations. Various sensors and communication modules are interfaced with the controller for data acquisition and processing. Proper integration ensures smooth communication among all hardware components and reliable system performance.

3)Medication Reminder Scheduling: The DS3231 Real-Time Clock module is configured to maintain accurate date and time information for medication management. Predefined medicine schedules are stored within the system according to user requirements. The controller continuously compares the current time with programmed reminder timings. Whenever a scheduled time is reached, the reminder mechanism is activated automatically to notify the user.

4)Health Parameter Monitoring: The LM35 temperature sensor and pulse sensor are utilized to monitor body temperature and heart rate continuously. Sensor data are collected and processed by the microcontroller in real time. The measured physiological values are updated regularly for continuous observation. This process enables effective health monitoring and supports timely identification of abnormal conditions.

5)Alert and Notification Generation: Visual and audible alerts are generated whenever medication reminder events occur. The LCD display presents reminder messages and health information clearly to the user. Simultaneously, the buzzer produces sound alerts to attract immediate attention. The combination of multiple notification methods improves reminder effectiveness and user awareness.

6)GSM-Based Communication: The GSM communication module is integrated to provide remote notification capabilities. SMS alerts are transmitted to patients or caregivers whenever reminder events are triggered. The communication process ensures that important information can be accessed even when users are away from the system. This feature enhances patient supervision and healthcare accessibility.

7)System Testing and Performance Evaluation: The developed system is tested under different operating conditions to verify its functionality and reliability. Sensor performance, reminder scheduling accuracy, communication efficiency, and alert generation are evaluated systematically. Experimental observations are analyzed to assess the effectiveness of the proposed system. The evaluation process confirms the successful operation of the healthcare monitoring and medication reminder platform.

VI. System Architecture

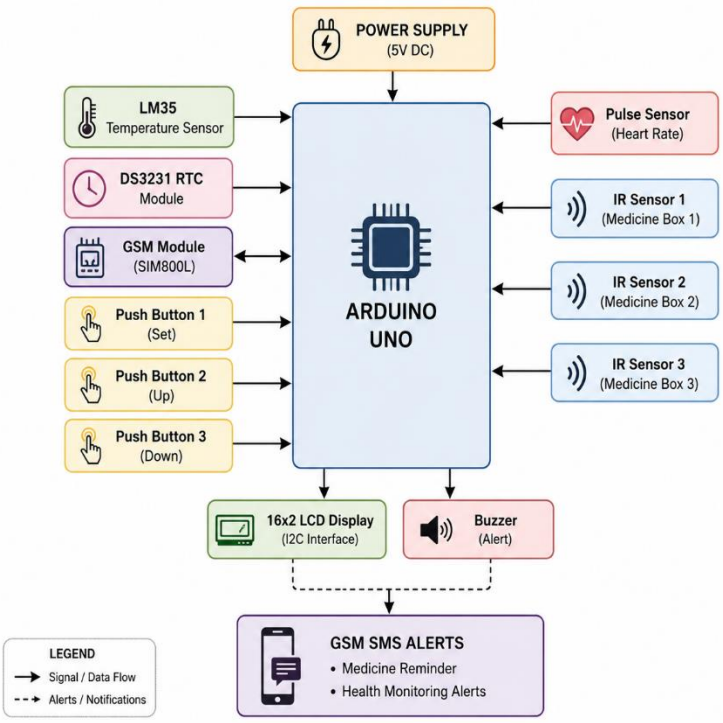

Fig 1: Proposed System Architecture of TerraPulse-X for Human Presence Detection and Predictive Analytics

The system architecture consists of a centralized Arduino Uno microcontroller that coordinates all sensing, processing, communication, and alert functions. A regulated 5V power supply provides the required operating voltage to all connected modules. The LM35 temperature sensor continuously measures body temperature, while the pulse sensor monitors heart rate in real time. A DS3231 Real-Time Clock (RTC) module maintains accurate date and time information and manages medication scheduling. Three IR sensors are incorporated to detect medicine box access and monitor compartment activity. Push buttons are provided for setting reminder schedules and navigating system functions. The Arduino processes data received from all input devices and executes the required control operations. A 16×2 LCD

display with I2C interface presents medication reminders, sensor readings, and system status information. A buzzer generates audible alerts whenever medication schedules are reached or specific events occur. The GSM module enables wireless communication by transmitting SMS notifications related to medication reminders and health monitoring alerts, thereby enhancing patient supervision and healthcare support.

VII. Experimental Setup

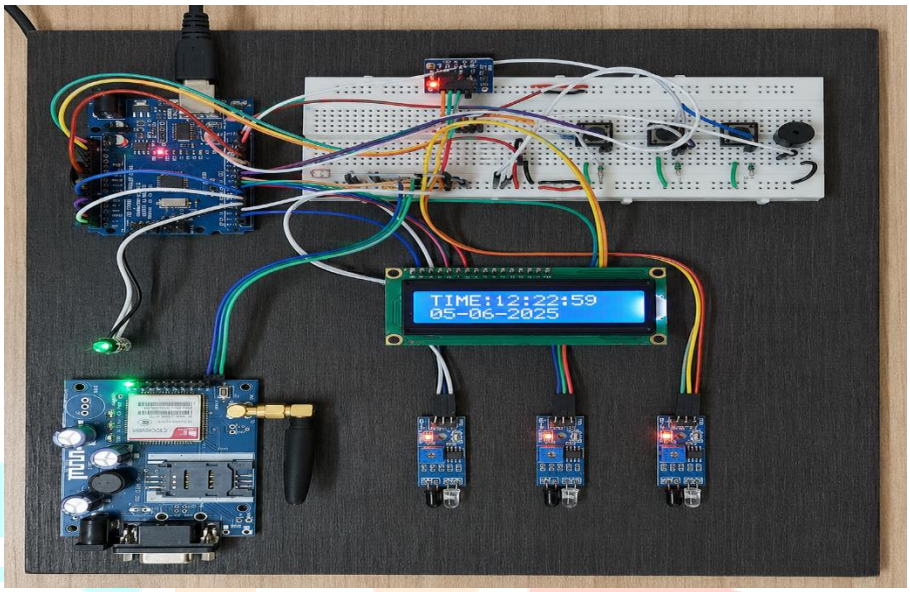

Fig. 2: Prototype Kit of Smart Medication Reminder and Health Monitoring System

The developed hardware prototype integrates an Arduino Uno, GSM module, RTC module, IR sensors, LCD display, buzzer, and control buttons to provide automated medication reminders and health monitoring functions. The system generates timely alerts, displays real-time information, and supports remote notification through GSM communication, enhancing patient safety and medication adherence.

VIII. Conclusion and Future Works

In this research, an IoT-based smart medication reminder and health monitoring system was successfully designed, developed, and evaluated to address challenges associated with medication non-adherence and inadequate health supervision. The system integrates an Arduino Uno, DS3231 RTC module, pulse sensor, LM35 temperature sensor, GSM communication module, LCD display, buzzer, and IR sensors into a unified healthcare platform. Experimental results demonstrated reliable reminder scheduling, accurate monitoring of vital parameters, effective alert generation, and dependable SMS notification capabilities. The developed solution assists patients in following prescribed medication schedules while providing continuous observation of essential physiological conditions. Its low cost, ease of operation, and dependable performance make it suitable for elderly individuals, chronically ill patients, home healthcare environments, and remote monitoring applications. The study confirms that integrating sensing, communication, and automation technologies can significantly improve healthcare assistance and patient safety. Future work can focus on incorporating cloud connectivity for real-time data storage and remote access, mobile application support for enhanced user interaction, and automated medicine dispensing mechanisms for improved compliance. Additional enhancements may include wearable sensors, GPS-based patient tracking, artificial intelligence for predictive health analysis, advanced anomaly detection algorithms, and secure data management features to create a more intelligent, scalable, efficient, and comprehensive healthcare monitoring ecosystem for diverse clinical and community healthcare settings.

REFERENCES

[1] T. Srujana, K. Naresh, and O. Saritha, "SMART IoT-Based Pill Reminder: Enhancing Medication Adherence and Remote Supervision," 2024.
[2] P. Dayananda and A. G. Upadhya, "Development of Smart Pill Expert System Based on IoT," 2024.
[3] M. Alruwaili and A. Almutairi, "Smart Pill Box: An IoT-Integrated Application for Monitoring Medication Intake," 2025.
[4] M. M. Hassain and M. A. Rahman, "Voice Activated Medicine Reminder Box with IoT Health Monitoring for Old People and Hospital," 2025.
[5] S. Siddiqha and R. Maheshwari, "IoT-Based Pill Reminder and Monitoring System," 2023.
[6] M. K. Singh and A. Kumar, "IoT Based Pill Dispenser System," 2024.
[7] P. Fadanvis and M. Dehankar, "Medicine Reminder and Monitoring System for Secure Health Using Internet of Things," 2021.
[8] V. Rajesh and P. Srinivas, "IoT-Based Kit for Medication Monitoring," 2024.
[9] A. Kumar and S. Patel, "Smart IoT-Based Medication Adherence System for Real-Time Healthcare Monitoring," 2025.
[10] S. Smith and J. Brown, "IoT Based Smart Medicine Reminder," 2024.
[11] R. Sharma and P. Verma, "Smart Medication Management and Pill Dispensing System with Health Monitoring," 2024.
[12] V. Peddisetti and A. Panangadan, "Enhancing Medication Adherence with an IoT-Based Pill Management System," 2024.