IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

# IoT Based Smart Medicine Reminder

**Dhanashri Rajmane, Monika Pawar, Varsha Jagdale, Sakshi Patil, Prof. Rukyabano M Sayyad**
Al-Ameen Educational and Medical Foundations College of Engineering and Management Studies, Pune

**Abstract:** *The IoT-Based Smart Medicine Reminder with Authentication is a healthcare solution designed to ensure that patients take their medications on time and prevent unauthorized access to medicines. This system is particularly useful for elderly individuals, chronic disease patients, or individuals with memory impairments, where regular medication intake is crucial for effective health management. Traditional methods, such as pill boxes and alarm reminders, lack the capability to authenticate the person taking the medication or track real-time adherence remotely. This project integrates Internet of Things (IoT) technology with Radio Frequency Identification to provide a smart, secure, and user-friendly medicine reminder system.*

*The proposed system is composed of several key components: a microcontroller (NodeMCU or ESP32), reader, medicine storage compartments, LCD display, buzzer alarm, and Wi-Fi connectivity. Each medication compartment is assigned a time schedule, and the system triggers an alarm and displays instructions when it is time to take a particular dose. The system leverages authentication to ensure that only authorized users can access specific medicines, preventing misuse or unauthorized access, which is crucial in multi-patient environments or homes with children. The IoT integration allows the system to send real-time notifications to a caregiver or family member via a mobile application (such as Blynk or a custom app). It also logs the medication intake in the cloud for tracking adherence and generates alerts for missed doses..*

**Keywords:** Medicine Reminder

## I. INTRODUCTION

In today's fast-paced world, ensuring medication adherence is a critical challenge, especially for elderly individuals, patients with chronic illnesses, or those with cognitive impairments. Missing doses or improper medication intake can result in severe health risks, increased hospitalizations, and higher healthcare costs. Traditional medication management methods, such as pill organizers or phone alarms, lack the ability to confirm if the medication was taken correctly or if it was accessed by an authorized individual. This underscores the need for smart healthcare solutions that can not only provide timely reminders but also ensure security and accountability in medicine intake.

The IoT-Based Smart Medicine Reminder System with Authentication aims to bridge this gap by leveraging the power of Internet of Things (IoT) technology and authentication to create a secure, reliable, and effective medicine management solution. The integration of IoT enables real-time monitoring, remote access to medication logs, and the generation of alerts for missed doses. This ensures better patient outcomes by keeping caregivers and healthcare providers informed of the patient's medication compliance. Additionally, authentication provides a security layer to ensure that only authorized individuals have access to the medication, which is especially important in households with children or multi-patient environments such as nursing homes and hospitals.

### Need for Smart Medicine Management Systems

Medication adherence plays a vital role in patient health management, especially for those suffering from chronic conditions such as hypertension, diabetes, or cardiovascular diseases. Studies show that poor adherence to medication is associated with worsening health conditions, higher hospitalization rates, and increased healthcare **costs**. The growing aging population further complicates the situation, as many elderly individuals struggle to manage their medication regimens. Caregivers and family members often rely on manual tracking methods, which can be prone to human error, leading to missed or incorrect doses.


DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

Additionally, some medications have a restricted access policy to prevent misuse or overdose, making it essential to ensure that only authorized individuals can access them. In healthcare institutions, managing medication schedules for multiple patients can be overwhelming for caregivers, increasing the risk of medication errors. Thus, a smart, automated, and secure medicine management system is crucial to reduce these risks and enhance patient safety

**Need for Smart Medicine Management Systems**

Medication adherence plays a vital role in patient health management, especially for those suffering from chronic conditions such as hypertension, diabetes, or cardiovascular diseases. Studies show that poor adherence to medication is associated with worsening health conditions, higher hospitalization rates, and increased healthcare **costs**. The growing aging population further complicates the situation, as many elderly individuals struggle to manage their medication regimens. Caregivers and family members often rely on manual tracking methods, which can be prone to human error, leading to missed or incorrect doses.

Additionally, some medications have a restricted access policy to prevent misuse or overdose, making it essential to ensure that only authorized individuals can access them. In healthcare institutions, managing medication schedules for multiple patients can be overwhelming for caregivers, increasing the risk of medication errors. Thus, a smart, automated, and secure medicine management system is crucial to reduce these risks and enhance patient safety

## II. LITERATURE SURVEY

**IoT in Healthcare (Patel et al., 2021)**

This study explores the adoption of IoT solutions in healthcare, particularly for remote patient monitoring. It emphasizes the benefits of real-time alerts and remote data access in improving patient outcomes. However, it identifies security challenges, which can be mitigated with authentication.

**Medication Adherence Issues (Brown & Bussell, 2018)**

The research highlights non-adherence to medications as a significant healthcare challenge, leading to adverse health outcomes and higher healthcare costs. It calls for smart reminder systems to enhance adherence, especially for elderly patients.

**Smart Pill Dispensers (Alvarez et al., 2019)**

The study investigates smart pill dispensers with IoT features, providing reminders through alarms and mobile apps. However, it notes the need for better authentication mechanisms to prevent unauthorized access.

**Cloud-Based Healthcare Solutions (Sharma et al., 2022)**

This research focuses on the role of cloud platforms in storing healthcare data, facilitating remote monitoring. It highlights the value of integrating IoT with cloud services for efficient healthcare management.

**Elderly Care through IoT (Zhang et al., 2019)**

The paper explores how IoT systems can assist elderly individuals in managing their daily activities, including medication intake. It stresses the importance of usability and accessibility in such systems.

**Mobile Health Applications (Kim et al., 2018)**

The research examines mobile health apps used to track medication schedules. It identifies challenges related to user engagement and suggests that real-time alerts can improve adherence.

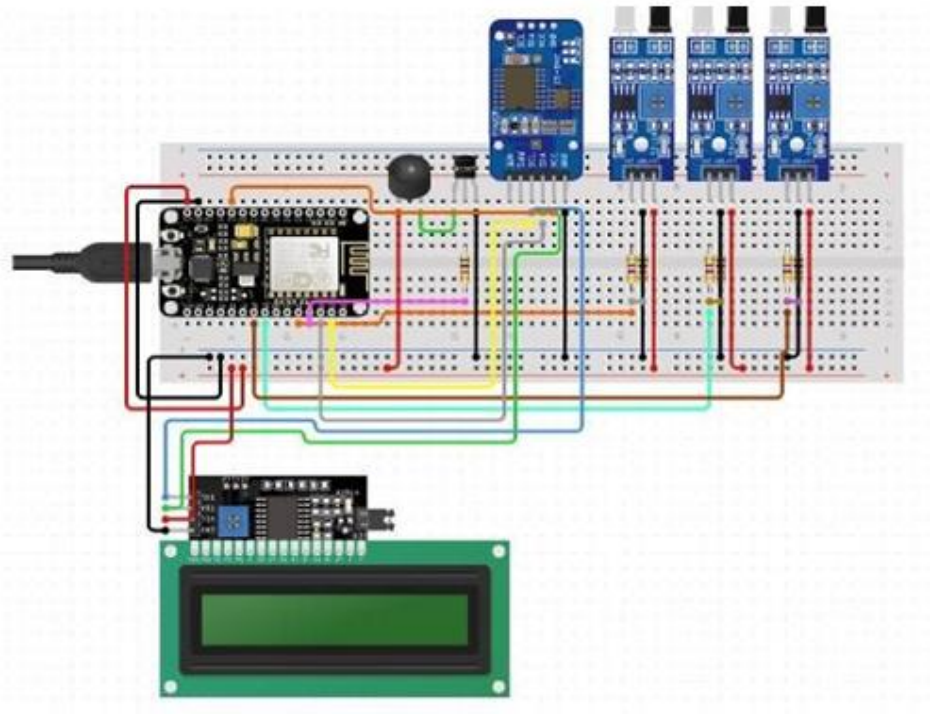
**Impact of Medication Reminders on Adherence (Smith et al., 2021)**

This study shows that medication reminder systems significantly improve adherence in patients with chronic conditions. It recommends integrating reminders with authentication mechanisms for better outcomes.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**Smart Homes for Healthcare (Ghayvat et al., 2019)**
This research discusses the concept of smart homes with integrated healthcare devices. It suggests that medicine reminder systems can play a crucial role in independent living for elderly individuals.

## III. BLOCK DIAGRAM



**Description of proposed work**
The IoT-Based Smart Medicine Reminder with Authentication is a healthcare project designed to ensure patients adhere to their prescribed medication schedules while maintaining security through authorized access. The system aims to automate the medication reminder process, prevent unauthorized access to medicine, and enable remote monitoring for caregivers or healthcare providers. This project combines IoT technology and based security to provide a practical, scalable solution for both home and institutional healthcare environments.

**System Design Features**
**1. IoT-Based Remote Monitoring:**
The system provides real-time data on medication adherence, accessible from anywhere through the cloud. Caregivers and healthcare providers can monitor patient behavior remotely.
**2. User-Friendly Interface:**
The LCD display provides clear instructions, and the mobile app offers easy access to medication schedules and alerts. This ensures the system is suitable for elderly patients.
**3. Alerts and Notifications:**
Alarms, display prompts, and mobile notifications ensure that patients do not miss their medication, even if they are away from home.
**4. Customizable Medication Schedule:**
The system can handle multiple medications with different schedules, making it suitable for patients with complex treatment regimens.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**Hardware and Software Integration**

**Hardware:**

o ESP32/NodeMCU microcontroller
o LCD/OLED display
o Buzzer/alarm
o Wi-Fi module (integrated with ESP32) • Software:
o Arduino IDE for coding the microcontroller
o Firebase notifications
o Android/iOS app for caregiver monitoring and schedule setup

**Applications of the Proposed System**

1. Home Healthcare:
o Helps elderly or chronically ill patients manage their medications independently with minimal caregiver intervention.
2. Hospitals and Nursing Homes:
o Ensures secure and error-free medication management for multiple patients, reducing the workload on healthcare staff.
3. Remote Patient Monitoring:
o Caregivers and family members can monitor medication adherence remotely, improving patient outcomes through timely interventions.
4. Pharmaceutical Compliance:
o Helps patients follow strict medication regimens prescribed by doctors, ensuring better treatment outcomes.

**Advantages of the Proposed System**

1. Improved Adherence: Automated reminders ensure timely medication intake.
2. Remote Access: Caregivers can monitor adherence from any location using the cloud
3.Error Reduction: Reduces the risk of medication errors in multi-patient environments.
4. Scalability: The system can be easily adapted for use in homes, hospitals, or nursing facilities.

**2. Key Features:**

**Real-Time Monitoring:**

Continuous monitoring of environmental conditions and immediate data transmission ensures real- time awareness of hazardous conditions.

**Wireless Communication:**

The system employs the NRF24L01 wireless transceiver for low-power, effictive communication between the transmitter and receiver. The NodeMCU provides Wi-Fi connectivity for cloud integration, allowing the data to be remotely accessible

**Cloud Integration:**

Firebase acts as the backend to store and retrieve data, making it accessible from anywhere
in real- time. This is essential for remotely monitoring worker safety and reviewing historical data for future analysis.

**Safety Alerts:**

The system is designed to instantly alert workers in case of dangerous situations. Local alarms and cloud notifications ensure that appropriate action can be taken quickly to avoid accidents.

**Scalability:**

The modular design allows for easy expansion to include additional sensors or connect multiple transmitter units to the same receiver, covering larger areas or more parame

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**Applications:**

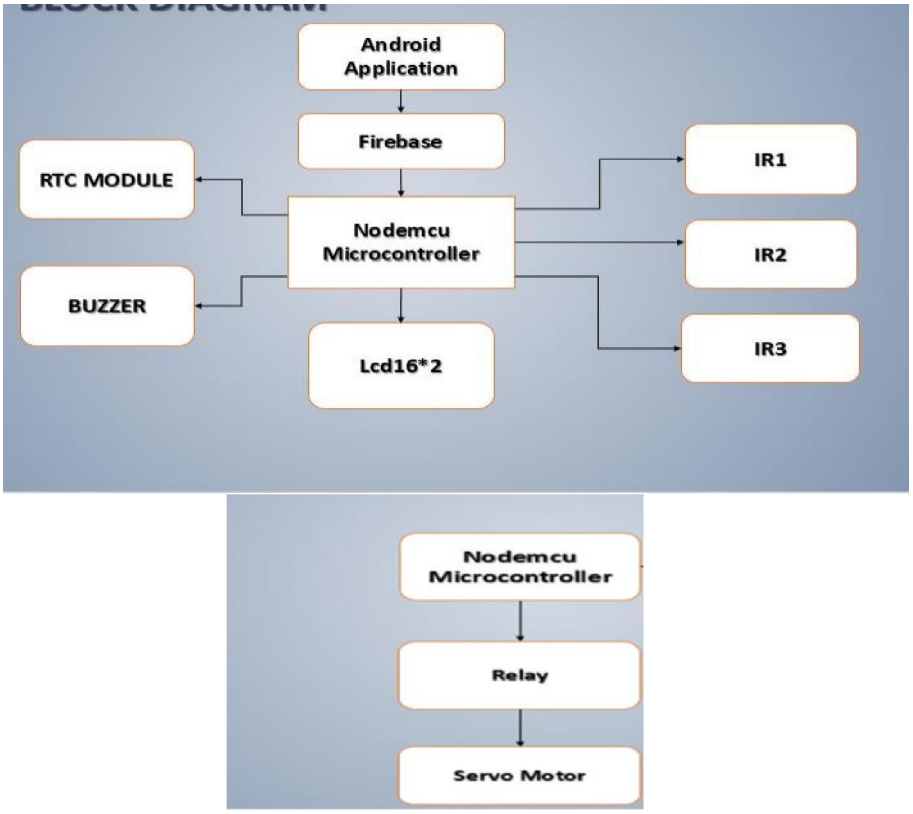
**Construction Sites:**

Workers in construction often face risks due to unstable structures, heavy machinery, and hazardous materials. This system can monitor for dangerous conditions, such as gas leaks or unsafe temperature levels, and alert workers in real time.

**Mining Operations:**

The presence of harmful gases and the potential for collapses makes mining a highly dangerous occupation. The IoT-based safety system will allow for continuous monitoring of gas levels and temperature, preventing disasters.

**Detail of Individual block**



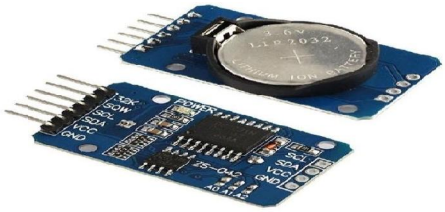

**NodeMCU Microcontroller:**

NodeMCU is an open-source IoT platform based on the ESP8266 Wi-Fi chip, providing easy access to Wi-Fi communication. It can be programmed using the Arduino IDE, and it supports various IoT protocols like HTTP, MQTT, and Blynk. It features multiple GPIO pins that allow interfacing with sensors, actuators, and modules. The microcontroller's built-in Wi-Fi capabilities make it ideal for smart home or remote monitoring projects. It can also access cloud services, enabling real-time control through apps like Blynk. Its compact size and affordability make it a popular choice for prototyping and IoT projects

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**RTC Module (Real-Time Clock):**

An RTC module is a timekeeping device that maintains precise time even when the microcontroller is powered off. It uses a small coin-cell battery to keep running, ensuring that the correct time is retained. RTCs are crucial for applications where precise scheduling or timestamps are required, such as attendance systems or alarms. They communicate with microcontrollers through I2C or SPI protocols, providing date and time information. Common RTC models include DS1307 and DS3231, known for their accuracy and ease of use. These modules are also used to log events with exact timestamps.



**Buzzer:**

A buzzer is an electronic component that emits sound when activated, usually used for alerts or alarms. It comes in two main types: active and passive. Active buzzers produce sound continuously when powered, while passive buzzers need a signal to create sound. They are commonly used in systems to notify users of specific events like successful authentication or sensor detection. Buzzers are inexpensive and easy to interface with microcontrollers through GPIO pins. They require a low amount of current, making them suitable for battery-powered applications. Adjustable sound patterns can be achieved by controlling the signal frequency.

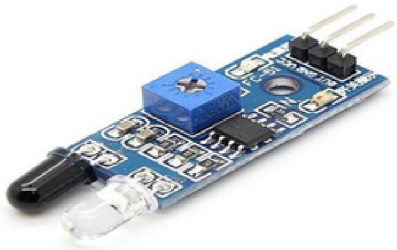
**LCD 16x2 (Liquid Crystal Display):**

The 16x2 LCD is a basic alphanumeric display capable of showing 16 characters per line across two lines. It is widely used in embedded systems to display information such as sensor readings, system status, or time. It communicates with microcontrollers via parallel communication, though I2C versions are also available for simpler wiring. Each character on the display is formed by a 5x8 dot matrix, providing readable text output. The LCD requires minimal power, making it suitable for battery-operated devices. Programmers can customize messages to appear dynamically based on sensor inputs or system status.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**IR Sensors (Infrared Sensors):**

IR sensors detect objects or measure distances using infrared light, making them useful for obstacle detection or motion sensing. They work by emitting IR rays, which reflect off objects and are captured by the sensor's photodiode. The reflected signal is converted into an electrical signal, which is processed to detect the presence or distance of an object. These sensors are used in automatic doors, robotic navigation, and safety systems. IR sensors come in different configurations, such as proximity sensors, distance sensors, and break-beam sensors. They are easy to integrate with microcontrollers through GPIO pins for triggering specific actions.



**Relay:**

A relay is an electromechanical switch used to control high-power electrical devices with a low-power signal from a microcontroller. It consists of a coil that, when energized, creates a magnetic field to move a switch, allowing high-power circuits to open or close. Relays are essential for home automation systems to control appliances, lights, or motors. They come in various configurations like single-channel or multi-channel boards. Using relays, microcontrollers can safely operate devices connected to higher voltage sources. They provide electrical isolation, protecting the microcontroller from voltage spikes or surges.


**Servo Motor:**

A servo motor is a rotary actuator that provides precise control over angular or linear position. It contains a motor, a potentiometer for feedback, and control circuitry. Servo motors are widely used in robotics, drones, and automation systems requiring precise movement, such as door locks. They operate on a PWM (Pulse Width Modulation) signal to achieve a specific angle, typically between 0° and 180°. Servos are lightweight and easy to interface with microcontrollers via GPIO pins. These motors are ideal for small projects because of their smooth movement and low power consumption

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

**Specifications of proposed system.**

**Specifications:**

1. Microcontroller: NodeMCU ESP8266
• Wi-Fi enabled microcontroller for IoT applications.
• Manages communication with the Blynk cloud platform.
• Controls peripheral components like, servo motor, relay, and sensors.

**2. Servo Motor (SG90):**
• Rotation Range: 0° to 180°
• Voltage: 5V
• Torque: 1.8 kg/cm

**3. Relay Module (5V, SPDT):**
• Operating Voltage: 5V
• Switching Voltage: 240V AC or 30V DC
• Purpose: Controls the activation of high-power devices, such as servo motors for door unlocking.

**4. Real-Time Clock Module (DS3231):**
• Accuracy: ±2 ppm from 0°C to +40°C
• Communication: I2C
• Battery Backup: CR2032 coin cell
• Purpose: Keeps track of real-time to trigger medication reminders at scheduled times.

**5. IR Sensors (TSOP1738 / TCRT5000):**
• Operating Voltage: 3.3V – 5V
• Purpose: Detects the presence of a person in the room to ensure the medicine alert is effective.
• Sensors used: 3 IR sensors for multiple locations/rooms.

**6. Buzzer:**
• Voltage: 5V
• Current: 30 mA
• Purpose: Sounds an alert for medicine reminders or warning in case of unauthorized access.

**7. LCD Display (16x2):**
• Type: Alphanumeric Display (16 characters x 2 rows)
• Communication: I2C (for fewer pins used)
• Purpose: Displays system messages, such as “Authentication Success,” “Medicine Time,” and current time.

**8. Firebase (optional):**
• Purpose: Stores user and medicine reminder data on the cloud for real-time synchronization with the Blynk app.

**Power Supply Specifications:**
• Voltage: 5V DC regulated supply for NodeMCU, sensors, and servo motor.
• Battery Backup: CR2032 for RTC module.

System Features:
• Access Control: Ensures only authorized users can unlock the door using tags.
• Medicine Reminder Alerts: Provides reminders at scheduled times with buzzer alerts and Blynk notifications.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

• Remote Monitoring: Allows users to track access events and medicine schedules via the Blynk app.
• Power-efficient: Uses relays to control high-power components only when necessary.
• Real-time Operation: RTC ensures precise scheduling even if the system is powered off.

## IV. CONCLUSION

The proposed based Authentication and Medicine Reminder System presents a multi-functional solution that integrates secure access control, IoT-based remote monitoring, and health tracking. In today's fast-evolving industrial and healthcare landscape, such systems provide critical value by enha1. Multifunctional System with Dual Purpose
This system offers two essential functionalities:
Medicine Reminder System: The inclusion of an RTC-based reminder mechanism addresses the growing need for health monitoring, ensuring timely consumption of medicine, especially for employees working in demanding environments.
By combining these two functions, the system provides not only security but also employee wellness, which is increasingly prioritized by modern organizations.

Relevance in Industry 4.0
The concept of Industry 4.0 revolves around smart technologies that leverage the Internet of Things (IoT), automation, remote monitoring, and cloud connectivity. This system perfectly aligns with this vision by integrating multiple components—such as, NodeMCU, , and Firebase—to create a seamless experience.
The system automatically logs access attempts and medicine reminders in the cloud, which reduces the need for manual monitoring and enhances operational efficiency.
This level of integration makes it a valuable asset for organizations striving to adopt smart infrastructure.
The system also triggers actions like unlocking doors using a servo motor, ensuring secure and controlled access to authorized personnel only. By enabling remote logging and notifications via the Blynk app, organizations can receive immediate alerts in case of unauthorized access attempts, enhancing security oversight.

IoT-Driven Health Monitoring and Employee Wellness
As industries place a growing focus on employee health and safety, this system offers a proactive approach to health management. Timely medicine reminders help employees manage their health, particularly in high-stress roles, shift-based jobs, or industrial settings where work schedules may disrupt regular routines.
RTC modules ensure accurate scheduling of reminders, while IR sensors detect the presence of individuals to ensure the reminders are effective.
Organizations benefit from reduced health risks and increased productivity, as the system helps employees manage chronic conditions efficiently.

Cost-Effective, Modular, and Scalable Solution
The proposed system is built using low-cost components such as NodeMCU, modules, RTCs, and IR sensors, making it an affordable solution for small and large-scale deployments. Its modular design ensures that additional functionalities can be added without overhauling the entire system
• New sensors, such as temperature sensors or biometric readers, can be easily integrated into the system for future expansions.
• Scalable architecture ensures that the same system can be adapted to new environments, such as hospitals, warehouses, offices, or residential complexes.
• The open-source nature of NodeMCU and Arduino ensures that organizations can continuously upgrade and customize the system as needed.
This level of scalability makes the system future-proof and adaptable to changing business or industrial needs.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, April 2025
Impact Factor: 7.67

Potential Applications in Various Domains

This system is not limited to industrial applications. It offers value across multiple domains:

1. Industrial Plants: Secure access to restricted areas (e.g., control rooms, warehouses) and medicine reminders for employees on shift work.
2. Hospitals and Clinics: Secure storage for medical supplies and automated medicine reminders for patients or staff.
3. Offices: Control access to meeting rooms and provide wellness monitoring for employees.
4. Educational Institutions: Secure access to labs and server rooms, along with wellness tracking for students or staff.
5. Residential Buildings: Secure entry and exit points, along with reminders for elderly residents to take their medication.

The versatility of the system makes it a practical solution across a wide range of environments.

Sustainability and Energy Efficiency

The system promotes energy-efficient operation by using relays to control high-power components like servo motors, ensuring they are only activated when necessary. Additionally, the NodeMCU's low-power mode reduces energy consumption when the system is idle.

The system also minimizes wastage of time and resources by automating tasks, such as access control and medicine reminders, reducing the need for human intervention.

Future Scope and Improvements

As technology evolves, this system can be enhanced in several ways:

• Integration with AI: Predictive analytics can be added to anticipate user behavior or suggest medicine schedules based on historical data.
• Voice Assistance: Integration with voice assistants like Alexa or Google Assistant for hands-free interaction.
• Cloud Storage Expansion: Use advanced cloud services for data analytics and long-term health monitoring.

These improvements would further enhance the system's capabilities, aligning it with future technological advancements.