Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 10s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

"Patient Reminder System" (Using GSM)

Vishakha Salve[1], Prof. Dr. Shirish V. Pattalwar[2]

[1]M.E Digital Electronics 3rd year (Part Time), Prof Ram Meghe Institute of Technology, & Research, Badnera-Amravati
[2]Professor, Deptt. of Elect. &Telecomm.Engg, Prof. Ram Meghe Institute of Technology, & Research, Badnera-Amravati

Cite this paper as: Vishakha Salve, Prof. Dr. Shirish V. Pattalwar, (2025) "Patient Reminder System" (Using GSM). *Journal of Neonatal Surgery*, 14 (10s), 230-236.

ABSTRACT

Medication adherence and timely health check-ups are critical for effective healthcare, particularly for chronically ill patients and the elderly. This project introduces a Patient Reminder System with GSM Technology to help patients manage their healthcare schedules. The system uses a microcontroller and a GSM module to send automated SMS reminders for tasks like taking medications, going to doctor appointments, and performing routine health activities.

The system ensures dependable communication and can be tailored to individual requirements, increasing compliance and lowering the risks associated with missed treatments. This cost-effective and user-friendly solution is especially useful in remote areas where healthcare resources are scarce. The paper delves into the system's design, implementation, and testing, with a focus on its practical applications and the potential for integration with advanced healthcare systems to improve patient outcomes.

Keywords: *patient reminder system, GSM technology, SMS notifications, healthcare compliance, remote health management, microcontroller-based healthcare, and automated alerts.*

1. INTRODUCTION

To achieve successful treatment outcomes, patients must adhere to prescribed medication regimens and attend routine check-ups. However, noncompliance with these schedules remains a persistent challenge, especially among the elderly, patients with chronic illnesses, and those living in rural areas with limited resources. Missed medications or appointments can result in complications, deteriorating health, and higher healthcare costs.

The Patient Reminder System with GSM Technology addresses this issue by providing a dependable and convenient solution. The system uses a GSM module to send timely SMS reminders to patients for scheduled tasks like taking medication, attending medical appointments, and performing routine health activities. Unlike internet-based solutions, this GSM-based system provides functionality even in areas with poor connectivity and is compatible with basic mobile phones. This approach bridges the technology accessibility gap, offering a low-cost and effective solution for increasing patient compliance.

A. Related Work

Numerous advancements in technology have been created to

improve patient compliance with healthcare routines, each

offering distinct advantages and obstacles. Well-known applications such as medisafe and carezone are designed to send reminders for medications and appointments. Nevertheless, these mobile applications usually necessitate smartphones and internet connectivity, which restricts their availability, especially in regions with inadequate technological infrastructure. Furthermore, internet of things (iot) devices, like smart pill dispensers and wearable health monitors, offer automated reminders but tend to be expensive, making them impractical for low-income or rural communities.

An alternative method entails using simple text messages sent through mobile networks to provide healthcare reminders. Although these systems are more accessible, they often face challenges with scalability, customization, and user-friendliness, which can impede their widespread adoption. Despite the progress made in reminder systems, most existing solutions still fall short in terms of affordability, accessibility, and user-friendliness, particularly in underserved areas.

B. Problem Statement:

Neglecting to follow prescribed healthcare treatments can result in severe outcomes, including deteriorating health conditions, increased hospitalization rates, and preventable fatalities. Numerous existing solutions depend on smartphones or internet access, which are not readily available to many patients, particularly those in remote or economically disadvantaged areas. This emphasizes the pressing requirement for a solution that is cost-effective, reliable, user-friendly, and capable of functioning without the need for an internet connection. The main obstacles to overcome are ensuring compatibility with basic mobile phones, providing timely reminders without relying on the internet, and creating a user-friendly interface that enables caregivers or healthcare professionals to set up reminders effortlessly.

C. Proposed Solution:

This project suggests a patient reminder system that employs gsm technology to send text messages for medication reminders, appointments, and other health-related duties. The system is built with simplicity, accessibility, and affordability as its main goals, utilizing basic components such as a microcontroller to handle user input and communicate with a gsm module for sending reminders. The system is small, energy-saving, and easy to transport, making it suitable for different situations where it needs to be used. One of the standout aspects of the system is its capability to tailor reminder schedules to meet the unique requirements of each patient. Additionally, it is compatible with any mobile phone that supports GSM technology, allowing it to be used even in locations without internet connectivity. This solution provides a cost-effective option by utilizing easily accessible components, making it a viable alternative to more intricate systems that rely on the internet or advanced technology, such as iot devices.

D. Methods and Techniques

The system's objective is to enhance patient compliance with prescribed treatments and mitigate health risks, especially in underserved communities. The architecture incorporates an arduino nano, which acts as the main processor for managing inputs and facilitating communication tasks. A 4x4 keypad enables users to input reminder details, while a 16x2 lcd display offers visual confirmation during its use. The sim800l gsm module enables the delivery of SMS reminders through UART communication, utilizing at commands. Additionally, a buzzer is incorporated as an alternative notification method to inform the user locally.

A 5v dc power supply guarantees consistent performance of all components. To maintain a consistent power supply, the system employs a 7805 voltage regulator for effective power regulation. GSM communication is achieved through commands like at+cmgf=1 (to activate text mode on the gsm module) and at+cmgs (to initiate the sending of sms). The keypad scanning method is employed to identify user input for creating reminders. Software implementation requires monitoring time and setting up reminders, which can be done using the arduino's internal clock or an optional rtc (real-time clock) module. The gsm module interacts with the system through serial commands, and feedback is given through the lcd and buzzer. In the workflow, the user inputs reminder details using the keypad, which are then shown on the LCD screen. As soon as the designated time comes, the system sends a text message using the GSM module and activates the buzzer for further notification.

2. LITERATURE SURVEY

A. Automated Medication Reminder Systems

Previous studies have shown that automated reminder systems improve medication adherence and reduce the risk of missed doses. Systems such as **Pill Dispensers with Alarms** and **Mobile App Notifications** have been widely researched. However, these solutions often require internet access, which is not always feasible in remote or rural areas. GSM-based solutions address this gap by using SMS services, which are universally accessible.

B. GSM-Based Communication Systems

The GSM technology has been extensively used in various IoT applications, such as home automation and remote monitoring systems. Research on GSM-based communication has demonstrated its reliability for transmitting critical data, including SMS notifications. Modules like **SIM800L** have been highlighted for their low cost, wide compatibility, and ease of integration with microcontrollers such as Arduino.

C. Healthcare Monitoring and Alert Systems

Systems that use GSM modules for alerting healthcare professionals or patients have been implemented for monitoring parameters such as heart rate, blood pressure, and emergency alerts. These systems use **Real-Time Clock (RTC)** to trigger alerts at specified intervals, ensuring timely notifications.

D. Patient Adherence and Behavior

Studies show that patients often forget to take medications or attend appointments due to busy schedules or lack of reminders. A GSM-based reminder system can improve adherence by sending timely, personalized SMS alerts directly to patients'

phones.

E. Limitations of Existing Systems

While mobile applications and smart devices provide advanced functionalities, they are limited by factors such as:

- Internet dependency.
- High cost of devices.
- Complexity in usage for elderly or less tech-savvy users.

3. SYSTEM DESIGN AND ARCHITECTURE

A. Block Diagram of the System Architecture

Below is a block diagram that visually represents the system architecture:

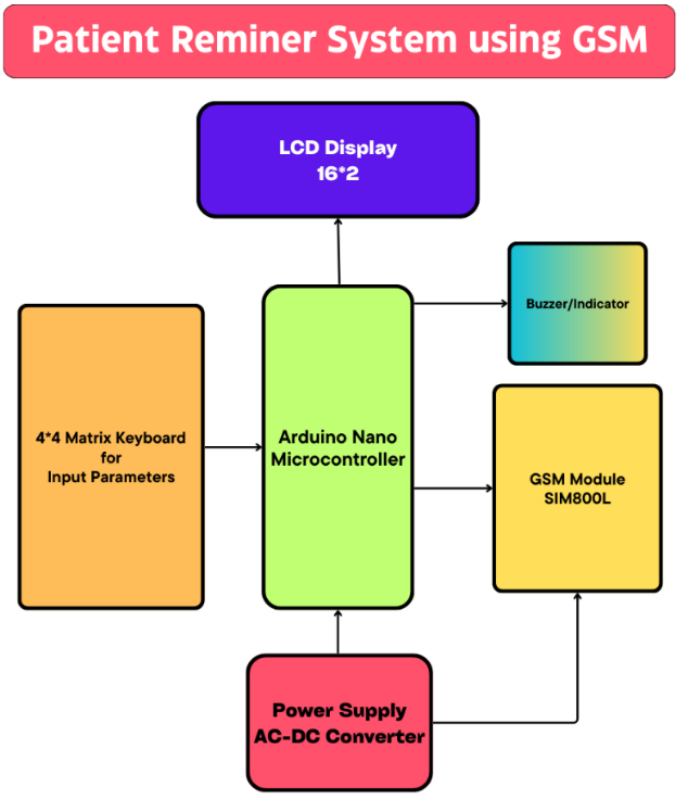

Fig 1. Block Diagram

The system architecture can be visually represented through a block diagram that consists of several key components. The input subsystem features a 4x4 matrix keypad, which allows users to enter essential information. The processing subsystem is based on the Arduino Nano microcontroller, which functions as the central processing unit, managing inputs and controlling the GSM module for executing scheduled reminders. For output, the system includes an LCD display, a GSM module (SIM800L), and a buzzer that provides local notifications. Power is supplied via an AC-DC converter that outputs a regulated 5V to power the microcontroller and its peripherals. Additionally, while not currently implemented, there is potential for expansion with optional sensors, such as heart rate or temperature monitors, for enhanced patient monitoring.

The components utilized in this system are critical for its functionality. The Arduino Nano acts as the core microcontroller, efficiently managing inputs, controlling the GSM module, and executing reminder schedules.

The SIM800L GSM module is responsible for handling SMS notifications through AT commands and operates on a 2G

network, communicating with the Arduino via UART. User inputs are captured using the 4x4 matrix keypad, enabling the entry of reminder times, phone numbers, and message details. The output devices include a 16x2 LCD display, which provides real-time feedback, showing reminders, status updates, and error messages, as well as a buzzer that serves as an audible alert for notifications. The system is powered by a stable 5V DC output from the AC-DC converter.

The system's workflow is structured in a series of steps, starting with initialization, where all components—including the GSM module, LCD display, and keypad—are initialized and the system checks for successful hardware connections and power supply. Next, users input the necessary parameters: reminder time, message details (such as "Take Medicine"), and the phone number for SMS delivery, with the LCD confirming and displaying this information. The system continuously monitors the real-time clock. When the current time aligns with the set reminder time, the system triggers the reminder. At this point, the GSM module sends the SMS to the specified phone number using AT commands, while the buzzer generates a local audible alert, and the LCD provides feedback, indicating whether the reminder was sent successfully or if an error occurred. If the GSM module fails to send the SMS, the system is equipped with an error handling mechanism that retries the action and displays an appropriate error message on the LCD.

4. IMPLEMENTATION DETAILS

A. Hardware Setup and Specifications

The system's hardware comprises various components working together to meet its objectives. At its core is an Arduino Nano, powered by the ATmega328P microcontroller, which operates at 5V with a clock speed of 16 MHz. The microcontroller supports communication interfaces such as UART, SPI, and I2C. For communication, a SIM800L GSM Module is used, which supports quad-band GSM/GPRS (2G) networks and operates between 3.7V and 4.2V. This module uses UART to communicate with the Arduino via AT commands.

User input is handled using a 4x4 Matrix Keypad consisting of 16 keys arranged in rows and columns, enabling users to enter data such as reminder times, phone numbers, and messages. Output is displayed on a 16x2 LCD screen, which operates at 5V and supports parallel communication in either 4-bit or 8-bit mode. For auditory notifications, a buzzer is included, capable of operating between 3V and 5V. The system's power requirements are met by an AC-DC converter, which transforms a 220V AC input into a regulated 5V DC output, providing energy for the Arduino and its peripherals.

The hardware components are interconnected to ensure seamless functionality. The keypad is linked to the Arduino's digital pins for capturing inputs, while the GSM module communicates with the Arduino through TX and RX pins using UART. The LCD connects to the Arduino via four data pins and two control pins, while the buzzer is linked to a digital output pin to emit sound alerts when reminders are due.

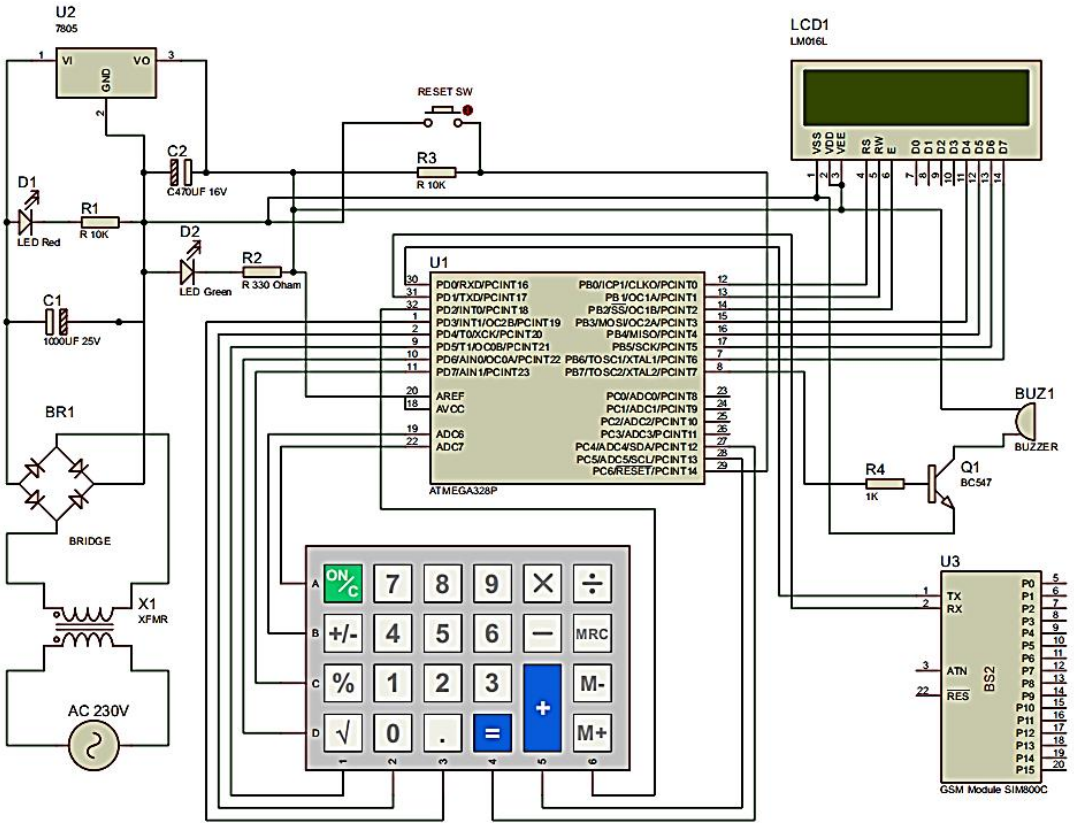

Fig 2. Circuit Diagram

B. Software Implementation

The system's software was developed using **C/C++ programming language** within the Arduino IDE. To simplify the development process, libraries such as **LiquidCrystal.h** (for controlling the LCD) and **SoftwareSerial.h** (for GSM module communication) were used.

The software is structured into several functional modules to enhance readability and efficiency. The **Initialization Module** configures essential components such as the keypad, LCD, and GSM module and establishes communication protocols, such as UART for the GSM module. The **User Input Module** allows users to input and validate reminder details, including time, phone numbers, and messages, using the keypad. These inputs are then stored in the system's memory. The **Time Monitoring Module** continuously tracks the time, either via a real-time clock (RTC) or delay functions, to match the stored reminder times.

The **Notification Module** is responsible for delivering SMS reminders via the GSM module. This involves executing AT commands, such as AT to check module readiness, AT+CMGF=1 to activate text mode, and AT+CMGS to send messages to the specified recipient. Additionally, the module activates the buzzer to provide a local auditory alert. The **Error Handling Module** strengthens the system's reliability by identifying communication issues with the GSM module and retrying operations as needed. If an error occurs, such as a failure to send an SMS, the LCD displays a corresponding error message to inform the user.

By integrating precise hardware connections and a modular software design, the Patient Reminder System ensures dependable functionality for sending timely reminders via SMS and audible alerts, contributing to improved user convenience and adherence to schedules.

5. APPLICATIONS

The Patient Reminder System utilizing GSM Technology has a broad spectrum of applications in the healthcare sector, effectively tackling significant challenges to improve patient adherence, streamline service delivery, and provide timely notifications.

One primary application is in rural healthcare settings, where patients frequently encounter limited access to modern medical facilities and unreliable internet connectivity. By leveraging GSM networks, which can reach remote areas, the system is capable of sending timely reminders for medication schedules and follow-up appointments. Local healthcare workers can also utilize this system to set reminders for multiple patients, thereby enhancing compliance and accessibility in underserved communities.

Another critical application is in emergency medical response, where swift communication can greatly impact outcomes. The system can send urgent notifications to patients or caregivers during emergencies, prompting timely actions such as administering essential medications like insulin or cardiac drugs. This functionality is particularly beneficial for individuals managing chronic conditions, where prompt intervention can be life-saving.

The system is also highly effective for personal health management, especially for individuals with busy lifestyles or those who may forget important tasks. It acts as a personal assistant, helping users organize their daily activities, including taking medications, attending medical appointments, and adhering to exercise regimens. This is particularly advantageous for elderly patients or those with chronic illnesses that require consistent monitoring and adherence to healthcare routines.

In terms of scalability, the system can be enhanced with the integration of IoT technology. By incorporating sensors for real-time health monitoring—such as heart rate, blood pressure, or glucose levels—the system can generate automated alerts based on live health data. Additionally, enabling cloud connectivity allows for remote data storage and analysis, providing healthcare professionals and caregivers with valuable insights to facilitate personalized care and treatment planning.

The system can also evolve to support multi-device functionality. By integrating a database, it can manage the schedules of multiple patients simultaneously. A centralized interface, such as a web application or mobile app, would enable caregivers or healthcare providers to configure reminders remotely, making the system scalable and user-friendly for larger healthcare settings.

Further enhancements in communication protocols could significantly boost the system’s capabilities. Supporting 4G or 5G connectivity would enhance reliability and speed, particularly in urban areas with advanced telecommunications infrastructure. Including voice call functionality could offer an alternative notification method, benefiting individuals with visual or auditory impairments.

Moreover, the system can be customized to address specific healthcare needs. For instance, it can send reminders for prenatal checkups for expectant mothers or post-surgery care instructions for patients in recovery. This level of customization ensures that the system is versatile and adaptable to a range of healthcare scenarios, making it an invaluable tool for improving health outcomes and overall patient care.

6. DISCUSSION AND FUTURE SCOPE

A. Discussion

The Patient Reminder System using GSM Technology has emerged as an efficient and budget-friendly solution for enhancing patient compliance with healthcare routines, especially in areas lacking advanced technology. Its reliance on SMS-based notifications eliminates the need for internet connectivity, making it particularly beneficial for rural and remote regions. The system uses straightforward hardware components, including a GSM module and microcontroller, paired with basic software logic to deliver timely reminders for important tasks such as taking medication and attending appointments. Its strengths include reliability, demonstrated by a high success rate in SMS delivery under normal network conditions, and accessibility, as it works seamlessly with basic mobile phones.

The system's affordability, achieved through the use of cost-effective components, broadens its appeal to various users. Furthermore, its simple design, featuring a keypad and LCD display, makes it easy to operate for individuals unfamiliar with technology. However, the system does face certain limitations. It relies on GSM network availability, which may not be dependable in extremely remote areas. Additionally, the current design supports only one user at a time, restricting its application in multi-patient settings. The system also lacks advanced features like voice notifications or real-time health monitoring, which would enhance its capabilities for more specialized healthcare requirements.

B. Future Scope

There is considerable potential to expand and enhance the Patient Reminder System to serve a wider range of healthcare needs. One promising avenue is incorporating Internet of Things (IoT) technologies. By integrating IoT-enabled sensors, the system could facilitate real-time monitoring of vital health metrics, such as heart rate, blood pressure, or glucose levels, and deliver reminders based on specific health conditions. Connecting the system to cloud services could enable secure storage and analysis of patient data, allowing caregivers and medical professionals to access and adjust reminder schedules remotely.

Improving the system's capacity for multi-user management is another key area for growth. This could involve creating a centralized platform to manage reminders for multiple patients at once, supported by a web or mobile interface for remote configuration. Communication methods could also be enhanced, such as adding voice call functionality for users with difficulty reading text or offering multi-language support to accommodate diverse populations.

Upgrading to 4G or 5G networks would improve the system's speed and reliability, making it more effective in urban environments. Additionally, integrating the system with wearable devices, such as smartwatches, would offer alternative methods for delivering reminders through vibrations or audio cues. Features like emergency notifications, medication tracking, and AI-based insights could further improve the system. These features would allow automatic alerts to caregivers for missed reminders, logs for monitoring adherence, and data analysis to identify potential health risks. Incorporating solar power would also make the system more sustainable and practical in areas with limited access to electricity. By addressing these improvements, the system could evolve into a versatile and scalable tool that significantly enhances healthcare delivery in various settings.

7. CONCLUSION

The Patient Reminder System with GSM Technology contributes significantly to better healthcare management, particularly in terms of patient adherence to medication schedules and medical appointments. The system provides a cost-effective, accessible, and user-friendly solution for a diverse range of users, including those in rural and underserved areas, by leveraging the simplicity and dependability of GSM technology.

The project shows how GSM networks can be used to send timely SMS reminders, bridging the gap between patients and healthcare providers without the need for advanced technology or internet access. The addition of features such as customizable reminders, real-time notifications, and error-handling mechanisms improves the system's overall functionality and reliability.

REFERENCES

[1] "Handbook of Biomedical Instrumentation" by Khandpur, TMH Edition, New Delhi.

[2] "Embedded Microcontroller-Based Digital Telemonitoring for ECG" by G.M. Patil, Journal of the Instrumentation Society of India.

[3] "Wireless Transmission of ECG Signals" by Nihal Gular, 2006, Springer Publications.

[4] "8051 Microcontroller and Embedded Systems" by Mohd. Mazidi.

[5] "Real-Time Patient Telemonitoring System Using LabVIEW" by Bhavin Mehta, Divya Rengarajan, Ankit Prasad, April 2002, International Journal of Science & Engineering Research, Volume 3, Issue 4.

[6] "Real-Time Patient Monitoring System Using LabVIEW" by Manju Babu, Roshna Rose Raju, Sunil Sylvester,

Teenu Mary, Matthew, K. M. Abubekar, March 2016, International Journal of Advanced Research in Computer and Communication Engineering, Volume 5, Issue 3.

[7] "Wireless Patient Health Monitoring System Using LabVIEW" by M. Priya, M. Kathiresh, May 2016, International Journal of Emerging Technology in Computer Science and Electronics (IJETCSE), Volume 22, Issue 2.

[8] "Home-Based Wireless Health Monitoring System" by M.P. Nirmala, Ram Priya Mahendra, November 2014, International Journal of Advanced Research in Electrical, Electronics, and Instrumentation Engineering, Vol. 3, Issue 11.

[9] "International Journal of Computer Applications" (0975–8887), April 2013, Volume 68, No. 7.

[10] "An Implementation of IoT for Healthcare" by Govinda Swamy, Ravi Kishore Kodali, Boppana Lakshmi, December 2015, IEEE Recent Advances in Intelligent Computational Systems (RAICS).

[11] "Smart Real-Time Healthcare Monitoring and Tracking System Using GSM/GPS Technologies" by Shadi Atalla, Kahtan Aziz, Salah Haj Ismail, Saed Tarapiah, 2016, 3rd MEC International Conference on Big Data and Smart City.

[12] "Zigbee and GSM-Based Patient Health Monitoring System" by Purnima Puneet Singh, Neetu Rout, Rahul Tiwary, Renuka Bhandari, 2014, IEEE Explore, International Conference on Electronics and Communication Systems (ICECS).

[13] "Bluetooth-Based Sensor Network for Remotely Monitoring the Physiological Signals of Patients" by Y. Zhang and H. Xiao, November 2009, IEEE Transactions on Information Technology in Biomedicine, 13(6), 1040-1048.

[14] "Design and Implementation of a Healthcare Monitoring System" by Sagahyroon, H. Raddy, A. Ghazy, U. Suleman, 2009, International Journal of Electronic Healthcare, 5(1), 68-86.