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Automatic Medicine Reminder and Recommender in critical health conditions

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Abstract: *This paper introduces an IoT-enabled smart medication reminder system utilizing Arduino Uno and Node MCU microcontrollers, along with an array of sensors and communication modules. The system's components, including IR sensors, a buzzer, LED, heartbeat sensor, and temperature sensor, work cohesively to provide personalized medication reminders and real-time health monitoring. By continuously monitoring vital signs and medication schedules, the system ensures timely medication intake through IR sensor detection, while simultaneously collecting health data for analysis. Integration with a GSM modem enables remote communication for emergency alerts or notifications to caregivers, enhancing user safety and adherence to medication regimens. This innovative solution holds promise for improving medication adherence and health management, particularly for individuals with chronic conditions or complex medication needs, offering a cost-effective and accessible approach to promoting better health outcomes.*

Keywords: *health monitoring, medication adherence, remote communication, vital signs, chronic conditions, health management*

I. Introduction

Taking medicine regularly is really important, especially for people with long-term health conditions like diabetes or heart disease. But sometimes, it can be easy to forget to take your medicine, or you might not remember when to take it. This can be a big problem because missing doses of medicine can make you feel worse and affect your health in the long run.To help people remember to take their medicine on time, we're using smart technology called the Internet of Things, or IoT for short. This technology connects different devices together to make them smarter and more helpful. With IoT, we can create a special system that reminds you to take your medicine exactly when you need it.Our system uses small computers called Arduino Uno and Node MCU, which are like tiny brains that control things. We also have sensors that can detect when you're taking your medicine, as well as other important things like your heartbeat and body temperature. These sensors help the system understand how you're feeling and if you need any special help with your medicine.By putting all these pieces together, our smart medication reminder system can give you personalized reminders and keep an eye on your health all the time. This means you won't forget to take your medicine, and you'll always know when it's time to take care of yourself. With our system, we're making it easier for people to stay healthy and manage their medicine more effectively.

In the following sections, we'll discuss how our smart medication reminder system works and how each component plays a crucial role

in ensuring timely medication intake and continuous health monitoring. We'll discuss the design and implementation of our system, including the functionality of Arduino Uno and Node MCU microcontrollers, the utilization of various sensors, and the integration of communication modules. Furthermore, we'll explore the potential benefits of our system in improving medication adherence and overall health management for individuals with chronic conditions. Through this research, we aim to contribute to the advancement of healthcare technology and provide a valuable tool for enhancing health outcomes.

II. Existing Systems

Current medication reminder systems typically rely on simple alarms or smartphone applications to alert users when it's time to take their medication. These systems often lack personalized features and real-time health monitoring capabilities. While some advanced systems may offer integration with wearable devices for basic health tracking, they are limited in their ability to adapt to individual health needs or provide targeted reminders based on the user's current condition. Overall, existing systems primarily focus on providing basic reminders rather than offering comprehensive solutions for medication adherence and health management.

III. Literature review

The literature on medication reminder systems reveals a spectrum of innovative approaches to address medication adherence challenges. Existing systems encompass various technologies, including Arduino and Raspberry Pi microcontrollers, GSM and Zigbee communication modules, and Android-based applications (Priya & Hema, 2017; Chorda et al., 2018; Gomathi et al., 2015; Sonawane et al., 2016; Priyadarshini et al., 2015; Pande et al., 2016; Ameta et al., 2015; Kataki et al., 2018; Jabeena & Sahu, 2017; Dimri & Thakral, 2020; Bhati et al., 2017; Hlaing & Naing, 2019). These systems offer functionalities such as personalized reminders, automatic dispensing, and real-time health monitoring, catering to diverse user needs. While some systems focus on simplicity and ease of use, others prioritize advanced features like remote communication and doctor-patient interaction. Despite these advancements, challenges remain in ensuring widespread adoption and effectiveness, including user acceptance, privacy concerns, and integration with existing healthcare systems. Moving forward, continued research and development in this area hold promise for further enhancing medication adherence and improving health outcomes for individuals with chronic conditions.

IV. Proposed system

In contrast, our proposed smart medication reminder system shown in Fig1 aims to revolutionize medication adherence and health monitoring through the integration of IoT technology. By leveraging Arduino Uno and Node MCU microcontrollers, along with a range of sensors such as IR sensors, heartbeat sensors, and temperature sensors, our system offers personalized reminders and continuous health monitoring capabilities. This enables the system to adapt to the user's individual health needs in real-time, providing tailored reminders and alerts based on their current condition. Additionally, integration with a GSM modem facilitates remote communication for emergency notifications or alerts to caregivers, enhancing user safety and medication adherence. Overall, our proposed system represents a

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significant advancement in medication reminder technology, offering a holistic solution for individuals with chronic conditions or complex medication regimens.

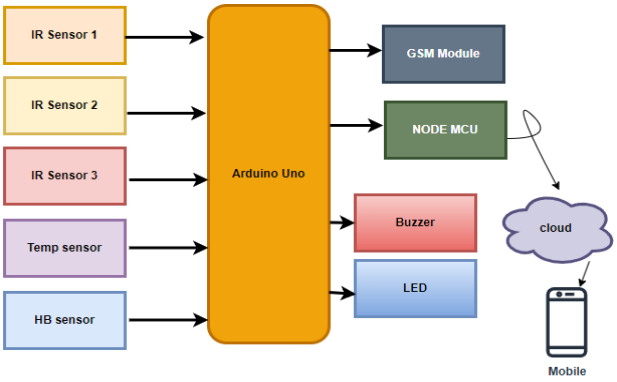

Fig 1: Block diagram of proposed system

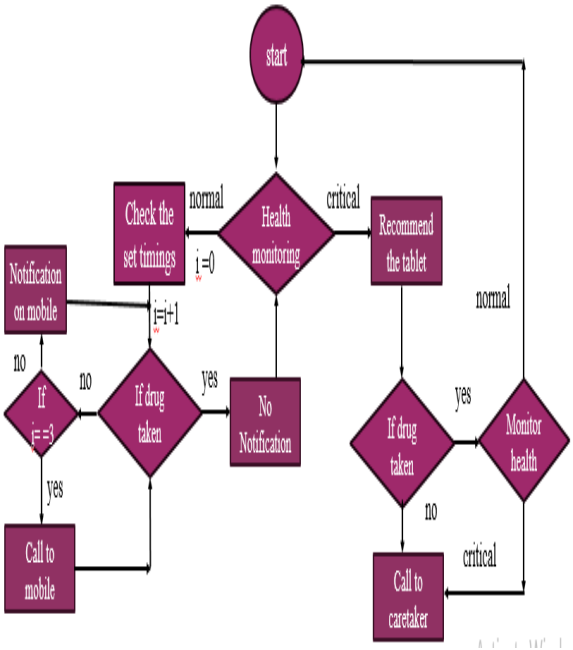

Fig 2: working flow of proposed system

V. Components and Description

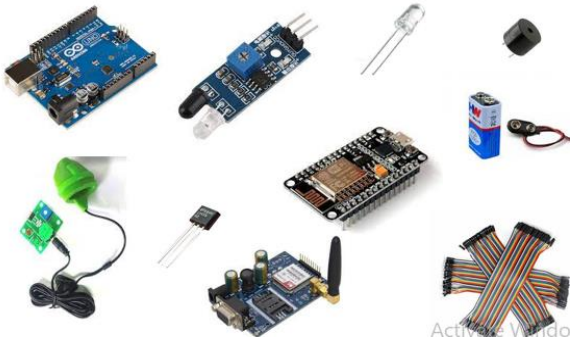

Fig 3: Hardware requirements

Arduino Uno and Node MCU: These microcontrollers serve as the brains of the system, controlling and coordinating the various components. Arduino Uno and Node MCU are popular choices for their ease of use and versatility in IoT projects.

IR Sensors, Buzzer, and LED: IR sensors detect when medication is taken, triggering the buzzer and LED to provide reminders. These components ensure that users receive timely alerts when it's time to take their medication.

Heartbeat Sensor and Temperature Sensor: The heartbeat sensor and temperature sensor continuously monitor the user's vital signs. This real-time health data allows the system to adapt reminders based on the user's current condition, ensuring personalized care.

GSM Modem: The GSM modem enables remote communication, allowing the system to send emergency alerts or notifications to caregivers. This feature enhances user safety and ensures timely assistance in case of emergencies.

9V Adapter and Connecting Wires: The 9V adapter provides power to the system, while connecting wires facilitate communication between the various components. These essential components ensure the smooth operation of the system.

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Each component plays a crucial role in the functionality of the smart medication reminder system, working together to provide personalized reminders and continuous health monitoring for improved medication adherence and overall health management.

VI. Working algorithm

Health Monitoring (Step 1): Continuously monitor the user's vital signs using sensors such as the heartbeat sensor and temperature sensor.

Recommend Tablet (Step 2): Based on the user's health data, recommend the appropriate medication if necessary.

Check if Drug Taken (Step 3): Determine if the user has taken the recommended medication. If the drug has been taken, proceed to step 5. If the drug has not been taken, proceed to step 4.

Call Caretaker (Step 4): If the drug has not been taken, initiate a call to the designated caretaker to notify them about the missed dosage.

Monitor Health (Step 5): Continuously monitor the user's health status to ensure stability and detect any changes.

Check Set Timings (Step 6): Verify the scheduled timing for medication intake. If it's time for the next dose, proceed to step 7. If it's not time yet, continue monitoring.

Check if Drug Taken Again (Step 7): Determine if the user has taken the scheduled medication. If the drug has been taken, proceed to step 9. If the drug has not been taken, proceed to step 8.

Notification on Mobile (Step 8): Send a notification to the user's mobile device to remind them about the scheduled dosage.

Check for Missed Dosages (Step 9): Keep track of the number of missed dosages. If the number of missed dosages reaches a threshold (e.g., 3), proceed to step 10. If the threshold is not reached, continue monitoring.

Call Mobile (Step 10): If the user has missed multiple dosages, initiate a call to the user's mobile phone to ensure they are aware of the missed medication and provide further assistance as needed.

VII. Results:

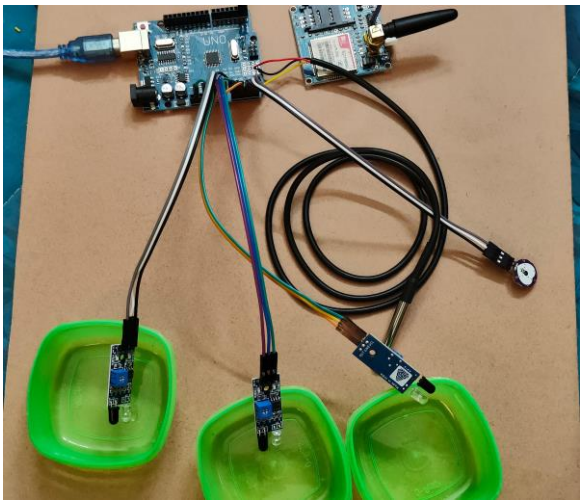

Fig 4: Developed medicine remainder system

The figure 4 illustrates the prototype of the smart medication reminder system developed in this study. The prototype comprises various components, including Arduino Uno and Node MCU microcontrollers, IR sensors, heartbeat sensor, temperature sensor, GSM modem, and connecting wires. The system is designed to provide personalized medication reminders and real-time health monitoring capabilities to users. The developed prototype demonstrates the feasibility and functionality of the proposed system in improving medication adherence and health management.

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Fig 5: Fig showing the status in mobile app

The figure 5 depicts the user interface of the accompanying mobile application, showcasing a received notification regarding medication intake status. The app displays relevant information such as the medication name, dosage, and scheduled time. Additionally, the user's medication adherence status, including missed dosages or completed intakes, is indicated for easy monitoring. This feature allows users to stay informed about their medication schedule and track their adherence conveniently through the mobile app interface.

Conclusion

The smart medication reminder system presented in this study offers a promising solution to enhance medication adherence and health management. Through the integration of IoT technology and various sensors, the prototype effectively provides personalized reminders and real-time health monitoring. The accompanying mobile application further enhances user experience by facilitating easy monitoring of medication schedules and receiving timely notifications. Overall, the system has the potential to significantly benefit individuals with chronic conditions or complex medication regimens by improving adherence and ultimately leading to better health outcomes. Further development and testing are warranted to refine the system's features and validate its efficacy in real-world healthcare settings.

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