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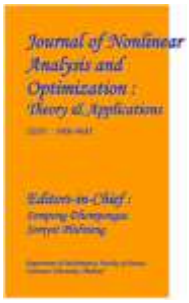

EXPERIMENTAL ANALYSIS OF IOT ASSISTED SYSTEMATIC MEDICINE DISPENSER WITH LOGICAL SENSORS

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1.ABSTRACT

Managing medication in hospitals is a complex task, particularly when it comes to ensuring that patients receive the correct medicine at the right time. The proposed Automatic Medicine Dispenser offers a simple and reliable solution to these challenges. This system automates the medication dispensing process, sends timely notifications to nurses, and ensures that patients take their prescribed doses as scheduled. By doing so, it enhances the quality of healthcare while minimizing the risk of manual errors.The system operates by dispensing pills into a small container at designated times, using a Real-Time Clock (RTC) module to ensure precise timing. This guarantees that medication schedules are adhered to, even in the hectic environment of a hospital. To keep nurses updated, the design includes a GSM module that sends real-time SMS alerts whenever pills are dispensed. This notification system ensures healthcare staff is informed about the patient's medication status, enabling improved monitoring and prompt intervention when necessary. To ensure that patients actually take their medication, the dispenser features a buzzer that activates as soon as the pills are dispensed. The buzzer rings continuously until the patient collects the pills, serving as a persistent reminder. This feature is especially beneficial for elderly patients, those with cognitive impairments, or patients who might otherwise forget to take their medicine.

The proposed dispenser is designed to be both cost-effective and scalable, making it ideal for hospitals of any size. By utilizing components such as Arduino, RTC modules, and GSM technology, the system remains affordable and easy to maintain. It can be customized to manage multiple patients, offering a flexible and versatile solution for healthcare facilities.

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2. INTRODUCTION

Healthcare systems, insurance corporations, and other stakeholders are becoming increasingly concerned about medication adherence. Because they are more likely to forget to take their medicines on time, especially when taking many medications, elderly or senior patients are more susceptible to pharmaceutical misuse. Furthermore, you run the risk of accidentally taking too much, which might be lethal. This illustrates the widespread nature of the issue, which is closely linked to poor patient outcomes and increased healthcare costs. This system's main objective is to assist patients—particularly elderly patients—in taking their prescriptions on schedule so they never forget a dose. Additionally, it reduces the possibility of inadvertently taking too much or too little. By alerting the patient and the designated nurse or caregiver, the system resolves these problems and makes sure the patient takes the recommended dosage at the appropriate time.

The proposed system enhances the concept of an automated dispenser by incorporating features not found in other similar devices. Each patient is given a unique account that can only be accessed by the patient and their caregiver, provided they have the necessary credentials. The system also offers detailed statistics on medication taken, along with information on alarms and previous doses. An online database for users, medications, and alarms plays a key role in the system's design. Additionally, alarms can be edited and created remotely using a smartphone app, offering flexibility and ease of use. To address this issue, we have developed a prototype of a pill dispenser featuring an alarm system that sends notifications to a smartphone. The goal is to create a smart, low-cost pill dispenser with an ergonomic design, specifically tailored to meet the needs of elderly users.

3. LITERATURE SURVEY

1.TAHASEENHASRATH

For non-professional users, a variety of pharmaceutical administration aids are available. Pill trays with several sections make up the majority of these manual devices. The user is supposed to take the medication from each tray every day for a maximum of 28 days, and each compartment can carry various kinds and combinations of pharmaceuticals. However, there is no alert on these gadgets to remind the user to take their prescription on time.

2.MUKUND

A gadget called the Pill-Mate Medicine Reminder alerts the user with both visual and auditory cues. It sends out reminders to take prescription drugs or go to certain events at predetermined times. Patients can avoid medication errors with the help of a smartphone application. It keeps track of users' intake regimens for future evaluation by medical specialists in addition to reminding them to take the right medications on time.

4.EXISTING SYSTEM

Some conventional medicine dispensers simply deliver medication into a box, while others allow for storing multiple doses of a

single day or even a week's worth of tablets. However, these systems often lead to issues such as missed doses and delays. Delays in medication can significantly impact a person's health and may lead to serious complications.

This system is designed for home use and is not suitable for hospital settings, where timely medication delivery needs to be managed either by the patients themselves or their caregivers.

The caregiver responsible for the patient must manually verify whether the medication has been taken. Additionally, this system does not provide any indication or reminder to the patient to take their medication on time, requiring the caregiver to perform this check manually.

The pill box is a commonly used method to help people remember their medication schedule. The most popular type is the compartmentalized pill box, which allows for organizing medications according to a set schedule, such as daily, weekly, or multiple times a day. Additionally, pill dispensers assist patients by providing reminders to take their medication on time. So far, there is no pill dispenser that reminds patients to take their medication through popup notifications on their smartphones.

DRAW BACKS :

Risk of Mismanagement: Even if medication is stored in a pill box, patients may still forget to take it, as there are no active reminders or confirmation of adherence.

Human Dependency: Caregivers are required to continuously monitor and manage the system, which reduces its reliability and increases the likelihood of human error.

5.PROPOSED SYSTEM

The proposed Automatic Medicine Dispenser is designed to improve medication management in hospitals. The system automatically dispenses the prescribed medication into a small container at scheduled times. At the same time, it sends notifications to the assigned nurse, ensuring that caregivers are kept informed of the patient's medication schedule.

To ensure the patient does not miss their dose, a buzzer will sound continuously until the pill is collected. This feature is designed to enhance medication adherence while reducing the need for human intervention and minimizing errors, making the system both reliable and user-friendly in a hospital setting.

An Automatic Pill Dispenser is a system designed to improve medication management and adherence in hospital settings. The device automates the medication dispensing process to ensure timely delivery, minimize human errors, and enhance the overall efficiency of healthcare services. The system dispenses the correct dosage of medication into a small container at scheduled times and sends real-time notifications to the nurse responsible for the patient, keeping them informed about the medication status. To further ensure timely medication intake, a buzzer sounds continuously until the patient collects the pill, promoting accountability and improving adherence.

Medication management in hospitals is a crucial process that requires both accuracy and punctuality. Nurses and caregivers frequently manage multiple patients at once, which makes it difficult to administer medications on time without errors. In such situations, delays or mistakes can have serious health consequences. The traditional manual method of dispensing medication is labor-intensive, prone to human error, and becomes less efficient as the number of patients increases. An automatic pill dispenser provides a streamlined solution to these challenges, making medication management more reliable and scalable.

ADVANTAGES

Improved Medication Adherence: The system ensures that patients receive their prescribed medication at the right time by automating the dispensing process. This reduces the risk of missed doses, particularly for elderly or cognitively impaired patients, helping to improve medication adherence.

Real-time Monitoring and Alerts: The GSM module sends real-time SMS alerts to nurses whenever pills are dispensed, ensuring that healthcare staff is always informed about the patient's medication status. This enables prompt intervention if a dose is missed or if there are any issues with the medication process.

Enhanced Accuracy and Reduced Human Error: By automating the medication dispensing process, the system minimizes the potential for human error, which can occur in manual medication management

Time Efficiency: The Real-Time Clock (RTC) module ensures precise timing for medication dispensing, making the system reliable even in the busy and fast-paced environment of a hospital.

Persistent Reminder for Patients: The buzzer feature serves as a continuous reminder for patients to take their medication.

6. BLOCK DIAGRAM

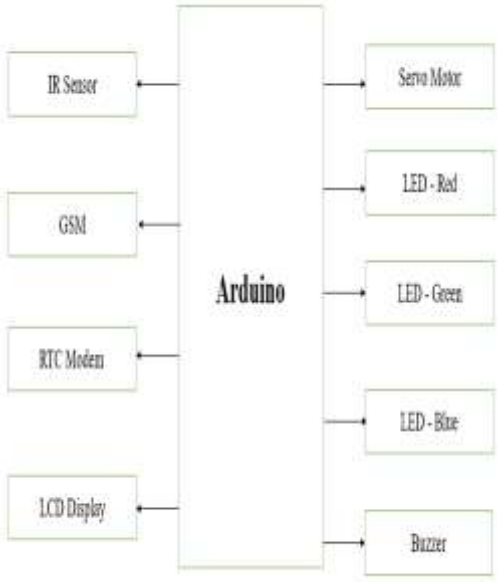

Fig.1

7.HARDWARE COMPONENTS

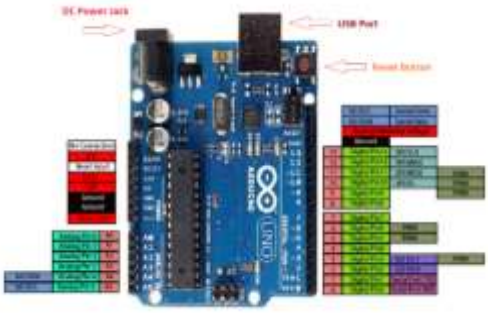

Fig.2

The Arduino Uno is an open-source microcontroller board developed by Arduino.cc, based on the Microchip

ATmega328P microcontroller. It features a range of digital and analog input/output (I/O) pins that can be connected to various expansion boards (shields) and circuits. The board includes 14 digital pins, 6 analog pins, and is programmable using the Arduino IDE (Integrated Development Environment) via a Type B USB cable. It can be powered through the USB connection or by an external 9-volt battery, with a voltage range of 7 to 20 volts. The Arduino Uno is similar to the Arduino Nano and Leonardo boards. To control the board, you send a series of instructions to the microcontroller using the Arduino programming language (based on Wiring) and the Arduino IDE, which is built on Processing.

SERVO MOTOR

High-tech industrial applications, especially in automation technology, make extensive use of servo motors. This electrical gadget, which is self-contained, spins machine parts with remarkable accuracy and efficiency. A servo motor is perfect for precise motions since its output shaft may be angled to a particular location. Servo motors are frequently found in toys, automobiles, airplanes, home electronics, and other gadgets. The definition, kinds, mechanism, principle, operation, control, and applications of servo motors are all covered in this blog.

Fig.3

LCD DISPLAY:

Liquid crystal displays, or LCDs, have become more and more common over the last few decades and are now utilized in many aspects of daily life. Examples include cell phones, e-books, GPS devices, computer monitors, automobile screens, projectors, and televisions. They play an important role in the information age and are essential to our everyday life. Unlike other display technologies, liquid crystals do not emit light; instead, they display images by altering the state of light produced by a light source. This light can come from a direct backlight placed beneath the liquid crystal panel or from an edge light placed along the edge of a waveguide sheet.

Larger LCDs are more suited for backlighting since it can provide more intense light but is bulkier. On the other hand, because of its modest size and light output, edge lighting is perfect for handheld, smaller devices. Flat fluorescent lamps (FFL), external electrode fluorescent lamps (EEFL), light-emitting diodes (LED), and cold cathode fluorescent lamps (CCFL) are common light sources for LCDs. A glass tube filled with mercury gas and having a cathode and an anode at each end makes up a CCFL. A fluorescent substance is applied to the inner surface of the tube. efficiency by reflecting polarized light in one direction and passing polarized light in another.

Fig.4

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LED

It is a p-n junction diode that emits light. It is composed of a particular kind of semiconductor and is a particularly doped diode. It is referred to as a light-emitting diode when the light emanates in the forward biased.

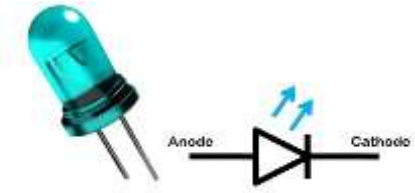

Fig.5

IR Sensor

An electrical gadget that emits infrared radiation in order to monitor different environmental conditions is called an infrared (IR) sensor. Infrared sensors are able to detect motion and measure an object's temperature. These sensors are known as passive infrared sensors because they usually measure infrared radiation instead of emitting it. Every item in the infrared spectrum emits heat radiation of some kind, which is detectable by infrared sensors but undetectable to the naked eye. Typically, an IR LED (Light Emitting Diode) serves as the emitter, and an IR photodiode, which is sensitive to the same wavelength of infrared light as the LED, serves as the detector. The resistance and output voltage of the photodiode alter in response to the amount of infrared light that strikes it.

Fig.6

LM358 OPAMP

In the infrared sensor, the LM358 operational amplifier (Op-Amp) serves as a voltage comparator. The voltage from the photodiode's series resistor (pin 3) and the threshold voltage established by the pre-set (pin 2) are compared by the comparator. This method uses a variable resistor that is pre-set, allowing the distance range at which an object should be detected to be calibrated.

Fig.7

Buzzer:

An auditory signaling device, a buzzer or beeper can be piezoelectric (piezo for short), mechanical, or electromechanical. Buzzers and beepers are frequently used for timers, alarm systems, and verifying user inputs such keystrokes or mouse clicks.

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Fig.8

GSM:

Bell Laboratories conducted research on the GSM (Global System for Mobile Communications) mobile communication modem in the 1970s. It is among the most popular mobile communication systems in the world. Mobile voice and data services can be transmitted via GSM, an open, digital cellular technology. It uses the 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz frequency ranges for operation.

Fig.9

RTC Module:

The DS3231 RTC (Real-Time Clock) Module is a compact yet powerful device that tracks the current time and date. It is widely used in computers, laptops, mobile devices, embedded systems, and various other applications. Known for its high accuracy, the DS3231 features a temperature-compensated crystal oscillator that ensures precise timekeeping even in extreme conditions. Additionally, the module is designed for low power consumption, making it an excellent choice for battery-powered applications where energy efficiency is essential.

Fig.10

8.SOFTWARE DESCRIPTION

A variety of boards based on the AVR Core are supported by the Arduino Software (IDE) by default. Users can add support for a growing number of additional boards that use other cores, including the Arduino Due, Arduino Zero, Edison, Galileo, and others, using the Boards Manager that comes with the basic installation.

9. APPLICATION

- ✓ Patient Compliance Monitoring: Ensures timely and accurate dispensing of medications, particularly for patients with complex prescriptions or chronic diseases. Tracks missed doses and alerts caregivers or healthcare professionals.
- ✓ Chronic Disease Management: Supports patients with conditions like diabetes, hypertension, or epilepsy by ensuring regular intake of critical medications. Integrates with mobile apps for tracking health metrics alongside medication schedules.

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- ✓ Hospital and Clinical Use: Reduces manual errors in dispensing medications for inpatients. Helps manage inventory of medications in real-time, ensuring timely refills.

8.CONCLUSION

The proposed Automatic Medicine Dispenser is an innovative solution aimed at tackling the ongoing challenges of medication management in hospitals. By automating the medication dispensing process and incorporating features like real-time alerts for nurses and adherence reminders for patients, this system addresses key gaps in current healthcare practices, ensuring improved efficiency and reliability. Thesystem is designed with a combination of reliable technologies, including a Real-Time Clock (RTC) module, GSM communication for notifications, and a buzzer for patient reminders, offering acomprehensive and effective solution for medication management.

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