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Smart Medicine Kit

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ABSTRACT

Health is one the most important aspects that can be considered by most of the human beings.Nowadays, Diseases keep on increasing day by day and people keep on taking tablets and certain medications to control those diseases. Missing to take tablets on time causes severe health problems to some of the sugar patients etc., but people nowadays keep on missing to take tablets in their regular life that causes health problems. Some people alter the tablet by mistake when tablets are mixed in the cover. Many uneducated people as well as visually and hearing impaired patients do not even know which tablet they have to take. According to many medical surveys many heart patients have died because of forgetting to take essential tablets. To avoid With such ill effects, we have developed a smart device which can act as an automated medical assistant to the patient. An alarm with visual indication will be given using buzzers with LED at tablet taking time and the single button will be used for opening or closing the tablet rack at that time of the alarm. A rack will be pushed, and that contains tablets to be taken at that time to avoid confusions on altering the tablets. The medicine kit configuration also done using eight buttons with multiple options like morning, afternoon, evening, night, snooze, emergency open etc., and an immediate action will be taken by sending SMS to guardian with the help GSM module when the patient missed to take the tablet. For further clarification how many times patients missed the tablet with date and time will be updated to the hospital through IoT for the corresponding patient ID. These details can be viewed by the doctor which helps to diagnose the patient. Process of this medicine kit was controlled by using an 8-bit Microcontroller.

1-INTRODUCTION

The project work entitled as "Smart Medicine Kit" describes the design and development aspects. Since it is a prototype module and for study purpose the basic concept is proven here, it can be used for real applications. The phenomenon designed in the project is the timely medicine remainder through alarm. For this module alerts the patient to have his/her medicine by energizing the alarm automatically according to the time data entered in to the embedded system through the keyboard interfaced to the controller.

Real Time Clock (RTC): A real time clock is basically just like a watch - it runs on a battery and counts time continuously even when there is a power outage. The time data can be logged from it through microcontroller and it can be displayed. As this chip is having battery back-up, time data will not be erased during power outages. Most microcontrollers have a built- in timekeeper called millis and there are also timers built into the chip that can keep track of longer time periods like minutes or days. This facility is offered by very few companies and availability of these chips is very difficult. Hence the controller used here doesn't have this facility, there by RTC is connected externally. When the RTC is turned on through microcontroller it starts counting the time from that point onwards, as this chip is having memory for long duration, it can deliver the data of days, months, and years in

addition to the time. Since this chip delivers the 1Hz square pulses, time can be displayed in seconds, minutes and hours. Facility is made available such that AM/PM also can be displayed. Time can be set to either 12 hours mode or 24 hours mode.

2-LITERATURE REVIEW

Many medical mobile applications are there to support and for monitoring purpose in medical field. However, special attention is needed for safety issues and to control the application from unauthorized persons. Already many works was proposed about medical pillbox but much work is not discussed about the safety measures. An author developed a system to overcome this problem but this device is not portable and cost is more and still it required human interface. In author proposed a system using Internet of Things (IoT) platform, it required a knowledge to operate android operating system, to take their pills in the box. However, it supports health diagnosis and health monitoring .Therefore this is not suitable for old age peoples and illiterates. In author proposed a concept to for this problem, but it required a special packing of medicine to dispense, practically is not suitable. Consuming dose of medicine is misconception than in the prescribed format will lead cause of recovery . As per recent survey most of senior citizens taking more than 4 tablets in a day and they fail to take it in proper time . Many standard medical equipment manufacturers have developed a product to dispense the pill in the stored tray in the present, time intervals, which includes alarm and other reminder futures . Hardware Requirements

The details or data sheets of the important components like IC's other devices used in the project work are gathered from websites. The Anauthor explains about One pill dispenser, i.e. pill dispense automatically using dropping mechanism, and the speed and frequency to release of the pill is in controlled path. This is not suitable for the patients taking more than one pill. This author proposed a modified work of author, it dispenses many pills but one by one, may struck due to size matter. Problem is dimension and size of pill gets varies; extra servomotor is used to overcome the problems. An author describes about the pill dispenser with mobile application assistance system is insufficient to fulfil the needs link exact reminding or monitor.

3-HARDWARE AND SOFTWARE REQUIREMENT

Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

following are the chips and other important components, whose data sheets are collected and provided in this chapter.

Arduino Uno Microcontroller board

Fig (Arduino)

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

Software requirements

- **Programming**

The Arduino Uno is programmable via the Arduino software (IDE). To start, select "Arduino Uno" from the Tools > Board menu, ensuring compatibility with the onboard ATmega328 microcontroller. This chip comes with a pre-installed bootloader, allowing code uploads without external hardware, using the STK500 protocol. Alternatively, you can program the microcontroller through the ICSP header to bypass the bootloader.

The ATmega16U2 (or 8U2 in earlier versions) handles USB-to-serial communication. It features

a DFU (Device Firmware Upgrade) bootloader, which can be activated for firmware updates. On Rev1 boards, this requires bridging a solder jumper and resetting the 8U2, while on Rev2 and later boards, a hardware modification simplifies the process. The firmware source code is available for further customization. This architecture offers flexibility for programming and hardware modification, making the Arduino Uno a versatile tool for beginners and advanced users alike.

- **Automatic (Software) Reset**

The Arduino Uno supports automatic (software) reset, eliminating the need for manual resets before code uploads. This feature is enabled by connecting the ATmega8U2/16U2's DTR (Data Terminal Ready) line to the ATmega328's reset pin through a 100 nanofarad capacitor. When DTR is asserted (taken low), it momentarily pulls the reset line low, resetting the microcontroller. This allows code uploads to start automatically when the upload button is pressed in the Arduino IDE, reducing bootloader timeout.

However, this can cause unintended resets when the Uno is connected to computers running macOS or Linux, as the board resets whenever a USB connection is established. To avoid communication issues during sketch execution, software should wait briefly before sending data after a connection is made. The Uno also has a "RESET-EN" trace that can be cut to disable auto- reset, and re-enabled by soldering the pads together. Alternatively, adding a 110-ohm resistor between 5V and the reset line can disable auto-reset.

- **USB Overcurrent Protection:**

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

4-SMART MEDICINE KIT

❖ **Existing Problems**

Keeping medicines out of reach of children can be a tedious task irrespective of the family size. Certain medications are designed and defined to attract kids. Some drugs designated for a specific age group have colors to attract the kids. Similar colors also are used for adults' medicines,living and the wrong patients consume incorrect medication. Moreover, with multiple families living in household which is common, especially in countries like India, it is cumbersome and imperative to segregate personal medicines concerning each person. At least one medical personnel must stay constantly alert about time and respective medicines around the patient. There cannot be any delay or compromise in medication, especially for patients suffering from chronic diseases such as diabetes, hypertension, etc. With the current scarcity in hospitals, especially government hospitals, it is challenging to have nurses around to keep track of patients' medicines and their routines.

❖ **Proposed System**

The medicine reminder and alert system is a revolutionary technological solution designed to enhance medication adherence, a critical challenge faced by many patients, particularly those with chronic illnesses and the elderly who often manage complex medication regimens. Non- adherence can lead to severe health consequences, including disease progression, increased hospitalizations, and elevated healthcare costs, making it essential to develop systems that promote consistent medication intake. This innovative system integrates several key components: a Real-Time Clock (RTC), a microcontroller unit, a keypad for user input, an LCD display for information output, and a GSM (Global System for Mobile Communications) module for notifications. At the heart of this system lies the DS1307 RTC, a reliable timekeeping device from Dallas Semiconductor, which maintains accurate time

even during power outages thanks to its external battery backup.

❖ **Block Diagram**

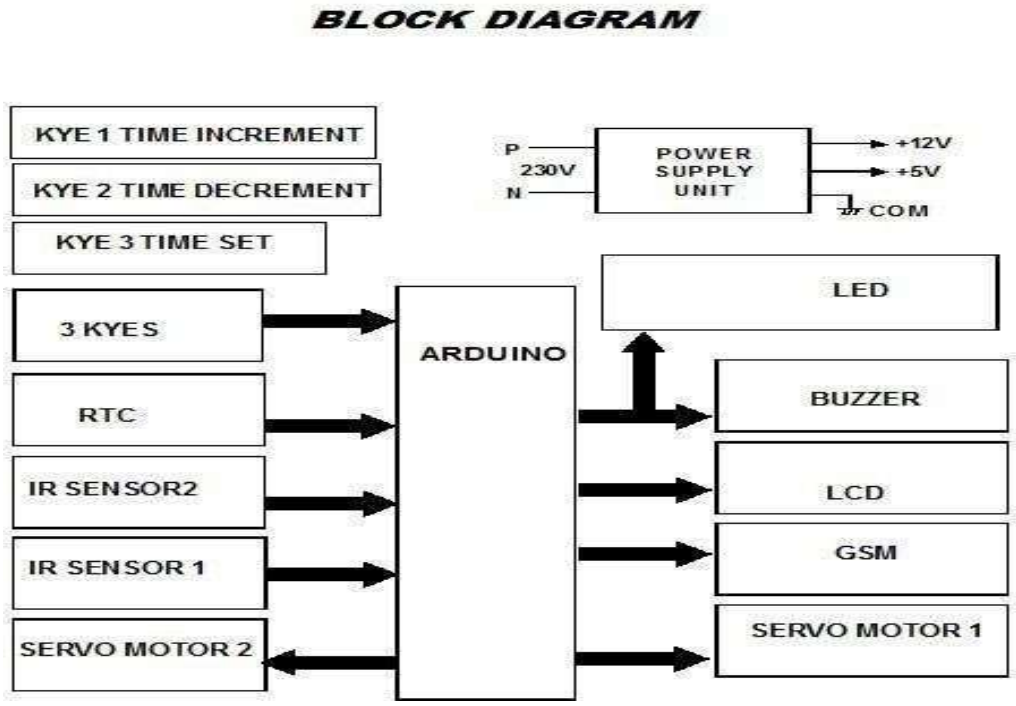

Fig Block Diagram

5-ADVANTAGES, DISADVANTAGES AND APPLICATIONS

Advantages

- Real-Time Monitoring: These kits can track medication adherence and health parameters, providing real-time data to users and healthcare providers.
- Automated Alerts: Users receive reminders for medication schedules, and alerts can be sent for missed doses or abnormal health readings.
- Remote Health Management: Healthcare professionals can monitor patients' health from a distance, facilitating timely interventions without in-person visits.

Disadvantages

- Privacy and Security Risks: Personal health data may be vulnerable to breaches, raising concerns about user privacy.
- Dependence on Connectivity: The kit relies on stable internet access; any connectivity issues can limit its functionality.
- Complexity for Users: The technology can be difficult to navigate, particularly for older adults or those less tech-savvy.

- High Costs: Initial investment and ongoing maintenance can be prohibitive, limiting access for some users.

Applications

- Medication Management: Automated reminders and tracking systems ensure patients take medications on schedule, with notifications sent to caregivers if doses are missed.
- Remote Patient Monitoring: Vital signs and health metrics can be continuously monitored and transmitted to healthcare providers for real-time analysis, improving patient outcomes.
- Telemedicine Integration: Kits can be equipped with video conferencing tools, enabling remote consultations with healthcare professionals for immediate guidance and support.
- Emergency Alert System: The kit can include a panic button or sensor that detects falls or emergencies, automatically alerting healthcare providers or emergency contacts for immediate assistance.

6-RESULTS AND DISCUSSION

Working:

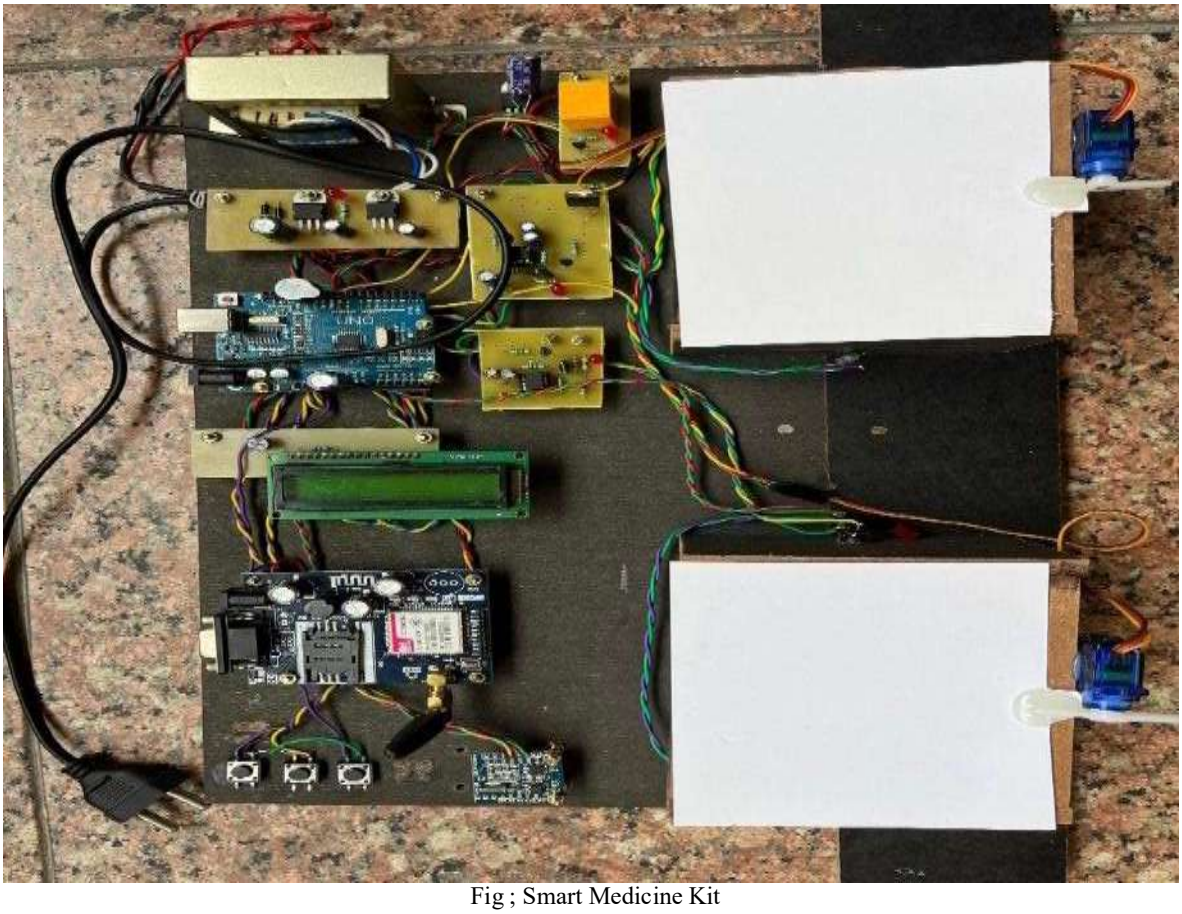

Fig ; Smart Medicine Kit

The Smart Medicine Dispenser Box is an IoT-based solution designed to assist patients, particularly the elderly, in taking their medications on time. The system is centered around an ATmega328 microcontroller, which controls and coordinates various components, including a Real-Time Clock (RTC), servo motors, GSM module, and IR sensors. The RTC (DS1307) keeps precise track of time, and the patient's medication schedule is inputted through a keypad. When

the scheduled time matches the RTC's time, the microcontroller triggers an alarm and operates the servo motors to open the appropriate compartment containing the prescribed medication. IR sensors are used to detect whether the patient has taken the medicine from the dispenser. If the medicine is not taken within a specific time, the system sends a notification via the GSM module to a caretaker or guardian, ensuring timely intervention. The LCD screen displays real-time information about the medicine to be taken, enhancing user interaction. This system is highly effective for patients requiring regular medication, reducing reliance on caregivers and preventing missed or incorrect doses.

The smart dispenser ensures that the patient takes the correct medicine at the right time, helps avoid missed doses, and notifies caretakers if the medicine is not taken. It is especially useful for elderly patients or those requiring assistance. The system enhances patient autonomy by minimizing dependence on caregivers.

Fig 5.2 Result

7-CONCLUSION AND FUTURE SCOPE

This project work **"Smart Medicine kit"** is completed successfully and the results are found satisfactory. Since it is a prototype module, it has been thoroughly revised taking in to consideration the developments in technology and introduction of new and improved methods of medical instruments for proper diagnosis. The hardware used in this project work were bulky, when this prototype module converted into engineering model, all bulky

components can be accommodated into a single chip and a sleek, portable, good looking module can be made. As the technology advances, particularly in the field of world-wide telecommunication networks, people are expecting improved quality service for various other applications in addition to the personal communications through mobile phones. In this regard GSM modules are developed which can be used for many applications. The use of GSM technology in medical instrumentation has resulted in the integration of automation and built in intelligence in medical instruments to a great extent. The advantages of using GSM processor is that there won't be any range restriction, because the telecommunications network is enhanced to all corners of the globe. In order to understand linkages between the life sciences and engineering techniques, it is necessary for engineers to have a fair understanding about the anatomy and physiology of the human body.

Future Scope:

The future scope of the Smart Medicine Kit is vast, given the growing need for healthcare automation and remote patient monitoring. Enhancements can include the integration of advanced IoT technologies like cloud-based health monitoring, where data on medication adherence can be uploaded to a cloud platform for real-time analysis by healthcare professionals. This would allow doctors to monitor patients remotely, adjusting prescriptions or scheduling checkups based on medication adherence trends. Additionally, the dispenser could be upgraded with voice control and AI integration, enabling patients to interact with the system through voice commands or receive personalized reminders. AI algorithms could also predict medication patterns, suggesting optimizations in scheduling or alerting caregivers when anomalies in patient behavior are detected. Another area improvement could be the use of biometric authentication (such as fingerprint or facial recognition) to ensure that the right patient is taking the right medicine, especially in multi-patient environments like nursing homes. Moreover, the system could incorporate smartphone app integration, allowing caregivers to track medicine dispensation in real-time, adjust schedules, or receive push notifications instead of just SMS alerts. Finally, expanding the system's design to accommodate multiple medications and creating a more compact, portable version could make it more suitable for broader patient demographics, including those who travel frequently. Battery optimization and solar power integration would further improve its functionality, particularly in areas with unstable electricity. These advancements would ensure that the Smart Medicine Dispenser becomes a more comprehensive, scalable, and widely applicable solution for medication management in the future.

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