

EMBEDDED SYSTEM BASED SMART MEDICINE BOX

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Abstract:

In day-to-day life most of the people need to take medicines which was not there in past couple of years and the reason behind this is diseases are increasing in large amount. So sooner or later many people come in contact with these diseases. Some diseases are temporary diseases while many are permanent life-threatening diseases. Life threatening diseases gets mixes with the human body in such a way that they can't leave the body ever and they increase in rapid time. Life span of humans became less because of such diseases and to overcome or to live a better life we need to take medicines regularly and also in large amount.

We need to be in advice of doctor who tells us to take desired pills in desired way so that patients face problems like forgetting pills to take at right time and also when Doctor changes the prescription of medicine patients have to remember the new schedule of medicine. This problem of forgetting to take pills at right time, taking wrong medicines and accidentally taking of expired medicine causes health issues of patient and this leads to suffer from unhealthy life. Our project is to made pic microcontroller based Smart medicine box which uses Real time clock.

The existing of this system was manual medication management in which simple pillboxes with compartments labelled by day and time. Patients or caregivers manually fill these compartments with the required medication doses. Printed or handwritten schedules detailing the times and doses for medications, which patients need to follow. Traditional pill organizers and schedules rely on patients or caregivers to fill compartments accurately and follow the schedule strictly. Mistakes in filling or following the schedule can lead to missed or incorrect doses. Patient may forget to check schedules or ignore reminders, leading to non-adherence.

The proposal system of our project was the Smart Medicine Box includes programmable timers that allow users to set specific times for medication doses. Multiple timers can be set according to the patient's medication regimen. Users can easily update or modify the medication schedule as needed, accommodating changes in prescriptions or dosing times. The system provides both visual and auditory alerts to notify patients when it is time to take their medication. This ensures that reminders are noticeable even in different environments or situations. If the patient does not take the medication within a specified time frame after the initial alert, the system escalates the alerts to ensure the patient is reminded multiple times.

Keywords - Life-threatening diseases; Human body; Life span; Forgetting pills; Medicines; Patient.

I. INTRODUCTION

A health care is a significant part of the country's economy. The health care is an important determinant in promoting the physical and mental health for the well being of people around the world. Healthcare has been important to civilizations. Folk healers, shamans, and medicine women were vital in caring for the injured and infirm throughout history, just as modern-day physicians, nurses, and caregivers are essential to health systems today. Healthcare delivery impacts human health.

It was reported that in Australia, around 140,000 cases of medical errors occur per year, with almost 2000–4000 deaths as a result. In the United States, however, medical errors result in as high as 251,000 deaths annually. In 2002, the WHO member states agreed on a World Health Assembly resolution on patient safety that prioritized global health, and later in 2019, matters such as developing global norms and standards for patient safety, promoting evidence-based policies, international recognition of excellence in patient safety, and assisting countries in several key areas have been discussed among policymakers. The National Health Service has spent around 2.4 billion pounds on clinical negligence claims in 2018–2019 and has been tripling every decade since 2009.

A decade-old survey reported on the views of public regarding deaths due to medical negligence, and since then, new efforts have been introduced to reduce medical errors.

The new awaited feature in our project is our system is sensible that patient has taken medicine or not and thus the patient can't postpone the time on which he needs to take pills. It is compulsory for the patient to take pills from the box at the right time otherwise our systems continue to make large sound until the medicine is taken out from the box. This notification feature adds life years to the patient and thus this thing is not available in any device which is the necessity for present days.

II. LITERATURE REVIEW

[1] S. Diwakaran et.al (2015) had highlighted that this project is useful for senior citizens and blind people who live in dependently or who

don't have personal caretaker to assist them in taking right amount of medicine at the right time. This medicine box which is a sort of semi-automatic is not only useful for geriatrics but instead it is can prove useful and a user-friendly tool for all of us

[2] Keshika Gupta et.al (2017) had highlighted that this project is mostly focused on the problems faced by aged and elderly people concerning loyalty to their prescribed medication. It not only aids the elderly people who live independently but also helps the caretakers of the elderly by reminding them about correct no. of pills to be taken at the right time. For the device to work satisfactorily we have chosen embed platform that has been experimentally proven. This device which is a sort of semi-automatic is not only useful for geriatrics but also useful as it is user friendly for all of us. Embed provides a greater efficiency to our project. It also makes it to be cost efficient. The other great advantage of this box is that it is very easy to use and less complicated as it does not require any prior technical knowledge.

[3] Aniket Patil et.al (2023) had highlighted that Smart Medicine Box project is a revolutionary product that offers an innovative solution for medication management and health monitoring. With the help of a mobile application, users can easily set reminders for taking their medication and receive alerts on the hardware device itself. Additionally, the device can monitor crucial health parameters such as blood pressure, oxygen levels, and ECG readings, which can be accessed from anywhere in the world.

[4] Ekbal Rosli et.al (2018) had highlighted that this project can help and give advantage to the nurses. The main objective for this innovation is to monitor the consumption of medicine intake for intrinsic patients. It is practical in the morning and evening but also can be used at night. This device is controlled by using Bluetooth system, so the nurse does not need go to the personal ward to give the medicine. This system is a very good to apply in the hospital because it can make the nurse job easier besides making the patients more comfortable to stay at the hospital.

[5] Roy Abi Zeid Daou et.al (2018) had highlighted that this project is, in its general

purpose, aiming to control medication adherence. In this way, this smart pill box will help to increase life expectancy for those of older as well as younger aged adults. Additionally, the proposed device is low cost, user friendly, and above all, a safe system

[6] Dileep V. Raju et.al (2023-24) had highlighted that this project is the IoT-based Smart Medicine Box project represents a significant stride towards revolutionizing medication management through the integration of cutting-edge technologies. By leveraging the power of the Internet of Things (IoT) and the computational capabilities of the Node MCU, this project offers a comprehensive solution to address the complexities of medication adherence. The seamless coordination of components such as the servo motor, IR sensor, LCD and speaker results in an intelligent system that not only dispenses medications accurately but also communicates effectively with users. As we move forward, the IoT-based Smart Medicine Box project exemplifies the convergence of healthcare and technology, emphasizing the importance of innovative solutions in enhancing patient well-being.

[7] Pooja Kalgude et.al (2023) had highlighted that the global healthcare system has recently undergone changes. Hospital medication and healthcare now have a new dimension thanks to IOT-based applications of smart healthcare systems. His project's goal is to concentrate on giving them the right medication. Through this project, older persons who require ongoing medication monitoring will gain. This project incorporates a server for storing drug administration times and other data, a mail transfer protocol, and a temperature sensor for accurate patient body temperature monitoring.

[8] Zara Nasir et.al (2023) had highlighted that the smart medicine box is a standalone medical box that not only dispenses medicines according to a prescribed schedule but also provides the facility of checking basic health conditions of the patient such as heart rate, temperature, and oxygen level. The machine has the advantage of biometric recognition so that the medicine is dispensed to the correct user. This project aimed to make the device user-friendly and cost-effective, especially for elderly patients. The

time and amount of the medicine can be changed as per the user's requirements. This medical box is incapable of handling non-oral medication, such as inhalers, eye drops, and creams. Therefore, in the future, we can work on non-oral medications, and develop an app that can be accessed by both patients and doctors. This device can currently store three different medicines per patient, which can be enhanced to as many as the user wants.

[9] D. Sathishkumar et.al (2020) had highlighted that to improve medication safety and to avoid confusion in taking tablet among the elderly, this paper proposed a smart pillbox with remind and confirm functions. The proposed pill box can reduce family member's responsibility towards ensuring the correct and timely consumption of medicines. Because the proposed pillbox containing an alert sound to the user for a particular time and real-time clock gives continuous time as an output.

[10] Girish Mantha et.al (2022) had highlighted that the solution of this sophistication is supplemented by the development of an advanced technology supported pill dispenser called the GSM based automatic pill dispenser. These simple efficient techniques are supported by advancements like GSM technology to bridge the gap in communication between the supplier or the chemist and the customer or patient, thus aiding the patient. This model summarized the major points about our SMB. In this project, we are using RTC timer which dispenses the pills automatically and Sophisticated pill – box is used to load the pills daily / weekly basis.

III. METHODOLOGY

This smart medicine box is designed for patients, meaning it helps patients remember to take their tablets at the right time. It is filled with all the medicines required by the patients. Each box contains only the same type of tablets. Each box in this smart medicine box is equipped with a limit switch. This limit switch monitors the open and close movement of the box and collects the count of the number of tablets taken out when the box is opened. The schedule is included in the ATMEGA328 Microcontroller by programming which tablet at which time

through a C Program. The date and time can be incremented, decremented and reset in the program using the keypad. This keypad is used to provide input to the smart medicine box. It is used to set the current time in the Smart medicine box using RTC. If the tablet is not picked up by the patient using GSM, it sends a message to the mobile that is connected to it. We can also add one or more mobile numbers to it. The LED in the box in which the tablet is to be picked up lights up. The alarm and LCD display automatically turn off when the patient picks up the tablet and the message is invalid. For example, if you do not take the tablet that you are supposed to take at 9:00 AM, it will continuously give a warning message through the LED, Alarm and LCD display. The alarm and LED will flash for the time given in the program and then it will automatically turn off. If not, a notification will be sent to the connected mobile via GSM. Through this, the patient’s guardian can view the message and inform the patient to take the tablet. The figure given below shows the block diagram,

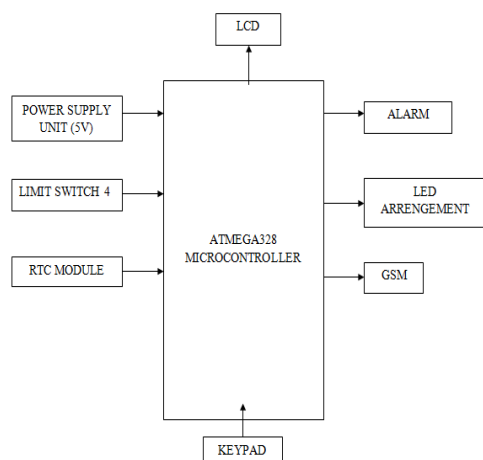


Figure 1: Block Diagram

A. Hardware Requirements

- Atmega328 Microcontroller
- Lcd
- Limit Switch
- Keypad
- Alarm
- Led Indicator
- Gsm
- RTC Module

B. Software Requirements

- Arduino software

C. Language Used

- Embedded C

IV. WORKING

Smart Medicine Box is a modern device designed to help patients remember to take their medication. This smart medicine box uses the following components: ATMEGA 328 Microcontroller, LCD, Alarm, LED, GSM, RTC Module, Limit Switch, and Power Supply. In this we give input through program. We give output through mobile notification, Alarm, LCD display. Below is a look at how each component in the Smart Medicine Box works,

• **ATMEGA328 MICROCONTROLLER:**

ATMEGA 328 Microcontroller is an 8 bit Microcontroller from Microchip Technology. It has a total of 28 pins. Out of which 6 pins are Analog pins and the remaining 14 pins are digital pins. The first pin acts as reset, the 7th pin as VCC, the 8th and 20th pins as GND, and the 22nd pin as AVCC (i.e. to provide power supply for the ADC). It will act as the central control unit in the smart medicine box.

• **POWER SUPPLY:**

The power supply used in this is a 230V AC power supply. This AC power supply is converted to DC by a Bridge Rectifier. It then supplies power to the required components.

• **RTC:**

RTC is an extension of Real Time Clock. It is found in the form of IC (integrated Chip). It is used to provide the current time in the smart medicine box. It has 4 pins. They are VCC, DA, CLK, GND. Using this, we can set the time in a form that suits us.

• **ALARM:**

The alarm will sound a warning when the time we set for taking the pill arrives in the smart medicine box.

- LED:

These LED lights will illuminate when it's time to take the tablet.

- GSM:

GSM is an extension of Global System for Mobile. This GSM has four pins. They are VCC, GND, TX, RX. This will send a notification via SMS to the connected mobile if the patient does not open the medicine box at the time of tablet administration.

- LCD:

The LCD will display the name of the tablet and how many tablets are left when it is time for the patient to take the tablet. The LCD used in this smart medicine box has 16 pins and 2 rows.

- LIMIT SWITCH:

LIMIT switch is to monitor the open and close movement of the smart medicine box. 4 limit switches are used in this smart medicine box.

The figure given below shows the work flow,

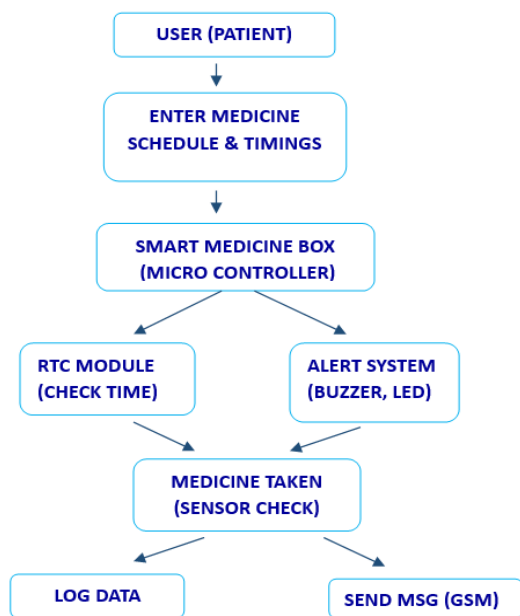


Figure 2: Work Flow

IV. RESULT AND DISCUSSION

As the result, the system attempts to address the issue with regard to monitoring the medication schedule as best as possible. The responsible

person gets to define the time and amount of each dose for the medication. The system stays dormant until the next dose is due. At the appropriate time, an alarm rings to alert that the dose is due. The alarm ceases and the remaining doses gets queued up. The alarm carries on ringing until the user disables it. If the patient appears not to have, the system will remind him/her using GSM means (SMS). When the user consumes the medicine or calls to acknowledge the reminder, the system proceeds to run. The process is repeated for all the medications that are scheduled. The system has finished its procedure for that day or session.

V. CONCLUSION

As we conclude this smart medicine box, it helps older people, visually impaired patients, and those with memory loss. When a doctor prescribes medication, the patient needs to take the tablets at specific times. If they miss a dose, it can lead to complications. In today's busy world, it can be challenging to ensure patients take their medication on time. To address this issue, a smart medicine box can be introduced. The smart medicine box is programmed to remind patients of their medication schedule. It notifies them when it's time to take their tablets and alerts them if they forget. The box includes components such as GSM, an alarm clock, a limit switch, RTC, and ATmega328. If a patient misses a dose, the box can sound an alarm or send a message to a designated contact saved in the cloud. This ensures that patients adhere to their medication regimen and stay healthy.

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