Medication Alarm: A Proficient IoT-Enabled Medication Alarm for Age Old People to the Betterment of their Medication Practice

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Abstract

Medicine is the science and practice of patient care. Taking the medicine on time, as prescribed, is important to ensure that your body has the right amount of medication at all times. The proposed system contains an IoT-enabled medication alarm and provides timely warnings to patients about their medication duration. It is an important factor in treating an older person who often takes multiple medications to treat a variety of conditions. Overdose or improper dosing can cause medical problems. Medication management includes everything that reminds patients to take the medicine in the prescribed container. The proposed model is very helpful for patients who forget to take their medication on a regular basis. It informs the patient to take medication in a timely manner by providing sound and visual warning. The use of this model is based on a co-design approach that allows IoT-related hardware, as well as software for designing a web-based alarm system and other system information that will be designed and simultaneously sending a notification to a registered mobile number. It is a system that allows medical caregivers or clients to decide when a pill should be taken, as well as service all times.

Keywords: Internet of Things, Web Application, Arduino UNO, Buzzer, LED.

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INTRODUCTION

The most important aspect of one's life is Health. Taking care of health is becoming a difficult task in present society. Modern life of the humans is being very occupied by their daily routines. This is leading to a very busy human life style and in this people are forgetting many important things. If a person is suffering from any disease or illness then it is important to take the medicine on the right time that is prescribed by the doctor. If the patient is at home, then any of family member can take care about the taking of the medicine or a care taker is required for tracking. This drags us into problem when we are away from home or if we don't have a care taker who can take the responsibility of intaking of the medicine. Noting the point that every time a family member or a beloved person can't stand with making us remember about the medicine timing and caring about taking of medicine we came up with the idea of 'MEDICATION ALARM' which can remember our medicine timing and remind us to take medicine in right time. There are many other Applications available with this feature that can remind the timing of our medicine but the problem is, when we are dealing with a person who is not familiar with the smart phone or who don't have a mobile. This model adds advantages as it does not require constant usage of applications on smartphone. With the growth of IoT, any object can now be internally connected and it has been dubbed the next technological revolution. This is mostly employed in healthcare as it is very useful in improving the environment around us and help in tracking of health conditions. IOT refers to the use of sensors and networks connecting the computers to the Internet. It is also cost friendly and does not require much effort. This model is also helpful for the amnesiac patients and the youngsters as it produces sounds and visual effects at appropriate timings.

RELATED WORKS

[1] Shawn, Wei and Sumathi discusses in detail about the IOT- Based smart medicine Reminder Device that is designed for the elderly based. This is designed to solve the issues faced by the elders and aged persons. The paper explains the important key roles of the device and how the IOT based smart medicine reminder is solving the problems faced by the elderly. This paper has also explained about the similar devices and their drawbacks so the better implementation of the idea can take place. Lastly, the paper concludes by mentioning the challenges identified, drawbacks, recommendations, and further studies.

[2] Othman and Ong explains that the medication misuse

among the elderly has become a big issue. This is Especially for those who have been prescribed with many medicines at once. They forget to take medicine on time or they may take wrong medicine. Taking wrong medicine may leads to another big problem. The proposed system of author helps people taking right medicine at right time with help of smart phone notification system. This Alarm system is implemented through popup notification on the patient's phone. The drawback of this idea is that the non-mobile users can face problem with this device.

[3] Hiba and Khalil discussed about advanced medicine box monitoring, analysis, and control system. The author explained two functionalities of the device: safety that ensures the wellbeing of the patient, good functionality of the system and the security that helps keeping the medicines away from the children. This system includes the monitoring of the patient's medicine timing by linking up with their mobile phone application. The main advantage of this model is that it can even verify the number of pills to be taken with help of the weights of the boxes or the containers. It even checks the remaining pills in the container and notifies if the containers are empty. The maintenance is major challenge of this device and this is hard to implement without a smart phone.

[4] Kuo proposed a pill box based on a micro-controller MCS-51. This device will be using a stepper motor for giving medicine on scheduled time. The drawbacks of this device are that a person is required to fill the medicine in pill box manually, this is additional responsibility for a family member of the patient.

[5] Shih-Chang and Hong-Yi proposed idea of an Intelligent pill box (IPB). This device is based on the bag system. This bag is of Medicines and the IPB device will send a bag that contains medicines at the right time. It checks whether the patient takes the bag away or not. If the patient fails to take the bag away then the device will notify. The drawback is that it will work on the internet.

[6] Hayes and Hunt explains about an electronic pillbox. This electronic pillbox is called MedTracker. This device records the timing of libs to be opened and it will transmit the information to pc via Bluetooth link. The drawback is that it will not provide any reminder or confirm function.

[7] Ajmal and Djahel proposed a Multidisciplinary approach to achieving efficient monitoring system. This paper explains the e health care and monitoring which includes medical data collection, aggregation, data transmission and data analysis. This paper discusses the essential services component as well as design challenges in designing the quality and patient centric monitoring scheme with potential solution.

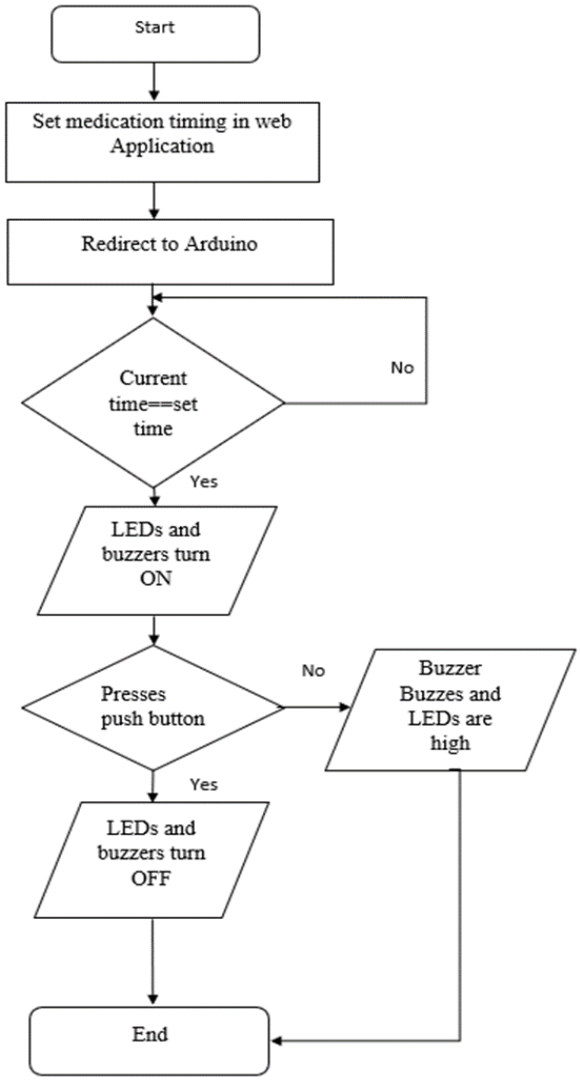

Figure 1: Block Diagram for working procedure of Medication Alarm

The above block diagram describes the entire working procedure i.e., how the system works when timings are set in Web Application [11].

REQUIREMENTS

Hardware

The hardware components used in this project are Arduino uno, Buzzer, LEDs, Jumper wires, Battery, Push buttons, Bread board.

Software

The software requirements are Arduino IDE, Mac or windows OS, Tinker CAD, XAMPP, I3 processor (min), 50GB of storage (min)[12].

RESULTS

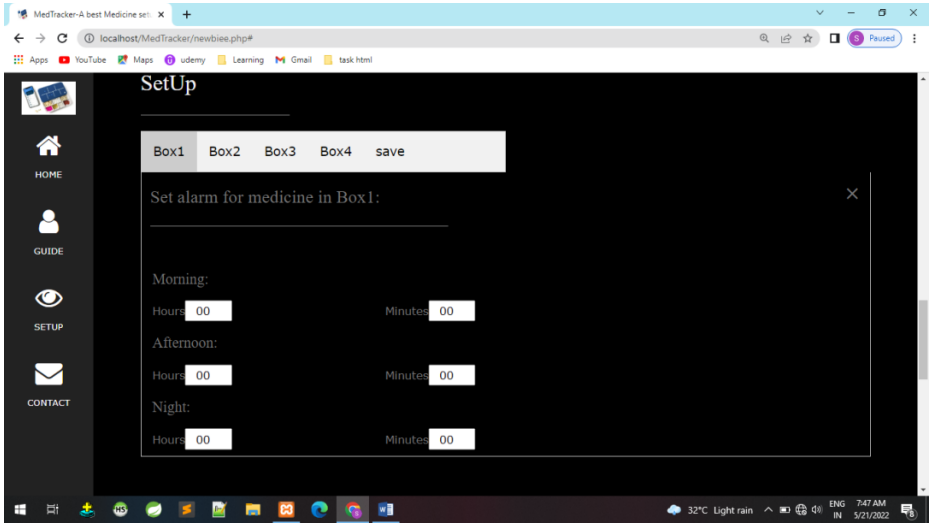

Figure 2: Set up page for setting alarm timings

The above figure represents setting time to activate alarm with audio-visual effect. Set up page is included in Software Application. The user must login (if already user) or sign up (if new user) in order to get access to this page. It consists of four compartments or slots named Box1, Box2...including save button. Each box enables to set different times. After setting the timings in required boxes, click on save button. On clicking save button, code is generated. Respective compartments in hardware will be activated by alarm.

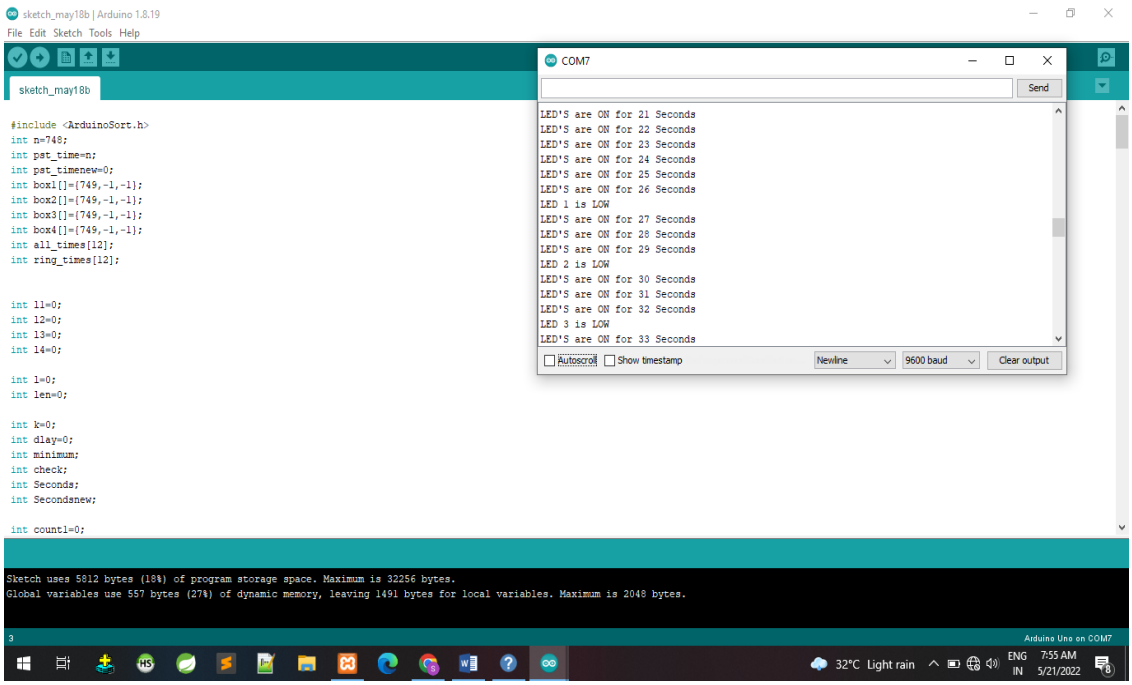

Figure 3: Output in Serial Monitor of Arduino.

The above figure represents output in Serial Monitor. It shows the time at which corresponding LED glows in Arduino application. It shows whether LED is OFF or ON and its duration. When medicine is taken and user presses the respective push button, the LED of respective slot will turn OFF and buzzer tone will be shut. If all the timings of the day are done, it starts with next upcoming day with same timings.

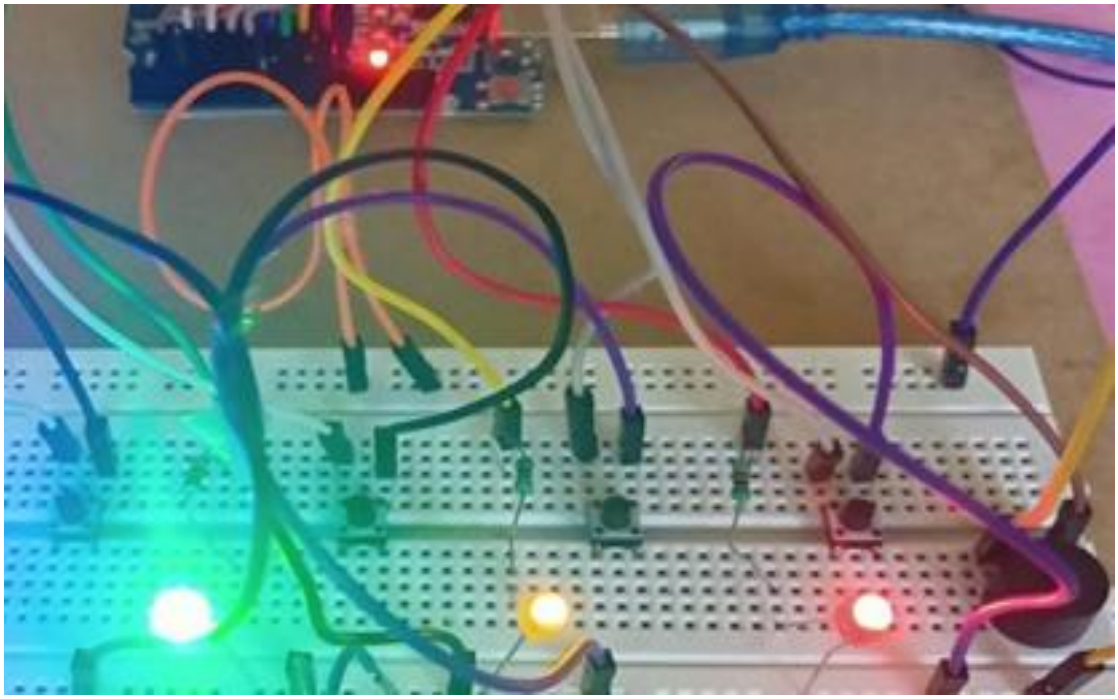

Figure 4: LED's and BUZZER are activated in Hardware IoT kit

The above figure represents the connection of LED's, Buzzer, and Push buttons to the Arduino board using jumper wires. The kit consists of four different coloured LED's with a Single Buzzer and four push buttons. Based on the Alarm timings set by using Web Application, respective box LED's starts to glow and Buzzer tone is set to high when timings are reached. After LED and buzzer are high, click on corresponding push button to turn OFF the activated. It will automatically get updated in Serial monitor of Arduino. This kit is also being included four resistors to resist the overflow of current from power supply. It is Nature friendly and cost effective [13].

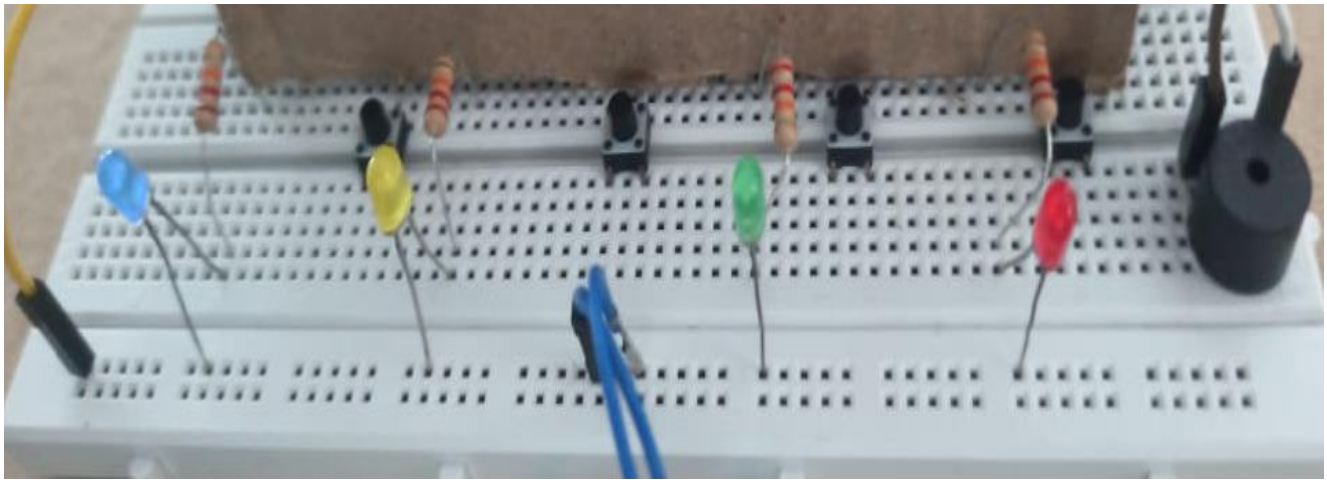

Figure 5: LED's and BUZZER in Hardware IoT kit

The above figure represents the Hardware components arranged on Bread Board. It has one buzzer to tone up and four different coloured LEDs to high when alarm timings are reached.

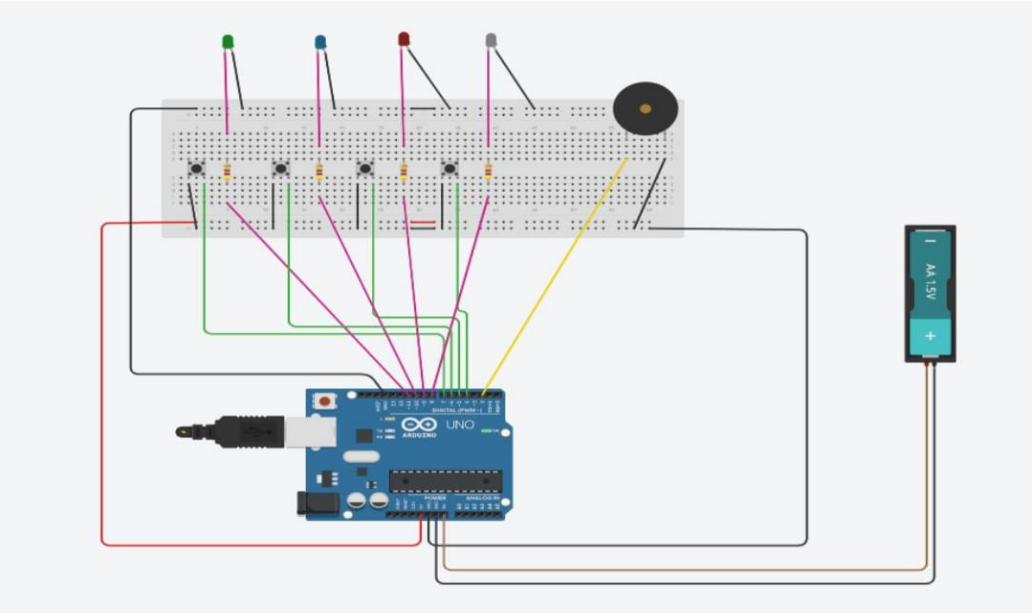

Figure 6: Circuit diagram for Hardware connection.

The above figure represents the connections between the hardware components. Circuit diagram is drawn, connections are made executed in Tinker CAD Application and tested for the output. LEDs activate and buzzer tone will set to high when set time is reached.

Table 1: Final Results with expected and actual outcomes

Test Procedure	**Expected Result**	**Actual Result**
Input timings in the webpage.	It should confirm and set the timing.	Confirms and sets as per the user.
Arduino gets activated.	Code must be generated.	Generation of code and output in Arduino IDE.
Ringing of the Buzzer and glowing of LED.	Current timings should match with Alarm set timing.	The timings match and the buzzerrings and LED(s) glows.
Stopping the functioning of LED and buzzer.	After pressing the respective button(s), should deactivate the buzzer and LED.	The pressing of push buttons causes the LED to stop glowing and the buzzer tone stops.

CONCLUSION

This system is implemented to reduce the effort of patient as well as the caretaker of patient in remembering the medicine by providing audio-visual effect. This system enables the patient to take right medicine in right time. It prevents the wrong dosages of medication. Basically, this system is Nature friendly and cost effective as no maintenance is required. It is done by using a Web Application which takes timing inputs and produce result in Arduino Serial monitor and Hardware board. The main motive is to help amnesiac patients, deaf people, Dumb people etc., This system also helps to the persons who are very busy with hectic schedules. This system involved a simple circuitry effort with minimal connections and generates better results. The future scope is to implement a system that takes the image of person by using camera and validate whether he/she the actual patient or not.

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