

Smart IoT Enabled Intelligent Health Medicine Dispenser System

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Abstract—As the people become older especially elderly people are unable to identify the necessary medicine that need to be taken in proper time. The elderly people sometime get confused due to the bad handwriting of medical prescription given by the doctors which may lead some confusion for the elderly to identify tablet and in-taking the tablet. Sometime they forget to take pills. In this paper we intend to build a smart IoT enabled intelligent health medicine dispenser system which is capable of automatically dispensing the medicine at particular time and further the time can be reset according to the patient requirement as suggested by the medical practitioner. Further our system even ensures that right medicine is dispensed at appropriate time and the system automatically monitors the number of pills left, if few, order of pill is sent by system to medical shop automatically through SMS via GSM module. Further, the pills requirements are updated in the cloud so that elderly patient relatives or medical practitioner can view the status of the pill thereby monitoring their health conditions indirectly.

Keywords—Internet of things, Medicine dispenser, RFID, Cloud storage

I. INTRODUCTION

Drugs are extremely fundamental for old individuals. Without medications, such old individuals would live for short life expectancy. Since these elderly individuals are bound to have constant restorative issue, for example, hypertension, diabetes, or joint inflammation they will undoubtedly take a larger number of prescriptions than more youthful individuals. These drugs are taken for a more extended timeframe.

As pills have taken such a critical job in regular day to day existence there has been the previous years an expansion in the quantity of restorative disregard cases identified with off base drug given to patients, for example, the instance of the attendant who gave a patient a disabled rather than an acid neutralizer that was recommended by the specialist, causing the patient's demise [1]. In the wake of seeing such huge numbers of these cases it is obviously significant that the right pill is taken by the right individual at the right time, generally taking a mistaken one or not taking one at all may open the patient to a few hazardous circumstances, extending from mellow medical problems up to death.

Different instances of wrong pills being ingested by patients are brought about by patients themselves, particularly at a seniority. As individuals develop old the human body will in general breakdown and the quantity of pills the normal individual needs to take when specific age is come to enormously increments due to age factor some elderly people or patient may need to intake more than five drugs per day [2]. Generally they are a wide scope of various

pills an older needs to take at various occasions. Monitoring taking the correct pill at the correct minute every day can become a difficult encounter for the older, as it isn't as simple as it could be for a more youthful individual. This reality is effectively clarified when we comprehend that a large number of the capacities, for example, sight, memory or legitimate abilities will in general lessening relatively to age once individuals have entered maturity, making it troublesome for them to recollect which pill to take at the correct time, making sure to take them or mistaking one pill for another as the individual will be unable to recognize one from another gratitude to their diminished sight just as the similitude in the pills structures and hues. This may lead worry for the pill taker by not taking the pill at time. Sometime this may lead to severe health issues for patient who are not regularly taking the pills. Patient need to manage the pill sorting and the intaking the pill need to be done at regular interval of time. Moreover, correct pill needs to be consumed to reduce the chance of error of intaking wrong pills.

Problems such as infections, some kinds of pain, and constipation can be cured with medication in short time. This medicine box is helpful to people who are forgetful about taking medicine in proper time, especially the elderly people. It can be used by nurses as well to avoid confusion in medication of patients. The time required to take medicine isn't printed on medicine box or can't be read by people. Sometimes they forget to take pills. This project deals with time a patient needs to take pills which can be changed according to his requirement. It even ensures that right medicine at appropriate time is taken, moreover it monitors the number of pills left, if few, order of pill is sent by system to medical shop automatically through Nodemcu. In this paper we intend to discuss about related works in Section II, hardware design approach in Section III, methodology in Section IV and further results are discussed in Section V.

II. RELATED WORKS

The utilization of pill box is a typical strategy to remind individuals about their medicine plan. The most generally used type is paid-based pill box. It is utilized to put prescription with a timetable, for example, day by day pill box, week after week pill box, week after week multiple times pill box and so on. Plus, pill distributor likewise causes the patient to remind themselves to take prescription on schedule. In the market, there are different sorts of pill containers that have been delivered by various organizations.

The accessible pill containers in the market just comprise of implicit alert for medicine time notice. It is difficult or the old patients to hear the alert due to the aggregated hearing misfortune. As of late, numerous alterations on the pill box

have been finished by different scientists. For example, an electronic pill encloses called MedTracker as proposed [3] can record the season of prescription taken from the container. At that point, a brilliant pill encloses proposed [4] accompanies update and affirmation capacities, by joining the utilization of grid standardized tag imprinted on the drug sack. In conclusion, a smart pill confine as detailed [5] proposed a prescription sack framework with warning framework utilizing the Skype application.

Hitherto, there is no any pill container to remind the patient to take medication through the popup warning on he advanced cell. Consequently, we utilize the accessible innovation to send warning to the patient through the advanced mobile phone; alert was not worked in the pill allocator. Alert is the warning that popup on the advanced mobile phone utilizing the MQTT application. Mix of infrared (IR) sensor and microcontroller will control the drug portion (number and kind of pill) and term of the medicine admission.

The Internet of Things (IoT) [6-9] is broadly being perceived by analysts as a standout amongst the most modern advancements with the planned to significantly change wellbeing, security and security and addresses real effects inside the general public. We intend to use IoT technology with RFID for each user identification as ID number so that a patient with this ID number can access the medicine dispense box and further the patient can take pills which can be changed according to his requirement. It even ensures that right medicine at appropriate time is taken, moreover it monitors the number of pills left, if few, order of pill is sent by system to medical shop automatically through GSM.

III. HARDWARE DESIGN

A. Introduction

The fundamental goal of this venture will be to take care of the previously mentioned issues by structuring and blend a device which will empower the proprietor to follow each pills to ingest in a simple and straightforward way requiring no preparation or complex gaining from their side so as to work the gadget. This gadget will be a smart pill allocator. The pill container will be intended to forestall mistakes in hospital ls and retirement homes where numerous pills must be offered day by day to every last one of the patients, every patient owning a gadget won't just radically diminish the odds of blunders happening yet in addition well streamline and accelerate work for the guardians/nurture by enabling the gadget to deal with pill the executives for them and liberating the schedule vacancy normally devoted to that. This gadget is proposed to log the pill name, number of pills and hours at which every pill is really taken versus the time it ought to have been taken. Nowadays there has been an expanding mindfulness as the quantity of pills endorsed to senior individuals, expressing that such a large number of pills may effects affect the patient's wellbeing. [3-7] The pillbox's logs will help assemble information concerning this issue.

It is necessary to have medicine dispenser system with wirelessly enabled to send the information to the cloud and thereby send the data to the end-user such as medical practitioner, patient or relatives, even to medical store to know about the quantity of pills available for the patient to intake. Such wirelessly enable system will increase the

health conscious among the patient those who are intaking the pills at regular interval of time. Further, wireless system enables to connect practitioner, relatives, medical store at one stretch through cloud data.

B. Hardware Description

Our system as show in Figure 1 includes Arduino MEGA 2560 and Nodemcu, in which the Arduino 2560 is enable to read the RFID data to ensure that the dispenser system is assigned to that particular patient or elderly people. Upon reading the RFID data, Arduino allows to read various sensor data such as ultrasonic sensor incorporated inside a box to detect the level of the pills accumulated in the box. In our project we used 3 box therefore we used three ultrasonic sensor and each box is further has a IR sensor which counts number of time the pills has been dispensed in and out. Further, each box has a servo motor to open the valve and dispense the pills from the medicine box.

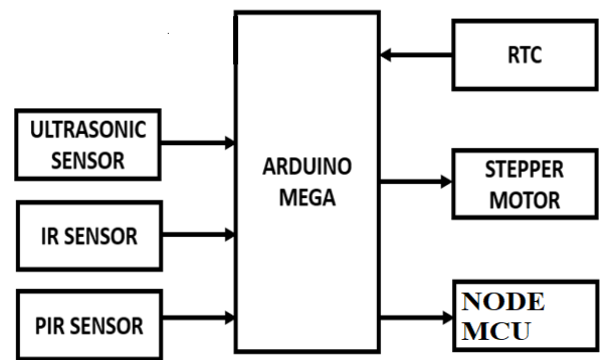


Fig. 1. System Overview

We used RTC to along with Arduino to set the date and time to dispense the pills. Further the pill count from each box and real time are being displayed through LCD. Finally the data from the Arduino is sent to Nodemcu to update the status of the pills and time at which the elderly people took the medicine from the medicine box. All the data are aggregated and uploaded to the cloud so that the medical shop keeper will monitor the number of pills remaining, relatives can monitor whether elderly people are consuming the pills at regular interval of time and further the medical practitioner also monitor the pills status and advice the elderly patient to intake pills at appropriate to avoid further health issues. The hardware circuit is shown in the figure 2.

The hardware components used in this paper for implementation are listed below:

- 1) *Arduino mega:- The Arduino MEGA 2560 has 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects.*
- 2) *Ultrasonic sensor:- transducers estimate distance by the reflected signals.*
- 3) *IR sensor:- used to measure heat and motion of an object.*
- 4) *Real time clocks (RTC): The DS1307 real time clock (RTC) is an IC of 8 pin device. It denotes seconds, minutes, hours, day, date, month and year qualified data.*
- 5) *LCD: uses liquid crystal to prvide a visible image. It is a 16×2 character electronic display device.*

6) *NodeMCU*: it is a commonly used IoT platform available as open source. *NodeMCU* is an open source IoT platform. It runs on the ESP8266 Wi-Fi SoC from Espressif Systems. It has the ESP-12 module based hardware.

7) *RFID*:-A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects.

estimate measure distance with the help of ultrasonic waves. It emits ultrasonic wave and receives the reflected wave from the object. The time lapse between emission and reception of ultrasonic waves indicates distance to the object.

It senses whenever a hand is put in box to calculate the number of pills left over. It emits to detect any object in its immediate surroundings. It is used to measure heat and

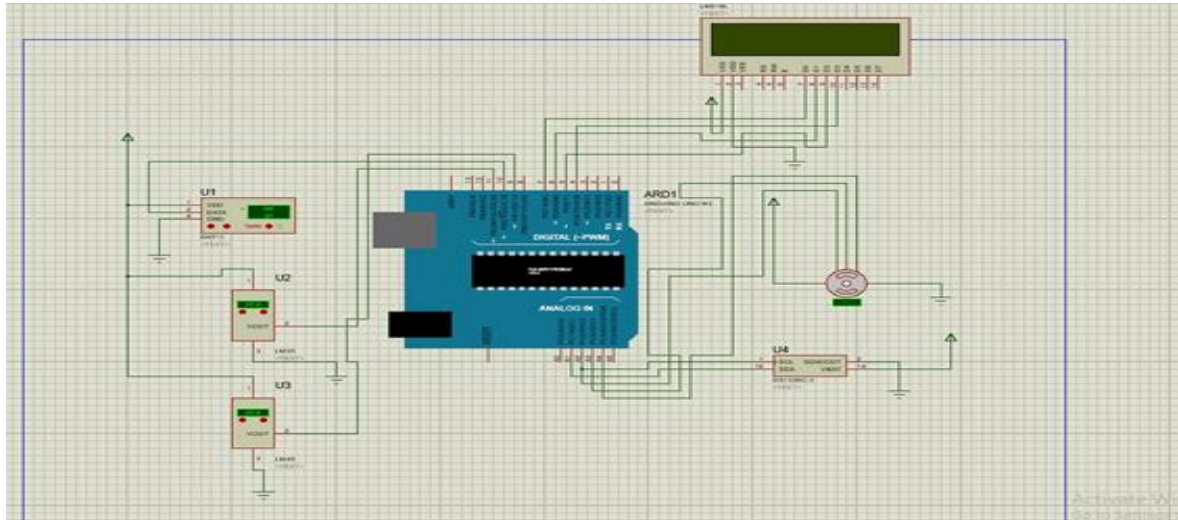


Fig. 2. Hardware circuit diagram

IV. METHODOLOGY

Figure 3 show our system methodology which includes Arduino Mega 2560 is a microcontroller board.

It can support any microcontroller. The simulation of sensors, Software based SMS generation, RFID,servomotor

motion of the object. When IR light falls on the photodiode, the resistances and the output voltages, change proportionally to IR light received. It also calibrates number of pills left in box on sensing the presence of hand. It is used to provide accuracy. It is an open source IoT with

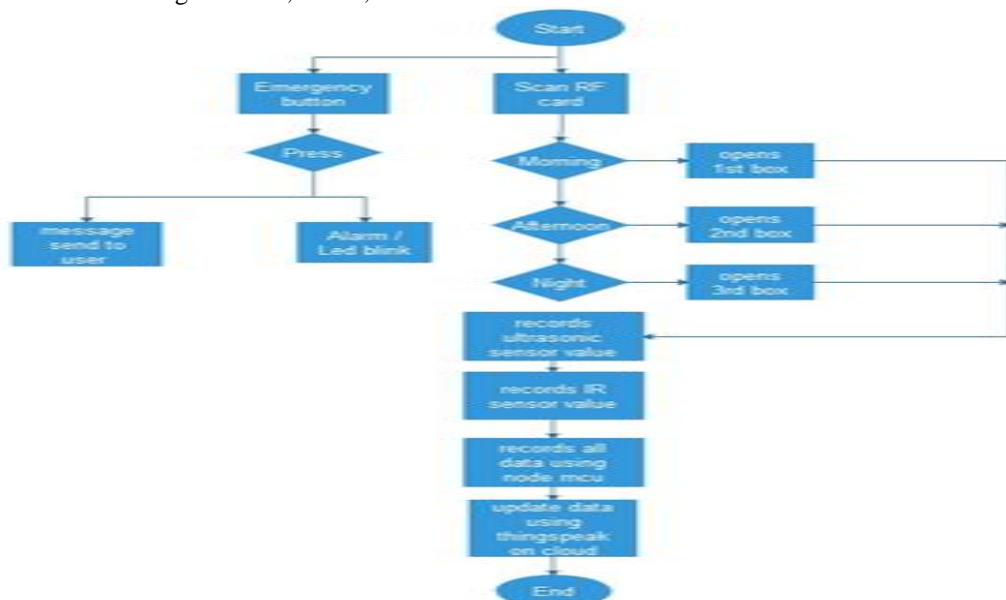


Fig. 3. Methodology of our system

is done on this microcontroller. The box incorporates RFID tag and reader. This is used to provide encryption. It prevents misplacement of pills. On scanning RFID tag in a particular time duration, respective box will be opened with the help of a servo motor. RFID is used to get information of an object uniquely on being scanned. Ultrasonic sensor is used to

incorporated Wi-Fi chip. It is used to take readings from sensors and upload the value of pills left in the cloud.

Further in our project we use software based SMS module allows users to send/receive data over GPRS, send/receive SMS and make/receive voice calls. It

communicates serially with the devices like a microcontroller, PC using AT commands. On pressing the emergency button, LED glows and sends message to the concerned.

V. RESULT

The real time implementation of our system is shown in figure 4 and corresponding cloud output is shown in figure 5. We use Ubidots IoT platform to update the pills information and send SMS to relatives, medical shopkeeper and medical practitioner. The hardware setup is first made with coding simulation.

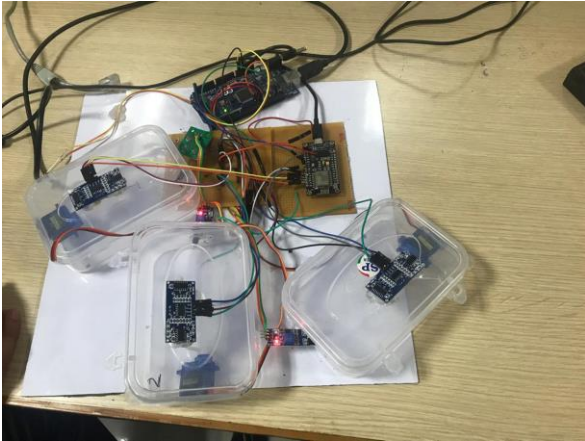


Fig. 4. real time implementation of our system

leftover pills is sent to cloud. The box also incorporates an emergency button which on being pressed, sends an emergency message to the concerned authorities. The following steps are initiated to precisely work with our system

1. RFID tag is scanned.
2. Servomotor rotates hence box opens.
3. Patient to pick the pill from the box.
4. It is assumed that only one pill is taken out each time hand is placed inside box.
5. Sensors (PIR, Ultrasonic) measures reading and updates it.
6. This information of sensors is sent to cloud through Nodemcu.
7. In case of emergency, patient presses emergency button which sends message to concerned person through GSM.

VI. CONCLUSION

In recent years many of elderly people are exposed to various drugs due to various conditions such as food, environment and old age problems. Further, it becomes difficult for the elderly people to intake the medicine at regular interval of time due to their laziness or unable to identify the tablet. Further the health issues may get severe due to incorrect medication use with clinically relevant consequences. Hence, our system helps in identifying whether the sufficient pills are there for the patient to rescue

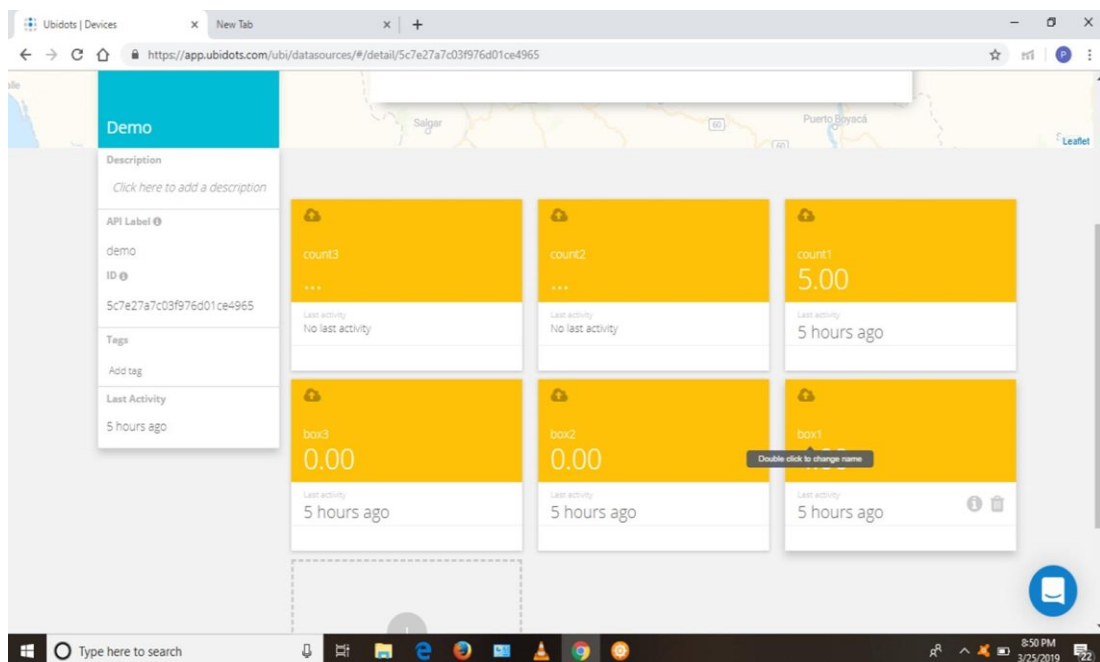


Fig. 5. Real time implementation of our system corresponding cloud output

The code is run after which the RFID tag is scanned. This leads to rotation of the servo motor which opens the box. Now when we place our hand inside the box the sensors (IR, Ultrasonic) start taking reading. Each time the hand is put it is considered that a pill has been taken out which the sensors simulation measures. At the same time this information of

and maintain their health at good conditions. This project aimed to resolve the practical problems that older people experience with the daily use of their medicines and their management strategies to address these problems and to determine the potential clinical relevance thereof.

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