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Design and Development of IOT Based Intelligence Pill Box

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Abstract: *The architecture and implementation of an medication dispenser specifically for users who take medications without close professional supervision. By relieving the users from the error-prone tasks of interpreting medication directions and administrating medications accordingly, the device can improve rigor in compliance and prevent serious medication errors. By taking advantage of scheduling flexibility provided by medication directions, the device makes the user's medication schedule easy to adhere and tolerant to tardiness whenever possible. This work is done collaborative by the medication scheduler and dispenser controller in an action-oriented manner. An advantage of the action-oriented interface between the components is extensibility, as new functions can be added and existing ones removed with little or no need to modify the dispenser control structure. The paper first describes the action-oriented design, major components and hardware and software structures of the smart device. It then provides an overview of the heuristic algorithms used by the medication scheduler and their relative merits.*

Keywords: *Intelligent pillbox, Arduino, Internet of things, GSM, sensor system.*

I. INTRODUCTION

It is often seen that individuals prefer to follow the diet schedule over taking their medicines on time. As people grow elder, they are completely dependent on outside support for health care. Most patients or aged people have diseases which need to take medications on time. In the modern age, it is difficult for family members to be available all the time to take care of the aged. Intelligent Pill dispenser box is one such approach to help them take their medicines efficiently. So the project deals with time at particular. The patient demands to take pills. For that purpose timing is set to the system and each pill having different time according to patient's schedule. Also there is one remainder which is given to patient before the medication time, so that in case patient will forget to take medicine. The aim of this study is to build a automatic pill dispenser box for medicine reminder. The project includes robot movement using android application, IOT technology for communication. Generally for home based health care the arrangement include communications, imaging, sensing and human computer interaction technologies embattled at diagnosis, treatment and monitoring patients without disturbing the quality of lifestyle.

It can be possible the development of a low cost medical sensing, communication and analytics device that is real-time monitoring internet allowed patients physical conditions. This project deals with the time at particular, the Patient needs to take pills. The timing is set to the system initially reminding and it can be changed by the patient according to his requirement. The system will start alarm at that particular time. To make the user-friendly system, the LCD, and Keypad connected to the system. This helps to change pills time. After having pills, the user must have to put the no. of pills he removed from the box. As, the no. of pills remains very few, the order for the particular pill is sent by the system automatically to medical shop through GSM system. So, it is helpful to user to get the pill at particular time and avoid confusion among pills.

II. LITERATURE REVIEW

G.Suganay et al. [1] This Online Health Community provide a platform for patients and their families to learn about an illness, seek and suggest support, and connect with other peers in analogous situations. In this paper architecture and implementation of an automatic medicine dispenser is proposed to support and extend the online health communities. Through this solution, doctor in the online health community may suggest pills based on the health conditions of their patients as communicated by them through online platform. Each user is secured with a unique barcode while starting the communication between the doctor and the patient. The barcode may then be scanned in the nearby automatic pill dispenser that can dispatch the medicine. Cloud is used as a medium to support Storage as a Service. The proposed model eliminates the need to spend time to visit the doctor and the time to spend in pharmacy. Also, the patients are relieved from the errors that might be caused due to handwriting misinterpretation and change of medicine that exists in manual medicine dispensing system.

Faizan Mehboob et al [2] This paper presents the working of a multipurpose robotic dispenser with "medicine dispensing application". The focus of the project is to build an economic, easily deployable, mobile medicine dispenser with Database Management system. Mobility in the dispenser is inherited from line-follower mechanism. The robot is built around a micro controller which takes input from a computer (serially) and moves the robot to desired location and manages dispensing mechanism. The dispenser mounted on the robot is self-manufactured with the help of DC motors, which substantially reduces the cost of overall system, to deliver the desired medicine. The purpose of the project is to dispense three different medicines to three different patients as seem obvious with three circular discs mounted on top. In order to deliver medicine to three different locations, mobility in the project is introduced and is accomplished through line follower which follows the path with its true ability. Three circular discs are controlled through DC motors. Its design is such that a single tablet is dropped implying one tablet in one revolution. The dispenser gets the command through serial port from a computer and satisfactorily dispenses the medicine to desired patient.

Shaantam Chawla et al [3] This project is an Arduino-controlled, consumer device which dispenses the correct amount of medication of the correct type. A textured cone was found to be the ideal method of trapping precisely one pill at a time to prevent overdose. After the medication is dispensed, the user is notified via SMS that his/her medication is ready to be taken. This device is also configurable via an Android application; a caretaker can select dates and times the medication will be dispensed for up to three types of medication. The device relies on an HC-06 Bluetooth module for a serial activation signal. The first set of results obtained measured how often the correct pill was dispensed and how often a single pill was trapped and dispensed. The success rate was over 93% for each pill type, ranging in diameter from 0.48 cm to 2.29 cm. The second set of results measured time elapsed between the scheduled release of a pill and the actual release of the pill followed by the user receiving an SMS notification. The time elapsed was under 10 seconds for every pill type. Apart from the preliminary step of loading the medication in the device, this model is fully automated and is the most effective in the current market.

Wissam Antounn et al.[4] The main thing of this system help to the patient without forgot the medicine. The smart medicine dispenser communicate to patient and caretaker. The mainly this system collect the data and care the controlling all functions. The mainly SMD is used Android application. They can also changes the pills timing respectively. If take the pill on time an alarm start after some time alarm will not stop then three main step as given, decrease the pills, patient not take the pills at right time or snooze the pill for 10 minutes. The alarm can be edited and created using android application and remotely through smartphone, SMD modular contain expandable contain unit with an own LED. Servo motors used to rotate the cylinders, the motors are controlled by Arduino Uno R3, using PWM signals that makes the servo motors for a bit then stop. The whole system promotes on the online application to provide user interface, manage user schedule and usage data.

SV Zanjali et al. [5] This paper is used for various technology involved in based on human care. The main purpose of this paper is fruitful to better capacity of medicine and less in amount. IOT is most use for the exchanging of information about health. The IOT is various secure technology of health care and it is easy to strong all health required data. The user individual information and converting data RFID will be use. The data is transmit via Bluetooth and ZigBee to a unit that manages PC. The collected information may be stored on the device and data will be used to analyse record of patient and further prescription will be give according to it. RFID will be used for the user personal identit

Nidhi Solanki et al. [6] Smart Pill Box system which keep tracks of the dosage and duration between each consumption. Untimed medicine administration can always show adverse effects on the health of the patients. Hence, this Smart Medicine Box will remind the patient to take right dosage of right medicine at the right time. The basic idea for this paper is integrating the principle of Alarm clock with Light based slot sensing on a normal pill box. To make it more state-of-the-art, it is inbuilt with a GSM module for alerting the patient and also the chemist at the needed instant. By using GSM, system also send SMS to the patient for the medicine reminder. Smart Pill Box is created with integrated software system running in the MCU. Software can be divided into 4 parts, user interface, real time clock, sound generation and LED controller.

Sanjay Bhati et al. [7]Old age patients suffer from problems of forget to take pills on proper time which causes certain health issues for patients having Permanent diseases We saw these problems in hospitals & people around us who have such kind of diseases and thus based on these two problems we made smart medicine box which solve these problems by Setting up time table of prescribed medicines through push buttons as given in prescription. Present time will be saved in RTC module and notification time will be saved in EEPROM. Therefore at the time of taking medicine system generate Notification sound and display the Bright light in certain pill boxes. So, patient can know the specific number of box from which he has to take out medicines. All pill boxes are pre-loaded in the system which patient needs to take at given time. And our system has quality that it can sense if the patient had taken out pills from the box or not. Compare to other devices available in market are capable to generate sound at one time and afterwards it stops. Thus, final result of our system provides fast curing of patient health by using our advantageous system.

Diya Minaam et al. [8] The medical errors occur because of the fact that the people in charge of patients have to deal with sorting of huge amount of pills each day. They intended to solve this deficiency of medical field by designing a pill box to help these people. They found the problem of elders to be Alzheimer and Missed dosage. So, they designed a system consisting of a wireless Wi-Fi connection in place of Bluetooth which could help these people in a better way by reminding them of medication in proper time n proper dosages. Thus, they helped in solving this problem This paper consists on the conception, design and creation of a pillbox prototype intended to solve this deficiency in the medical area as it has the ability of sorting out the pills by itself as well as many other advanced features, with this device being intended to be used by hospitals or retirement homes. This medication pill box is focused on patients who frequently take medications or vitamin supplements, or attendants who deal with the more seasoned or patients. Our smart pill box is programmable that enables medical caretakers or clients to determine the pill amount and timing to take pills, and the service times for every day. Our shrewd pills box contains nine separate sub-boxes. In this manner, medical caretakers or clients can set data for nine distinct pills. At the point when the pill time has been set, the pillbox will remind clients or patients to take pills utilizing sound and light. The warning of pills should be taken will be shown by an android application which is held by the patient.

Ms.Heiba Zeden et al. [9] presented a advanced medicine box. They found that researchers today are busy in finding a system for easy monitoring of patients. Thus they thought of making a safety related box. Their main focus in system was on two points that is safety with wellbeing of patients and keeping it out of reach from the children. They tested the given system on various patients and found it to be successful with only 3% defective ratio. This system can also be monitored by the patient parents as it will be linked to a phone application. This application will be used to configure the medical box by calculating the weight of each pill, setting the schedule of medical intake, alarming the user of the number of remaining pills, generating alarms whenever the patient does not take the required number of pills or doesn't take them at all, and so on... This system was implemented and tested by more than 50 patients who were taking several medication types (each one of them takes one medication only) and were using different mobile phone. The overall results were very acceptable with a faulty alarm generation below 3%.

Ekbal Rasoli et al. [10] The Smart Medicine Box is successfully designed in helping the introvert patients taking their medicine without help of others. This project is to develop a robotic device that can assist patient to take medicine alone by implementing an IOT apps system for controlling the Smart Medicine Box where it will overcome an emotional disturbance experience by the introvert patients. There are four sensors such as PIR, IR, temperature and ultrasonic sensors use for the project. The purpose of PIR sensor is to detect hand movement near the device, while IR sensor is to detect the line follower on the floor. The LM 35 acts as the detection of the temperature inside the box and the ultrasonic acts as the detection of the obstacle in front of the device. The MIT Apps Invention 2 is used to develop an apps and collect the data from sensors through Arduino microcontroller. A proof of concept design has implemented and demonstrated successfully.

TABLE I
Comparative Study Of Various Systems Used In Medicine Dispenser

Authors Name	Methods	Benefits	Limitations
1.G.Suganay 2.M.Premal 3.Mukta Pandya	Used Unique barcode system and scanned in the nearby automatic pill dispenser that can dispatch the system	The methodology is found to be error free in the perspective pf transcribing and dispensing	Complex Circuitry
1.Faizan Mehboob	Used Line follower mechanism.	Efficient and secure database Management System	Complex Mechanism with one tablet in one revolution.
1.Shaantam Chawla	Used trapping system with HC-06 Bluetooth model and SMS notifications	Success Rate is over 93% of each pill type, ranging in diameter 0.48cm to 2,29cm.	Time elapsed for every pill type.
1.Wissam Antoun 2.Ali Abdo 3.Suleiman al-Yaman	Used SQLite database system and PHP and JSON for communication	Application is very light wet and very low internet data usage	Complex programming

1.SV Zanjali 2.GR Talmale	Used web mobile device or pic access medicine shop.	The system improves the efficiency and secure database system	It is costly and not always preferable
1.Nidhi Solanki 2.Dr.P.H.Zope	Used C and WINAVR/GCC compiler and Principal of alarm clock with light based slot sensing on normal pill box	Reusable, affordable system	Do not used at home, used only in Hospital.
1.Sanjay Bhati 2.Harshad Soni	Used EEPROM for notification purpose	High sensing capability.	More complexity
1.Diya Minaam 2.Mohamad	Used ESP connections to the remote app for communication.	It works on two different mode i.e. Normal and management	Pills need to be out manually
1.Heiba Zeidan 2.Khalil Karam 3.Ali hayek	Used Proteus Simulation model to simulate codes for 3D modelling	It is used several medication type.	One medication only.
1.Ekbal Rasoli 2.Yusnira Husaini	Used MIT's app invention to along with Arduino Mega, PIR, IR, temperature and ultrasonic sensors are used.	Low maintenance cost	Less battery backup

III. CONCLUSION

Timely medication is very necessary for the cure of any disease. By taking advantage of scheduling flexibility provided by medication directions, the device makes the user's medication schedule easy to adhere and tolerant to tardiness whenever possible. This work is done collaborative by the medication scheduler and dispenser controller in an action-oriented manner. With the help of our project we aim to tackle the problem of timely medication. An automatic pill dispenser with the ability to distribute multiple pills for certain patient or private individual can allow more attention to be given to patients and elderly to remember when and what dosage of their medication to be taken. This system is useful for to take the medicine on time. This device can bring a revolution in medical field as it will introduce robotics in medication system. This system can help the elderly people in proper medication without forgetting to take the medicine in time. This system has alarm which alerts them to take the medicines. It also includes a Wi-Fi to alerts the caretaker whether the patient has taken the medicine or not. In this way the problem of forgetting to take medicine in proper time by the patients can be resolved.

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