Medicine Dispensing Unit

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***Abstract* - This paper presents the architecture and implementation of an automatic 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.Here the website is provided for professional for prescribing the medicines and the users are provided with an app where he can see the prescribed medicine along with the barcode.After scanning the Barcode the prescribed dosage of medicine will be given to the users from Pill dispenser.**

Index Terms* — Firebase*, Servo motor, Beaglebone, Pvc Pipes.

I. INTRODUCTION

Thanks to years of advances in medical and pharmaceutical technologies, more and more drugs can cure or control previously fatal diseases and help people live actively for decades longer. The benefits of the drugs would be even more wondrous were it not for the high rate of preventable medication errors. Medication errors are known to occur throughout the medication use process of ordering, transcription, dispensing, and administration. They lead to many hundred thousands of serious adverse drug events, thousands of deaths and billions of dollars in hospital cost each year in US alone. These alarming statistics have motivated numerous efforts in research, development and deployment of information technology systems and tools for prevention of medication errors. We now witness increasingly wider use of computerized physician order entry (CPOE) systems in hospitals and clinics for prevention of prescription errors, which account for more than 50% of all errors. Data available to date show that together with clinical decision support and electronic patient health and medication records CPOE systems can help prevent up to 80% of prescription errors, i.e., 40% of all errors. Next to prescription errors, administration errors (i.e., errors due to failures to compliant to medication directions) are the most prevalent: They contribute 25 – 40% of all preventable errors and are the cause of 25% of admissions to nursing home. The smart medication dispenser described in this paper is designed to prevent this type of errors. It is primarily for the growing population of users who are elderly or have chronicle conditions but are well enough to live independently. Such a user may be on many prescribed and over the counter (OTC) medications for months and years without close professional supervision.

II. RELATED WORKS

A typical user is likely to be cared by multiple physicians and given prescriptions ordered via CPOE systems. While each of the user's prescriptions is error free, it may fail to account for interactions between medications ordered by different prescriptions. A major function of the prescription authoring tool described in to help user's pharmacist detect and eliminate this kind of error. Another important function of the tool is the generation of medication schedule specifications that guide the operations of the dispensers. The tool first merges all of user's prescriptions and OTC medication directions and then translates the merged directions thus generated into a MSS, written in XML language, for the user's dispenser. The tool also makes sure that all the constraints defined by MSS for each medication are feasible, i.e., there is at least a schedule meeting the constraints if the medication were to be scheduled alone. The demand-versus-supply test (DST) described in is for this purpose.

There are a large variety of medication administration assistance devices for non-professional users. Unlike our dispenser, most stand-alone devices (e.g., [19-22]) available today are manual: A disadvantage of a manual device is that the user must load the individual doses of medication into the device, understand their directions and program the device to send reminders accordingly. This manual process frequently introduces errors. Like schedules used by our dispenser, medication schedules used by automatic devices and scheduling tools such as MEDICATE Tele-assistance System [23, 24] and Magic Medicine Cabinet [25] can be adjusted to compensate for user tardiness and condition changes. The adjustments are by care providers who monitor and supervise the user via Internet, however. Those devices are better suited for users who need close professional supervision and fully integrated health care services. In contrast, our dispenser is a stand-alone tool, capable of making schedule adjustments permitted by existing prescriptions. It is for individuals who are well and hence do not want to incur the cost of continuous monitoring and care and consequent loss of privacy and independence.

III. PROPOSED WORK

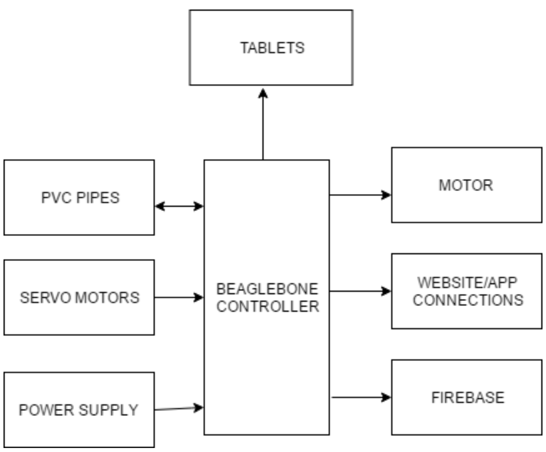

Fig 1: Block Diagram

Hardware Details

*A.*BeagleBone

The BeagleBone is low-power open-source single-board computer produced by Texas Instruments in association with Digi-Key and Newark element14. The BeagleBoard was also designed with open source software development in mind, and as a way of demonstrating the Texas Instrument's OMAP3530 system-on-a-chip. The board was developed by a small team of engineers as an educational board that could be used in colleges around the world to teach open source hardware and software capabilities. It is also sold to the public under the Creative Commons share-alike license. The board was designed using Cadence OrCAD for schematics and Cadence Allegro for PCB manufacturing; no simulation software was used.

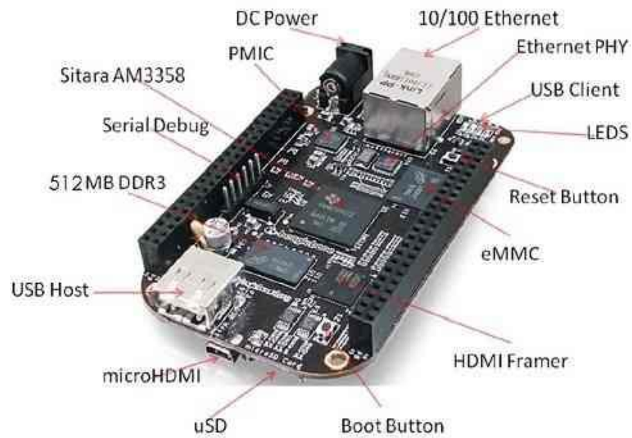

Fig 2: BeagleBone

B.Servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.
Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.
Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

Fig 3: Servo Motor

C.Pvc Pipes

The use of plastic materials by the piping industry accounts for a significant volume of polymers. In this segment PVC represents the largest worldwide market for plastics. PVC is often used in plastic pressure pipe

systems for pipelines in the water and sewer industries because of its inexpensive nature and flexibility. Pipes and fittings constitute the largest volume application at 40% of the marketplace.
PVC pipes have been used for more than 60 years and show that they have very long-lasting material properties. They are easy to install, strong and durable and, when they eventually reach the end of their service life, they can be recycled back into new PVC pipes. As a result, PVC pipe systems are very cost efficient.

Fig 4: Pvc Pipes

Implementation

Details about the design the smart medicine dispenser are included in this paper.Initially the requirements to design this device are collected. Finally a design process is suggested to design automatic medicine dispenser.
Here the patients will be able to take only prescribed dosage of medicine.So that we can avoid misuse of medicine(eg.avoiding human error).Here we are using Servo motor for dropping the medicines.Beagleboard is a microprocessor and we used for dumping code.Pvc Pipes are used for making the medicine fall correctly.

A. Module 1

In our project we are using Website which will be provided for professionals for prescribing the medicines to the users or Patients. In this unique id's will be provided for Firebase is a fully managed platform for building iOS, Android, and web apps that provides automatic data synchronization, authentication services, messaging, file storage, analytics, and more. Extending Firebase with the App Engine flexible environment gives you the benefit of automatic real-time data synchronization, without the need to run your code inside the App Engine standard environment sandbox professionals so that they can login to the website and prescribe the medicines to the users.

B. Module 2

Here the android app is only provided for users for taking the medicines from the professional.Barcode is generated for each prescription provided by professionals.Using this app the user can scan the barcode in the Automatic pill Dispenser for getting the medicines.Here the user can view the type and number of pills that he/she have to take by using this the user can avoid extra dosage of medicines and exact medicine without any mistakes.

C. Module 3

After getting the data from the app in the form of barcode scan the data should be sent to the firebase and it generate number of pills according to the scan given by doctor.The servo motors are connected to the beaglebone according to the data taken by the app the servo motors rotates that many times.If number of pills is 2 then servo motor rotates 2 times so that the medicine drop from the pvc pipes.Here we are placing medicines in pvc pipes and a slider is attached to the servo motor so that when ever the motor gets instructions it rotates according to it.

IV. STEPS FOR THE PROCEDURE

1. Start Step
2. Doctor will enter the details in the website about the medicines required by the User.
3. The user will get the details about the medicine in the app with unique barcode and id.
4. Now the user need to scan the barcode using the automatic Pill dispenser.
5. Automatic Pill dispenser scan the barcode and drop the pills according to the prescribed dosage.
6. Servo motors are placed along with the PVC pipes.
7. According to the prescription the barcode generates the number of pills to the servo motor.
8. Then the servo motor rotates based on the number of pills.
9. As soon as the servo motor rotates the pill drops.
10. If count = 4
11. Return to step 9.
12. else stop

The algorithm is explained in the flowchart below:

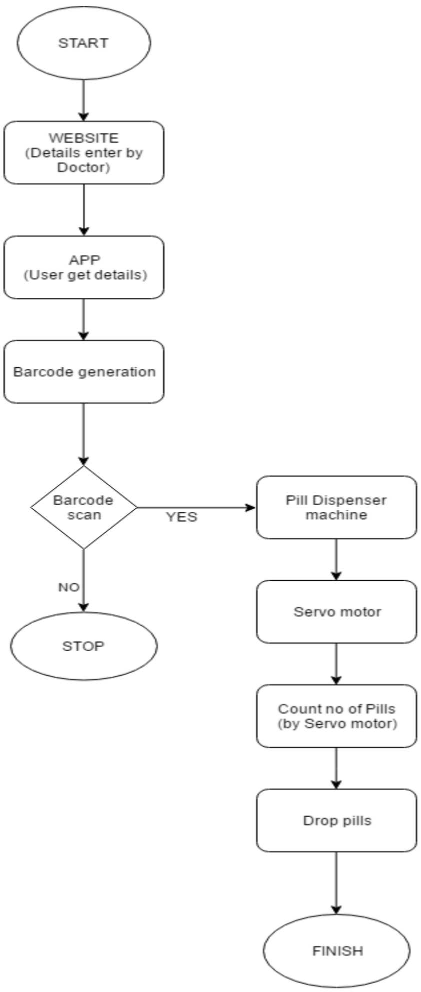

Fig 5: A flowchart of the Medical Dispenser.

V. RESULT ANALYSIS

Except for set up operation and retrieval of individual doses from medication containers, the dispenser is fully automatic. By monitoring the user's actions during set up, the dispenser prevents errors in medication identification. By automating the choices of dose sizes and times according to a machine readable MSS, the dispenser relieves the user from the burden of interpreting medication directions and special administration instructions and thus prevents the common errors due to misinterpretation. By using algorithms that can take advantage of the scheduling flexibility provided by the sizable ranges of dosage parameters of modern medications, the scheduler can often adjust dose times of medications to keep compliance when the user is tardy. The bulk of the critical work in medication administration is done collaboratively by the dispenser controller and medication scheduler. As pointed earlier, generality of the interface is an advantage of this design. By replacing the decision maker and action handlers, one can build a different device using more or less the same action executor. Similar, we can easily enhance and configure the medication dispenser by adding new and enhance action handlers into the action handler library. Indeed, we plan to use the action-oriented design to build medication dispensers for hospital and clinic use. The dispenser controller and the medication scheduler in the current prototype run on the same computer.

Fig 6 Here in this app we check the prescriptions given by the doctor and unique id is generated for every user.Barcode is also generated for each person according to the medicine given by the doctor.

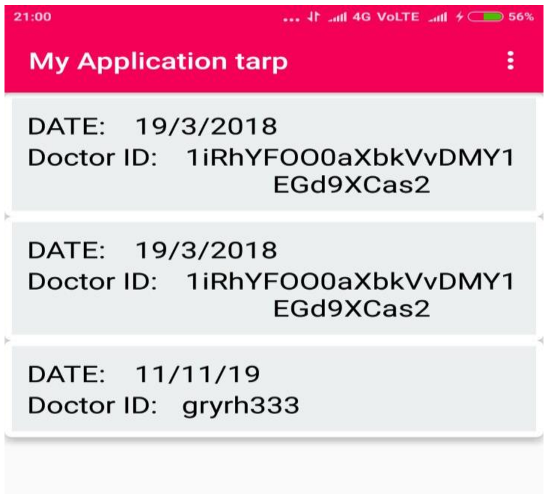

Fig 6: Screenshot of the App

Fig 7: Here we can see that number and type of pills are displayed prescribed by the doctor.

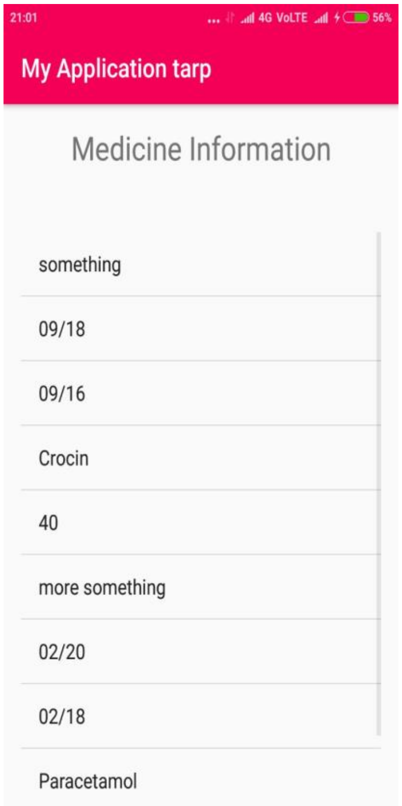

Fig 7: Screenshot of the App

Fig 8: Here only doctors have to login and prescribe for the patients so here we have only doctor's email and password for the login passage.

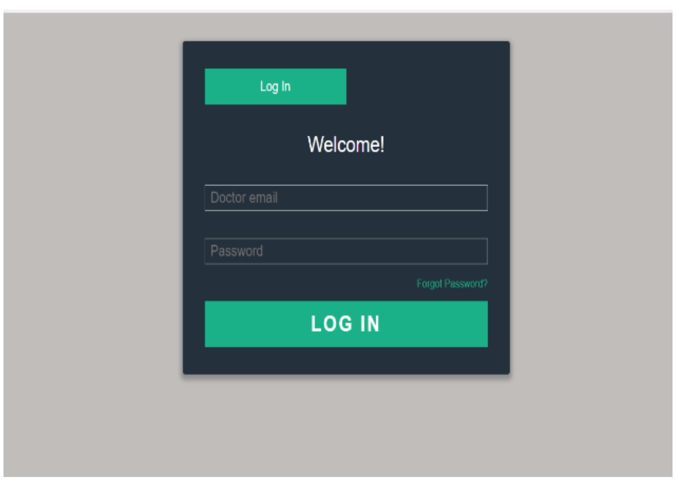

Fig 8: Screenshot of the Website

Fig. 9: This is the whole medical dispenser system connected with pvcpipes and servo motors on both sides of that pipes.And beaglebone is connected to servo motors.

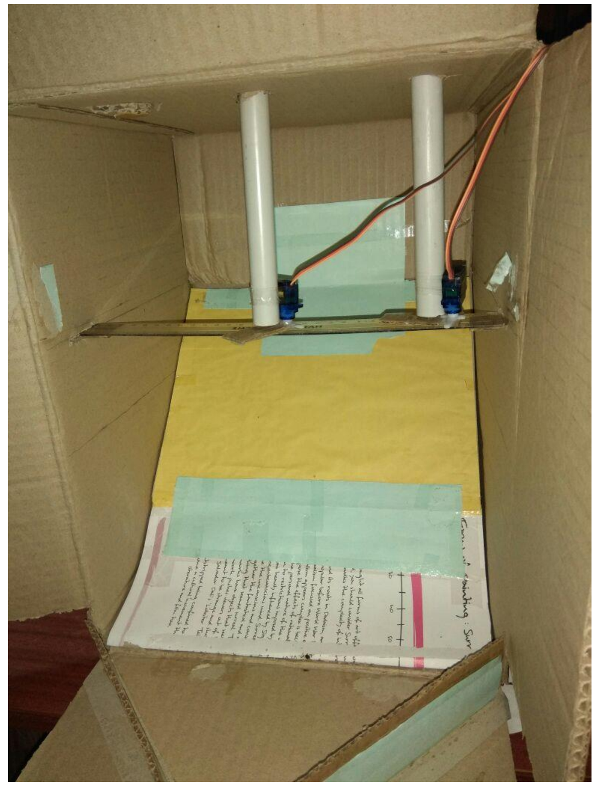

Fig 9: Medical dispenser system connection of Servo motors

VI. CONCLUSION

The overhead incurred in their communication is minimal. An alternative design is to have the controller run on the local embedded machine but have the scheduler runs on a networked server. In that case, we can link multiple dispensers to a single scheduler server through the network and the single scheduler can compute medication timetables for multiple persons and request corresponding actions to be carried out by multiple dispensers. While this alternative appears to be suitable dispensers for hospital and clinics, factors such as high communication overheads and lower than ideal network availability may rule out its use. The medication scheduling algorithms need to be modified to take into account the soft constraints defined by the user preference parameters. The compliance monitor in the current prototype is designed to perform basic non-compliance notification (e.g., call a care taker). In addition to enabling it to send non-compliance notifications using multiple media, we also want the monitor to record actual sizes and times of individual doses of all medications taken by the user, and thus generate a local medication record for the user. Finally, the current prototype needs the user to retrieve doses from containers manually.

VII. REFERENCES

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