International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 12 | Dec 2020 www.irjet.net p-ISSN: 2395-0072

IoT based Automatic Dispenser using Cloud

Prajwal P. Jagtap [1], Mahesh T. Dubey[2], Vaibhav P. Kale[3], Ankita P. Mende[4], Vrushabh P. Kalbande[5], Kirti B. Nagne[6]

[1-5]Student, Dept. of Electrical Engineering, DES'S COET, Dhamangaon Rly
[6]Professor, Dept. of Electrical Engineering, DES'S COET, Dhamangaon Rly

---

Abstract - *Cloud is used as a medium to support Storage as a Service. In this seminar, an 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. Online health communities generally 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. 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. Each user is secured with a unique barcode while starting the communication between the doctor and the patient. The proposed model eliminates the need to spend time to visit the doctor and the time to spend in pharmacy. The barcode may then be scanned in the nearby automatic pill dispenser that can dispatch the medicine.*

***Key Words*: Automatic Medicine Dispensing, Medicine, Pharmacy Automation, Pills.**

1. INTRODUCTION

The alarming statistics about medication errors have lead to numerous efforts in research, development and deployment of Information and Communication Technologies (ICT) to prevent medication errors.. Similarly, it is observed that the majority of the population in India die due to the lack of availability of the medicines on time. The problem arises majorly during night times when there is an emergency need of medicines but the pharmaceutical stores are closed or the stock of drugs may not be available the best solution in such situations would be the Any Time Medicine Dispenser. After analyzing the death rates for 8 years John Hopkins patient safety experts calculates that more than 250,000 deaths occur due to the lack of proper medication. A study with WebMD.com's most active OHCs showed 62.1% of patient posts could benefit from clinical expertise. However, there are varieties of medicine dispensing machines available in the market. OHCs provide a way for patients, health care related staff, clinicians, caregivers etc., to share their views and develop solutions for the problems of interest. In the medical field, innovation plays a vital role in sustaining health. But most of them are customized for household usage hence it cannot be implemented for outdoor applications. Among the disruptive technologies for the future, Online Health Community (OHC) platforms play a vital role. The most common problem that prevails in the medical and pharmaceutical industry is the medication errors that occur through improper use of transcription writing, dispensing medicines, and administration.

The process of prescribing and governing a patient's medication involves several steps including,

(i) Ordering: the clinician must select the appropriate medication, the dosage and frequency.
(ii) Transcribing: the handwritten prescriptions must be read and understood by the pharmacist.
(iii) Dispensing: the pharmacist must check for delivery of medicines in the correct dose considering the chemical matching, if any.
(iv) Administration: the medication must be received by the appropriate patient at the right time and should be consumed in the right dosage.

This Paper states that automation along with clinical decision support systems can help prevent up to 80% of prescription errors that accounts to 40% of all errors. A survey from the Medical Group Management Association (MGMA) in 2017 states that the average wait time in clinician practices was 20 minutes whereas the wait time in hospital-owned physician was 17 minutes. The administration errors stand next (i.e., errors due to failures to compliant to medication directions) and they contribute 25 – 40% of all preventable errors. Pointed out the necessity of CPOE based systems for senior citizens who live independently. al. Kuperman et. It is primarily for the OHC lovers as well as the type of users who are elderly that is preventing them to spend time at hospitals and pharmacy. The digital transformation of medicine is best supported by computerized provider order entry (CPOE), a term that refers to system in which clinicians directly place orders by electronic means, with the orders transferred directly to the patient or whomsoever it needs to be. Tsai et. These kinds of users may be prescribed by doctors through OHC and can use the automatic medicine dispenser nearby to ensure error-free operation. The above process is error-prone and hence requires computerization to support OHCs too. Long appointment wait times in hospitals always result in negative impact on patient satisfaction that directly influences healthcare experience. The automatic medicine dispenser described in this seminar is designed to prevent users to waste their

wait time in hospitals and to reduce transcribing and dispensing errors.

2. RELATED WORK

H. Yeh et. Al. explained about APAMAT, A Prescription Algebra for Medication Authoring Tool. This tool includes the tools include prescription entry systems, authoring, scheduling, and pill dispenser. Authoring tool helps pharmacists to collect and integrate prescriptions given by clinicians, to verify drug-drug interactions amongst them, and to generate the corresponding scheduling instructions for dispensers.

Large variety of medication administration assistance devices are deployed for non-professional users. All these type of devices target on elderly people who live independently and are left out with administration errors. These devices require human beings to load the medicines for individual days manually and hence needs weekly attention. This manual process frequently results in errors.

Wan D introduced Magic Medicine Cabinet that uses face recognition for day to day scheduling of pills.

Puneet discussed about the necessary of automation in current world scenario where people are not able to spend any time.

Debiao discussed about the design of parallel pharmaceutical automatic dispensing (PPAD) machines that are widely used in central fill pharmaceutical units to improve the prescription dispensing speed and accuracy. The objectives of the design by Debiao are to minimize the make span and collation delay. Many devices emerged into the market and can schedule the dispensing of medicines based on clinician's prescription and can be monitored through Internet. These kinds of devices are better suited for patients who need close professional supervision and fully integrated health care services.

The intent of our work is to automate the medicine dispenser system combined with cloud based services to simulate pharmacy works. The proposed dispenser is a stand-alone tool, capable of releasing pills to the users based on the prescriptions suggested by clinicians without the need to manually visit the clinician. The methodology is found to reduce the waiting time of patients at hospitals and pharmacies and ensures privacy and independence among the patients.

3. METHODOLOGY

3.1 Block Diagram of Proposed System

A dispenser that can dispense medicines to the patients, based on the prescriptions suggested by the doctor secured by individual barcodes. These dispensers are to be owned by the pharmacies and to be filled with medicines on the time of requirement (like ATM machines). Users of Online Health Communities are the target users of these machines who can get appropriate suggestions from the doctors associated with the same group.

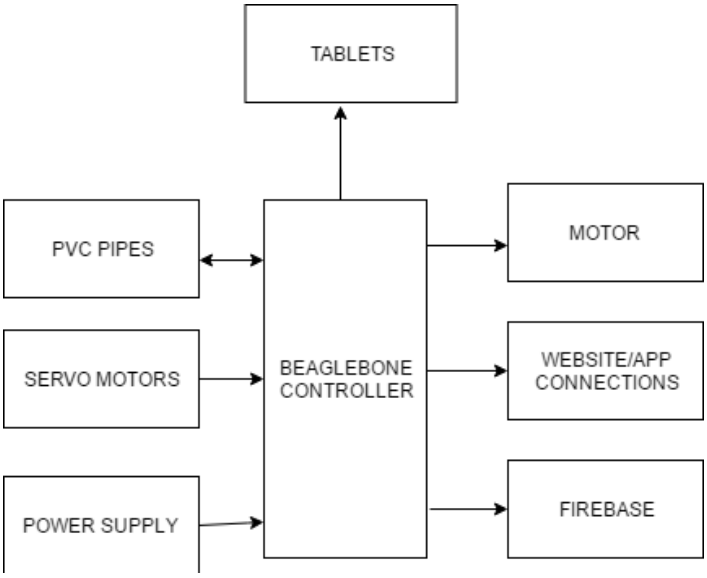

Fig.3.1: Block Diagram of Proposed System

The IoT based automated medicine dispenser system as shown consists of a controller (Arduino mega) that controls the sub-systems such as RFID reader, Global System for Mobile Communication (GSM), Medicine dispenser, Wi-Fi module, and Servo motor.

This system is proposed using the concept of the internet of things, and RFID technology which plays a pivotal role. Radio Frequency Identification is an important component of this seminar. It consists of a tiny silicon chip and an antenna, wherein the reader can scan and send the data to the database. So through this, it is possible to make every object to be trackable with the unique identification and we have utilized this key aspect in this work to build a system to identify the unique user by their Id. With the help of this RFID technology, the amount can be credited to the card which is used for the payment when the user requests the medicine.

3.1.2: Datastore

Cloud based datastore is required to store the details of OHC users along with their history of medication and the sequence of medications they had etc., Firebase is used for prototype modeling that can be replaced with appropriate cloud infra.

3.1.3: User Interface

An android application that can be used by doctors to create prescriptions for patients registered in OHC.

3.2: Cloud Computing for Heathcare

In recent years, the cloud computing paradigm has become one of the hottest topics in information technology. It has scalability, mobility and security benefits by providing on-demand computing resources (e.g., storage, services, networks, servers, applications, and hardware) to users. According to a research, cloud computing has recently emerged as a backbone of IoT healthcare systems. Another great advantage of cloud computing is the capability of sharing information among health professionals, caregivers, and patients in a more structured and organized way, thus minimizing the risks of medical records lost. As a result, healthcare services and applications have benefited from the development of technologies such as IoT and Cloud Computing. A platform of an m-Health monitoring system based on a cloud computing technology which contained three main layers was proposed in the platform was presented below.

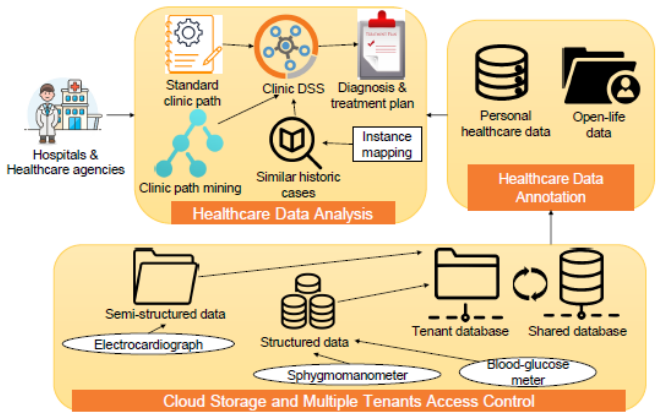

Fig.3.1: Functional platform of the cloud-computing-based Health monitoring system

(i) The Cloud Storage and Multiple Tenants Access Control Layer is the backbone of the platform, which receives healthcare data collected by sensors such as BG and sphygmomanometers in daily activities. The authors reduced the cost of storing and managing data by adopting the cloud framework. Moreover, a multiple tenant access control module between tenant database and shared databased is implemented to enhance the security and privacy of patient data.

(ii) The Healthcare Data Annotation Layer solves data heterogeneity issue that is commonly happened during data processing. Because equipment varied by hospitals, generated data are often heterogeneous, which increases the complexity of automatic healthcare data sharing and comprehending between medical agencies. The authors proposed an open Linked Life Data (LLD) sets to annotate personal healthcare data and integrate dispersed data in a patient-centric pattern for the cloud application.

(iii) The Healthcare Data Analysis Layer analyses healthcare data stored in the cloud to assist in clinical decision making because similar historical data are valuable assets to make a treatment plan for a similar illness case. Mining algorithms are implemented to induce clinic paths from personal healthcare data. After that, a similarity calculation module is designed to compare patients' healthcare data with historical cases. Each layer was specially designed to handle a predefined task, and it can be implemented to serve a variety of demands for healthcare using cloud platform and service-oriented architecture. This platform helped practitioners to observe and evaluate health conditions by transmitting raw sensors information from end-user to the cloud platform for processing and then displayed results to doctors.

3.2 Medicine Dispenser

Medicine dispenser is modeled using various components as stated in Figure 3.2. A short description about the various technical requirements is discussed below.

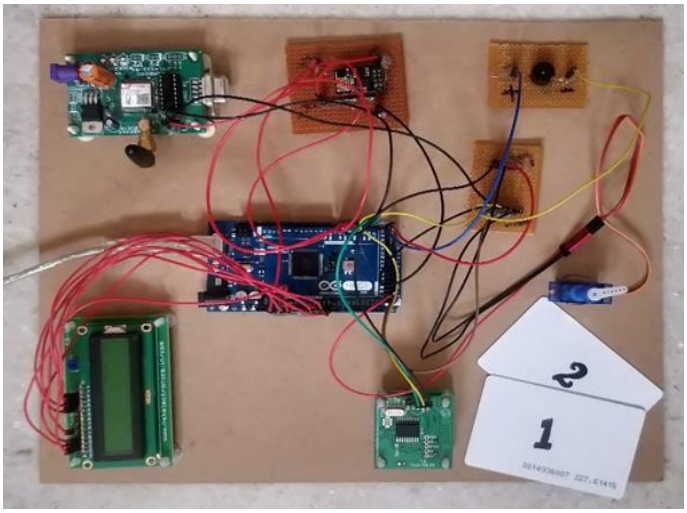

Fig.3.2: Complete Setup of IoT Based Automated Medicine Dispenser

The system mainly consists of an RFID reader and a tag. The complete setup of IoT based automated medicine dispenser is as shown in Fig.4.1. To use this system firstly the users, have to register for obtaining the RFID card. The communication begins when the user swipes the RFID tag to the RFID reader. The RFID reader reads the details of the user when an RFID card is swiped and displays the read data. The system asks for the PIN from the user to avoid the misuse of the card. After user identification is done the LCD displays the list of medicines in the system which is divided into two types i.e., Regular type which contains BP and Diabetic medicines and the other one is General Type which contains a First Aid Box, are present in the system. Users can select the corresponding number of the required medicines. The selected medicine's expiry dates will be checked by the

system. If the medicines are expired then the system displays an alert message on the LCD and also sends an SMS alert to the pharmacist to remove the medicines, and the transaction ends without dispensing the medicine.

Depending on the medicine selected and their quantity amount will be calculated and the respective amount will be deducted from the card. Then the system delivers the selected medicines through a servo motor. Further, with the help of the GSM module, the generated e-bill will be sent as an SMS to the user's registered mobile number. After dispensing the medicine, the remaining medicine count in the system is updated to the cloud (ThingSpeak) through the WiFi module and this medicine data is represented in a graphical form. Later when the medicine count in the storage reaches the minimum level immediately an SMS alert will be sent to the nearby pharmacist suggesting the refilling of the medicine via GSM module.

4. CONCLUSION

In this seminar, the overhead incurred to the patients for waiting in hospitals and pharmacy can be greatly reduced using the proposed architecture. Security can be provided by managing private cloud for each OHC groups. Pharmacy people will be relieved off from the distribution tasks for small tasks. The methodology is found to be error-free in the perspective of transcribing and dispensing. Since all the automated dispensers are networked through the cloud, future expansion to include multiple pharmacies becomes easier.

REFERENCES

[1] D. E. Goldstein, "e-Healthcare: Harness the Power of Internet e-Commerce & e-Care". Gaithersburg, MD: Aspen, 2000.

[2] D. Howcroft and N. Mitev, "An empirical study of Internet usage and difficulties among medical practice management in the UK". Internet Res., vol. 10, no. 2, pp. 170–181, 2000.

[3] Dr. S. P. Meharunnisa, Janhavi A, Lavanya R, Nivedita Nanagouda Biradar, Vaishnavi B, "IoT based Automated Medicine Dispenser", (IRJET) e-ISSN: 2395-0056, Volume: 07 Issue: 06 | June 2020

[4] H. Yeh, P. Hsiu, C. Shih, P. Tsai and J. W. S. Liu, "APAMAT: A Prescription Algebra for Medication Authoring Tool," 2006 IEEE International Conference on Systems, Man and Cybernetics, Taipei, 2006, pp. 4284-4291. doi: 10.1109/ICSMC.2006.384807.

[5] https://patientengagementhit.com/news/solutions-for-reducing-healthcare-appointment-wait-times-for-patients.

[6] https://psnet.ahrq.gov/primers/primer/6/Computerized-Provider-Order-Entry

[7] Huh J, Mcdonald DW, Hartzler A, Pratt W. "Patient Moderator Interaction in Online Health Communities". AMIA. 2013 In Press. [PMC free article] [PubMed].

[8] Kuperman, G. J., Bobb, A., Payne, T. H., Avery, A. J., Gandhi, T. K., Burns, G., Classen, Bates, D. W. (2007). "Medication-related clinical decision support in computerized provider order entry systems". Journal of the American Medical Informatics Association.

[9] Mathur P. (2019) "Key Technological advancements in Healthcare. In: Machine Learning Applications Using Python". Apress, Berkeley, CA

[10] Tsai, Pei-Hsuan & Chen, Tsung-Yen & Yu, Chi-Ren & Shih, Chi-Sheng & W. S. Liu, Jane. (2011). "Smart Medication Dispenser: Design, Architecture and Implementation". Systems Journal, IEEE. 5. 99 - 110. 10.1109/JSYST.2010.

[11] Wan D. (1999) "Magic Medicine Cabinet: A Situated Portal for Consumer Healthcare". In: Gellersen HW. (eds) Handheld and Ubiquitous Computing. HUC 1999. Lecture Notes in Computer Science, vol 1707. Springer, Berlin, Heidelberg.