International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.07, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Design and Implementation of Automated Pill Dispenser

Debasish Biswas[1], Kaushik.Y.H[2], L.Prashanth[3],

Lohith.R[4], Vidyasagar.K.N[5]

[1,2,3,4,5] *School of Electronics and Communication Engineering,*

REVA University, Bengaluru, Karnataka, India 560064.

ABSTRACT

People on high medication who fail to take prescribed drugs at the right time and right dosage risk jeopardizing their health and independence.Pill dispenser facilitates the user to constantly monitor the health of the patient without the need to be physically present with the patient.The use of Internet of Things (IOT) concepts and health sensing technologies make diagnosis easier and convenient for the doctors as well as the patients.This version of the device can also transmit text messages to notify designated contacts (typically family members) if medication has been taken by the patient.The automated pill dispenser hosts an array of devices which includes a motor and motor controller which hosts the pill container, a Wi-Fi module for accessing the cloud storage, and an array of sensors for monitoring the health of the patient, all integrated to a micro controller.The user can set the time to dispense more than one pill at desired timing.A beep alert is given whenever the pill is dropped.The major objective is to keep the device simple, user friendly and cost efficient system with a reliable and stable software, so that concerned population can be benefitted from this device as it avoids expensive in-home medical care.

Keywords: *medication, dispenser, motor controller, Internet of Things.*

I. INTRODUCTION

In this era where people are getting busier, they often fail to take their medication at prescribed and scheduled time. As a consequence of which the geriatrics often land up into hospitals. Hence a system is needed to be designed in a way that it will dispense the adequate pills at stipulated time as provided by the care taker. Since the aim of the device is to target the geriatrics population, it needs to be user friendly, portable, safer to use and light weight. In order to make a working prototype following steps have been taken to achieve different attributes. According to the feedback from many patients it was found that there is a huge need of this device in medicine field.

II. LITERATURE SURVEY

A large plethora of medication assistance devices or system can be found in the market, majority of them are manual medication assistants which includes 'pill trays' that hosts multiple containers to store medication.Each

container is dedicated to hold medication for a single time, many such containers are grouped together forming a tray that serves medication for a period of 28 days. There is no provision of intimating the time of taking the medicine [1]. Pill-Mate-Medicine reminder is a device that uses both audio visual signals to notify users to take medicines at a pre-set time[2]. In order to avoid mistakes and negligence a smart phone application is designed to remind the users to take prescribed medication on scheduled time and record the in-take of medicines for later review by doctors or the concerned people [3].

III. METHODOLOGY AND IMPLEMENTATION

The automatedpill dispenser facilitates the user to constantly monitor the health of the patient without the need to be physically present with the patient.The proposed system consists of an IOT enabled medicine box which gives timely intimation for the patients about their medication.It alerts the patients to take medicines at the proper time.The medicine details can be recorded in the System by the caretaker of the patient. The architecture of the Automated Pill Dispenser is described in Fig. 1.

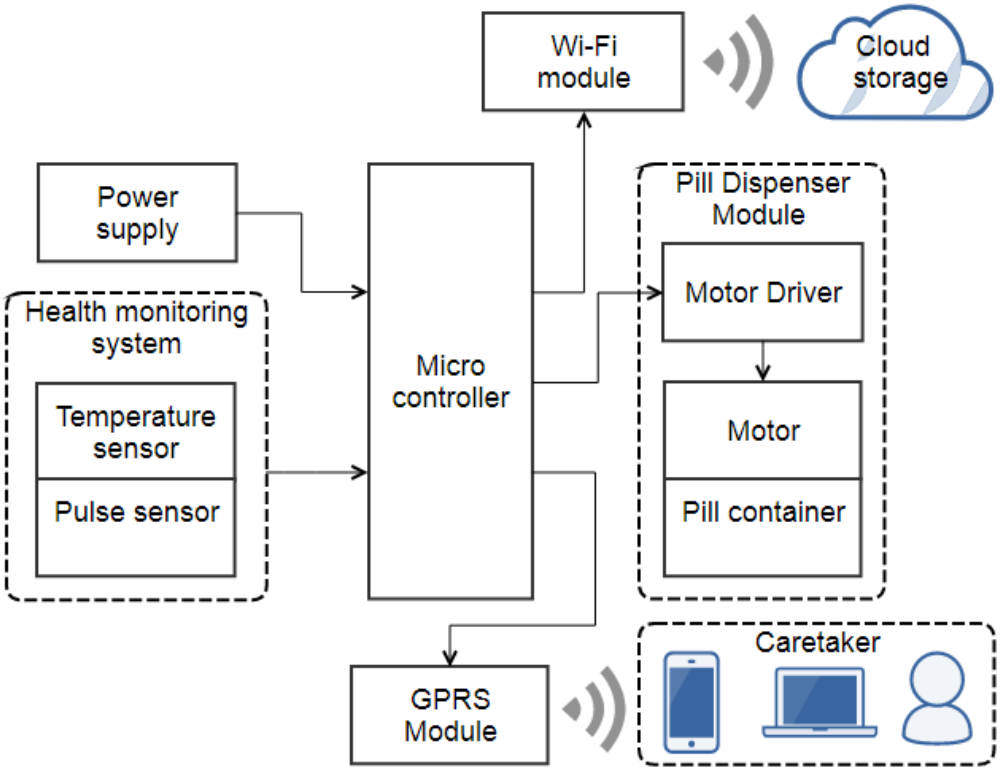

Fig. 1 Block diagram of Automated Pill Dispenser.

The alarm system is used to give the intimation to the patient.When the alarm sounds, it indicates that medicine is available for the patient.When the patient takes medicine, then message is received by the caretaker/doctor.This also includes periodical checkups of pulse rate and temperature rate, these rates are

updated to the cloud through IoT devices. If patient fail to take medicine, then delay is given for the long buzzer, then message is received by the caretaker/doctor regarding not taking the medicine. The working of the automated pill dispenser is described using the flowchart as illustrated in Fig. 2.

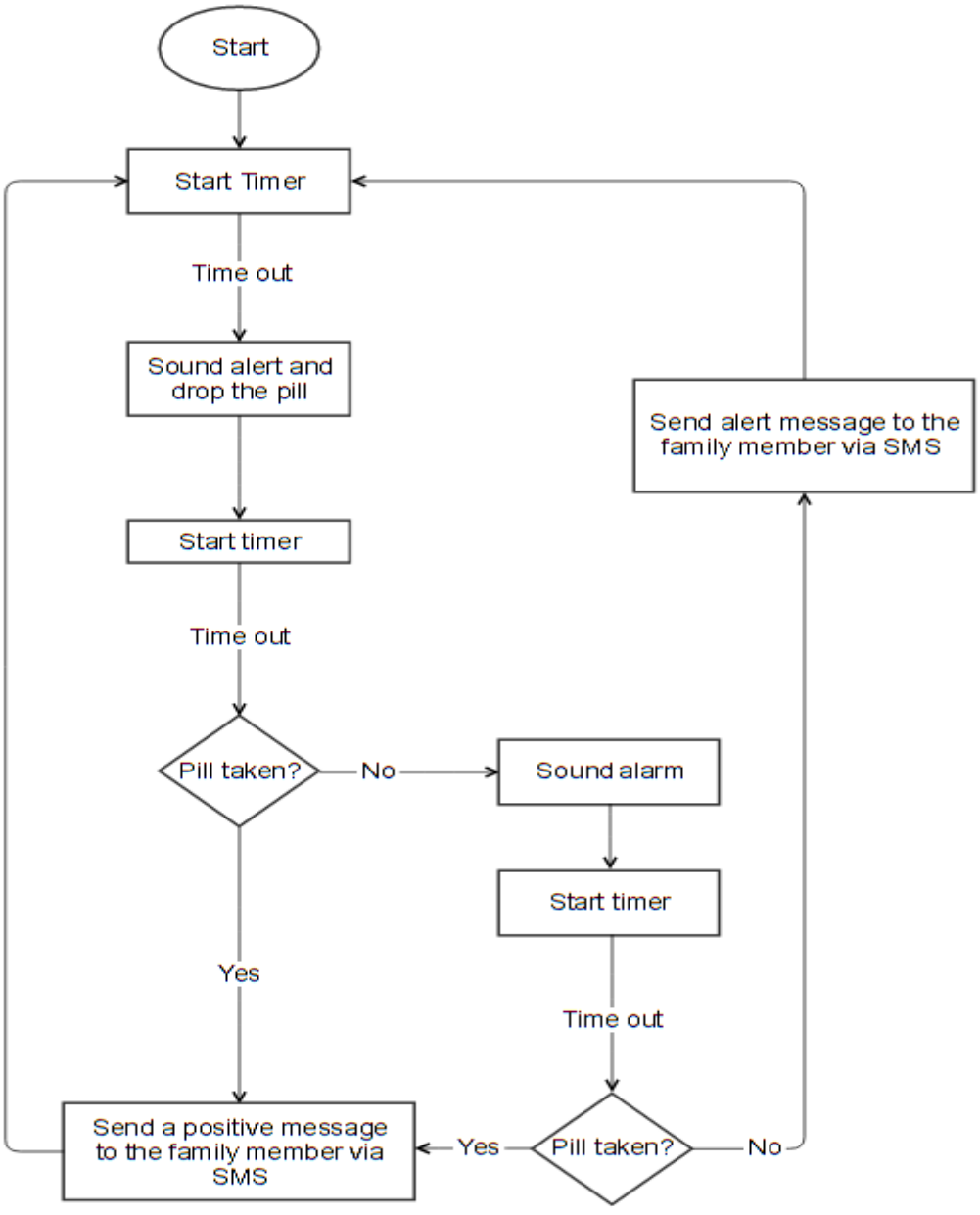

Fig. 2 Flowchart of working of the Automated Pill Dispenser.

IV. DESIGN CONSIDERATIONS

The automated pill dispenser is designed such that the caregiver can remotely monitor and control the medication of the patient. The hardware design includes components and modules that support this process.The

components used includes the power supply, pill container and dispenser, a microcontroller, a stepper motor and a motor controller, a buzzer for sounding the alarm, a website based user interface for monitoring and administrating the patient's medical conditions.The following are the overview of each component.

4.1 Power Supply

The power supply design will provide the necessary power requirements of the Automated Pill Dispenser. The design requirements are5mA at 5VDC for the microprocessor, 12VDC is necessary for the motor and motor controller, the GSM module requires 2A peak current at 12V DC, the power consumption of buzzer, heartbeat sensor and ultrasonic sensors are handled by the microcontroller.

4.2 Pill Container and Dispenser

The pill container design will have four slots to store four different pills, each pill dispenser can host medication for thirty days. The sensors send the data about the pulse rate, temperature and feedback on the acceptance of medicine by the patient [4].

4.3 Microcontroller

The important part of the Automated Pill Dispenser is themicrocontroller. The microcontroller is the central processing systemthat controls and administers all the operations of the automated pill dispenser. A specific microcontroller is chosen as to use its resources in the most effective while keeping the cost as low as possible. It consists of several input and output ports which are used to collaborate the motor and motor controller, the GSM module, heartbeat sensor, temperature sensor, and anultrasonic sensor.The microcontroller used here is Atmega 328 is a microcontroller unit present in the Arduino UNO R3, and The ESP8266, 32-bit microcontroller with inbuilt low cost Wi-Fi microchip with full TCP/IP stack.

4.4 Motor and Motor Controller

The motor used is the stepper motor, which takes the input in binary format, the rotation speed and its direction can be determined by the inputs given to it. The functionality of the stepper motor is controlled by the motor controller.Motor controller is the device used to regulate the motion of the stepper motor.Its functionality is to energize the circuit of the motor to start and de-energize it to stop. Every motor has its own driving current requirements, hence suitable motor controller must be used. The power supply to the stepper motor is controlled by the motor controller which in turn depends on the logical inputs fed by the microcontroller.

4.5 Alarm Module

This module is a combination of devices including an ultrasonic sensor, a buzzer and a GSM modem. The buzzer is sounded before the medicine is dispensed, the ultrasonic sensor keeps a track on if the medicine is taken or not. The GSM module is used to send SMS alerts to the respective care taker regarding the pills are taken by the patient or not.

4.6 Web Interface

To make the device user friendly, this is integrated with a web application so as to make the health monitoring of the patient convenient and remotely accessible. Any change in the medication and the dosage of the patient's medicine can be altered using this. The health status i.e. heartbeat and temperature of the patient is logged in the server and can be viewed by the care taker of the respective patient.

4.7 Health Monitoring System

This is an add-on feature for the automated pill dispenser, it contains a heartbeat sensor and a temperature sensor, the patient needs to check his/her body temperature regularly as per the description of the doctor. This data is logged in the server, and can be accessed by the respective people as and when required.

V. RESULTS AND DISCUSSIONS

Automated pill dispenser hosts several functionalities which makes this device a helpful and reliable alternate solution to the existing medical assistants. The medication in the form of pills are stored in the container of the dispenser, the details of these medications are updated to the system via a cloud technology. The designed prototype can have up to four pills, the time at which each pill has to be taken is also specified in the web-application. When the time is right, the automated pill dispenser sounds a buzzer and drops the pill, the dispenser gives a two minutes pause and then checks if the pills are taken, if not it sounds another buzzer and yet if the pills are not taken, a negative message will be delivered to the care taker, so that the concerned person can take immediate actions. If the pills are taken by the patient, a positive message will be delivered to the care taker, so the care taker can feel assured about the health of their loved ones.

VI. CONCLUSION

This paper focus on the implementation of new technologies designed to overcome the disadvantages of conventional pill dispenser, which includes less reliability, inconvenience.The proposed dispenser has two advantages over existing medication dispensers, they are, (1) To achieve a high degree of remote manageability, and (2). High dependability, cost effective and user friendly management system. Further, system settings,the automated pill dispenser gives the flexibility to remotely manage the errors without causing inconvenience to the user.The automated pill dispenserfunctions normally and performs the management operations from the medication monitoring server suitably.The automated pill dispenser can be used to improve medication adherence. It is designed to prevent the users from accessing over dosage or under dosage of the prescribed medication. Further, this project can include functionalities like motion sensors and cameras to ensure that user consumes the medication.

REFERENCES

[1] Hsiu-Ling Tsai , Chun Hsiang Tseng , Long-Cian Wang , Fuh-ShyangJuang"Bidirectional Smart Pill Box Monitored Through Internet And Receiving Reminding Message From Remote Relatives", 2017 IEEE International Conference on Consumer Electronics - Taiwan (ICCE-TW).

[2] K. Doughty, G. Williams, L. Holloway"TEMPEST-an intelligent pill reminder and delivery system for telecare applications"Engineering in Medicine and Biology Society, 1998. Proceedings of the 20th Annual International Conference of the IEEE.

[3] Mei-Yeing Wang, "A Mobile Phone Based Medicine In-take Reminder and Monitor", 9th IEEE International Conference, June 2009.

[4] Lea GulstavDalgaard, Erik Grönvall, NervoVerdezoto"MediFrame: A Tablet Application to Plan, Inform, Remind and Sustain Older Adults' Medication Intake".2013 IEEE International Conference on Healthcare Informatics

[5] Kuperman GJ, Bobb A, Payne TH, et al. "Medication Related Clinical Decision Support in Computerized Provider Order Entry Systems: A Review" Journal of American Medical Informatics Association, 2007.

[6] J. W. S. Liu; C. S. Shih; H. C. Yeh; P. C. Hsiu; W. H. Chang; P. H. Tsai; C. Y. Yu, "Point-of-Care Support for Error-Free Medication Process", 2007 Joint Workshop on High Confidence Medical Devices, Software, and Systems and Medical Device Plug-and-Play Interoperability (HCMDSS-MDPnP 2007).

[7] Shih CS, Tsai PH, and JWS Liu, "Algorithms for scheduling multiple interacting medications," Technical Report TR-IIS-08-001, Institute of Information Science Academia Sinica, Taiwan, April 2008.

[8] Shaantam Chawla, "The autonomous pill dispenser: Mechanizing the delivery of tablet medication", 2016 IEEE 7th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON).

[9] Andrea Mondragón, Andrés De Hoyos, Axayacatl Trejo, Marco González, Hiram Ponce, "Medi-Kit: Developing a solution to improve attention on medical treatment", 2017 IEEE Mexican Humanitarian Technology Conference (MHTC).

[10] EmreErmisoglu, CoskunBayrak, Engin Mendi, "Simulation of Mobile Treatment Monitoring System", 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2013).