Smart Pill Box for the Blind Using Internet of Things

Akshaya Dwaraka Mayi T.S[1], Aswita S.[2], Aneesh, Nicola J.[3],

Athira Unnikrishnan[4],

[1,2,3,4] *Rajalakshmi Engineering College, Chennai, Tamil Nadu, India*

Abstract:

According to the World Health Organization (WHO) the estimated number of people visually impaired in the world is 285 million. 82% of the blind are 50 years and older. These visually challenged people also suffer from several chronic diseases which require regular medication. It is difficult for the visually challenged people to take their medication correctly and at the right time without the assistance of a caretaker. In the absence of the caretaker who is withheld for unavoidable reasons, these blind patients are put into the situation of skipping their pills which is risky. In order to resolve this issue, we have developed a prototype which deals with the smart pill system focused for the blind where the visually impaired people are intimated to take their pills on time via a recorded voice input which guides the person to take the correct tablet. There does exist smart pill boxes which remind the intake of pills via text on the LCD but since here the application is for the blind, an APR voice module is installed to give the commands in voice format. The pill system uses Arduino mega 2560 microcontroller and the coding is performed on Arduino IDE software using C language. The system features embedded sensors in each compartment that transmits detected signals to a server using the IOT module whenever the user is taking the pills, so that the pill status can be monitored by the care taker.

1. INTRODUCTION

Diseases affecting the blind and causing blindness at old age are several. The cause for blindness is not only refractive error or childhood blindness but several other factors such as glaucoma, cataract, age related macular degeneration and diabetic retinopathy which are more prominent to occur in adults aged fifty and above. These conditions require proper medication at the right time on a daily basis. While taking the right pills at the right time becomes a herculean task even for ordinary people then imagine the plight of the visually challenged ones

Most of the visually challenged people are accompanied by someone to take care of them But in their absence they tend to skip their medication which puts forward a major risk .This project resolves the above mentioned risk by proposing a smart pill box for the blind which helps them to take their medications on their own in the absence of the caretaker .The pill box reminds the blind patient to take the right medication by using an real time clock based reminder system where the patient is alerted to take the pill from the pill box at the right time via a buzzer and voice input. Thereby in cases where the caretaker is unable to make it to the patient's house, then he/she can monitor the patients medication status via a webpage in which the time at which the patient has taken his/her pills is updated by an Internet of things(IOT)module.

2. HARDWARE AND SOFTWARE USED

- Arduino MEGA controller 2560
- Force-sensing resistor (FSR)
- IOT module
- RTC module(DS1307)
- APR voice module
- Infrared sensor
- ARDUINO IDE software is used

(programming is done using C language) in device operation.

3. DEVICE OPERATION

The smart pill system operates as follows
• The entire system is controlled by an Arduino MEGA controller 2560
• At any time, the real time clock (RTC-DS1307) compares the programmed time and the current time and during perfect match of both the times it triggers a buzzer and simultaneously delivers the prerecorded voice message which indicates the tablet to be taken.
• The voice message is delivered using an APR 9600 voice module
• The pill boxes are interfaced with a touch sensor - Force Sensitive Resistor (FSR sensor), so when the box compartment lid, it indicates the tablet name present in the corresponding compartment and whether or not the patient is taking the right pill.
• An infrared sensor indicates whether the pill box is filled or requires a refill.
• An IOT (Internet of Things) module is used to update the patients pill status onto a webpage which can be monitored by the caretaker any time

4. BLOCK DIAGRAM
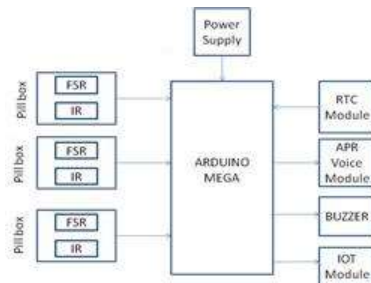
5.COMPONENT DISCRIPTION

Arduino Mega 2560 controller The Arduino Mega 2560 controller controls the entire operation of the pill box system. The board is based on the ATmega2560(datasheet). It is more efficient cause it permits more interfacing due to the presence 54 digital I/O pins, 16 analog inputs. The Arduino Mega 2560 is programmed using the Arduino Software (IDE), an Integrated Development Environment common to all Arduino boards.

Force Sensing Resistor

FSR A force-sensing resistor or FSR is a material whose resistance changes when force or pressure is applied. Force sensing resistors consist of a conductive polymer, which changes resistance in a predictable manner following application of force to its surface. Applying a force to the surface of the sensing film causes the film to press against the conducting electrodes. This produces a change in the resistance of the film. The FSR sensor is a better choice as its economical and has good resistance to shock and has a thickness typically less than 0.5 mm. A pressure threshold is predefined for the touch sensor
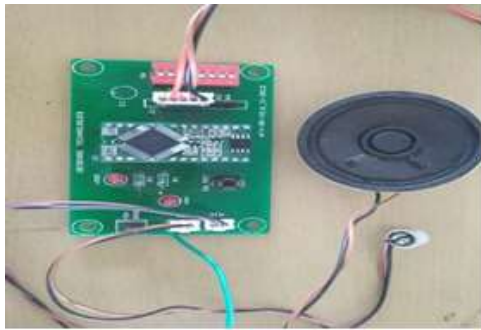

INFRARED SENSORS

An infrared sensor is an electronic device that emits or detects infrared radiations in order to sense certain characteristics of its surroundings An IR sensor can measure the heat of an object as well as detects the motion. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum.

APR 9600 VOICE MODULE

The APR9600 device is a single-chip voice, non-volatile storage that supports voice recording and has a playback capability for 40 to 60 seconds, this capability can be varied by varying the resistor value. The device is ideal for use in portable voice recorders, toys, and many industrial applications. The IC can operate in one of two modes: serial mode and parallel mode. In serial access mode, sound can be recorded in 256 sections. In parallel access mode, sound can be recorded in 2, 4 or 8 sections.

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blind which is otherwise a tedious task for them to perform without any assistance

RTC Module (DS 1307)

The DS1307 serial real-time clock (RTC) is a low power device, fully binary coded decimal(BCD) clock/calendar that works exactly like a clock keeping track of hours, minutes, seconds and year information. Address and data are transferred serially through an I2c bidirectional bus.

6. EXISTING METHOD

There exists a smart pill system in which the patient is alerted via a text message on a LCD interfaced to the pill system. It is mainly used for aged people who are suffering from chronic diseases which require regular medications at the right time in order to maintain stability. The system proposed here is the pillbox for the blind patients in order to avoid skipping of tablets in the absence of the caretaker. This system uses a APR voice module to remind the patient to take the pills via recorded voice format and buzzer. This system simplifies the task of pill taking for the

7. CONCLUSION

A smart pill box system designed exclusively for the blind patients which reminds them to take medication on time has been proposed in this paper. Since the caretaker can monitor the pill status from wherever he is, through the server the caretaker's workload has also been reduced. This system can be further enhanced in the future to keep track of the number of pills dropped by the patients by interfacing a camera with the pillbox and doing the necessary processing.

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