

Cataract Surgical Monitoring System with Timely Reminders

¹Ms. K. Raja Saranya, ² Navin Raj M, ³ NithyaNagalakshmi M, ⁴ Pavithra S, ⁵ Prabhakaran U

¹ Assistant Professor, ^{2,3,4,5} UG Student

Department of ECE, Jerusalem College of Engineering, Pallikaranai, Chennai, Tamil Nadu, India

ABSTRACT

Healthcare industry is one where lot of improvement is taking place. Here, the elder people are suffering from lot of health issues, the major one is eye problem. To get rid of this, they undergo a surgery known as Cataract, which is the leading cause of reversible blindness and visual impairment, it is necessary to take medicines at right time prescribed by the doctor. The care taker intimates the patients to take prescribed medicines at correct time, but every time it is difficult for the family members/care taker to remind the patients about the medication. Also care takers who are dealing with increased number of patients may feel hectic to sorting of medicine list for respective patients at appropriate time. This system consists of specialized features including three sub boxes which helps to organize three different medicines, which also provides timely reminders for the patient or caretaker using android application like hand-held devices like smartphone. The proposed system is much safer as it clearly intimates about time, dosage, stock of medicine and sorts out different drops in correct sub boxes during the next fill by caretaker.

Keywords - Elder people, Cataract, Medication, Dosage, Care taker

Article Info

Publication Issue :

Volume 9, Issue 1

January-February-2023

Page Number : 63-71

Article History

Accepted: 01 Jan 2023

Published: 15 Jan 2023

I. INTRODUCTION

In modern society, most of the time people are busy with their daily life schedule. It is true that they give priority to their work taking care of their health. Eye diseases like cataract are very common nowadays. It becomes very difficult for old people to maintain daily medication. There are many people in our family those who need constant help, be it our elderly people, youth or others. But it is not always possible for us to remind them about the dosage of their medicine every time. For this purpose, we must have some facility for monitoring patients and take care.

Nowadays we are all used to living technology-based life. We can use this technique in a way that will be beneficial to us. In our others. But it is not always possible for us to remind them about the dosage of their medicine every time. For this purpose, we must have some facility for monitoring patients and take care. Nowadays we are all used to living technology-based life. We can use this technique in a way that will be beneficial to us. In our project, IoT enabled devices will control the overall monitoring system and developed an android application that helps patients to remind medicine on time and so on.



Figure 1 Block diagram of Monitoring System

This paper gives a brief introduction of cataract surgery. Cataract surgery, also called lens replacement surgery, is the removal of the eye's natural lens that has developed an opacification, called a cataract, and its replacement with an intraocular lens. The goal of this project is to create a device for monitoring the patients through GSM application.

OBJECTIVE

- The main objective of our project is to monitor the eye patients (cataract surgery undergone) and provide them medicine on time with a proper dosage by alerting them thrice and also by updating their intake details through Android application.
- So that the doctor/ care taker can get a notification on each intake of medicine.
- To provide an monitoring system with comfort, safety, cozy design architecture

II. RELATED WORK

Evgeny Stankevich, Ilya Paramonov, Ivan Timofeev, has presented the principle of Mobile Phone Sensors in Health Applications. Slagle, J.M, Gordon, J.S., Harris, C.E., Davison, C.L., Culpepper, D.K., Scott P. and Johnson, K.B., in (2011) has explained the working of MyMediHealth– Designing a next generation system for child-centered medication Management. Zao, J.K., Wang, M.Y., Peihuan, T. and Liu, J.W.S., in (2010) has proposed the Smart Phone Based Medicine Intake Scheduler, Reminder and Monitor , IEEE e-

Health Networking Applications and Services. Prasad, B., in (2013), an introduced Social media, health care, and social networking. S.T.-B. Hamida, E. Ben Hamida, B. Ahmed, and A. Abu-Dayya has reviewed Towards an efficient and secure in-home wearable insomnia.

SYSTEM OVERVIEW

The Block diagram of Cataract Monitoring System with timely reminders is as shown in (Figure 1). In this work, Patients can often fail to adhere to their medication, whether by forgetting to take it, taking it at the wrong time, or even taking too much. Therefore, there are many systems such as reminders, alarms, etc. to remind the patient . We focus on patients who are having difficulty in eye problems to take medicine on time, we tried to design and help patients to manage their medical prescription through a reminder app which they can use to take their medicines will do to view and manage. Pill reminder will help users to take right medicine on time. The system provides a real-time monitoring system that allows the concerned people to remotely monitor the patient's activity

III. COMPONENTS REQUIRED

A. Arduino Nano

Arduino Nano is a type of microcontroller board, and it is designed by Arduino.cc. It can be made with a microcontroller like the Atmega328. This microcontroller is also used in Arduino UNO. It is a small size board and also flexible with a wide variety of applications. Other Arduino boards mainly include Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lilypad, Arduino Leonardo and Arduino Due. And other development boards are AVR development board, PIC development board, Raspberry Pi, Intel Edison, MSP430 Launchpad and ESP32 board.

This board has many functions and features like Arduino Duemilanove board. However, this Nano board differs in packaging. It has no DC jack so power can be supplied using a small USB port otherwise directly connected to pins such as VCC and GND. 6 to 20 volts can be supplied to this board using a mini USB port on the board.



Figure 2 Arduino Nano

B. LCD

A Liquid Crystal Display is a type of flat panel display that uses a liquid crystal as its primary form of operation. LEDs have a large and varied set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors, and instrument panels.

LCDs were a huge leap forward in terms of the technology they replaced, which include light-emitting diodes (LEDs) and gas-plasma displays. LCD allowed the display to be much thinner than cathode ray tube (CRT) technology. LCDs consumed much less power than LED and gas-displaced displays because they work on the principle of blocking rather than emitting light. Where an LED emits light, a liquid crystal in an LCD creates an image using a backlight.

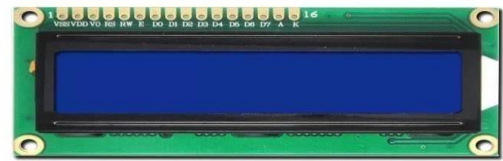


Figure 3 Liquid Crystal Display

C. Ultrasonic Sensor

An Ultrasonic Sensor is an electronic device that measures the distance to a target object by emitting ultrasonic sound waves and converting the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (that is, the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits sound using a piezoelectric crystal) and the receiver (which receives the sound as it travels to and from the target).

Ultrasonic sensors are also used as level sensors to detect, monitor and control liquid levels in closed containers (such as vats in chemical factories). In particular, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumors, and ensure the health of babies in the womb.



Figure 4 Ultrasonic Sensor

D. Buzzer

An Audio Signaling device such as a beeper or buzzer may be of electromechanical or piezoelectric or mechanical type. Its main function is to convert the normal signal from audio to sound. Generally, it operates through DC voltage and is used in timers, alarm devices, printers, alarms, computers, etc. Depending on the different designs, it can produce different sounds such as alarm, music, bell and siren.

Piezo buzzer works on the principle of piezoelectric effect and produces sound opposite to the piezoelectric effect. The electrical potential difference in the piezo material is one reason for generating the pressure variation. Piezo buzzer is one of the most famous among other types of buzzer because of high sound output using less current. Other names for buzzer are an audio alarm, beepers, audio indicator, audio transducer, audible alarm.



Figure 5 Buzzer

E. IR Sensor

An Infrared (IR) Sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was discovered accidentally in 1800 by an astronomer named William Herschel. While measuring the temperature of each color of light (separated by a

prism), he noticed that the temperature just outside the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum).

There are two types of infrared sensors: the active and another is passive. Active infrared sensors emit and detect the infrared radiation. Active IR sensors having two parts: a light-emitting diode (LED) and a receiver. When an object approaches the sensor, the infrared light from the LED is reflected away from the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots). Passive Infrared (PIR) sensors only detect infrared radiation and do not emit it from the LED. PIR sensors are commonly used in motion-based detection, such as in-home security systems. When a moving object that emits infrared radiation enters the detector's sensing range, the difference in IR levels between two pyroelectric elements is measured. The sensor then sends an electronic signal.



Figure 6 IR Sensor

F. GSM Module

GSM stands for Global System for Mobile Communications and is a digital mobile network mainly used with mobile phones in Europe and other parts of the world.

This technology uses various Time Division Multiple Access

(TDMA) customized Global System for Mobile Communication (GSM) modules designed for wireless radiation monitoring via Short Messaging Service (SMS). This module is capable of receiving serial data from radiation monitoring devices such as survey meters or field monitors and transmits the data as text SMS to the host server.



Figure 7 GSM Module

G. Potentiometer

A manually adjustable variable resistor with a potentiometer 3 terminals. Two terminals are connected to either end of a resistive element, and the third terminal is connected to a sliding contact, called a wiper, that moves over the resistive element. The position of the wiper is determined the output voltage of the potentiometer.

Potentiometers are really very useful in changing the electrical parameters of a system. This is a single turn 10k potentiometer with a rotating knob. These potentiometers are also commonly called rotary potentiometers or POT for short. These three-terminal devices can be used to vary resistance between 0 and 10k ohms simply by turning a knob. A potentiometer knob can also be used with this pot for aesthetic purposes.



Figure 8 Potentiometer

H. Ribbon Cables

Ribbon Cables are commonly seen in computers for internal peripherals, such as hard drives, CD drives, and floppy drives. They were also used for external connections on some older computer systems (such as the BBC Micro and Apple II series). The ribbon-like shape hinders cooling of the computer by obstructing air flow within the case and also makes cables awkward to handle, especially when there are a lot of them; As a result, round cable has almost completely replaced ribbon cable for outdoor connections and is increasingly being used internally. Also ribbon cable (also known as multi-wire planar cable) is a cable that consists of multiple wires running parallel to each other on a single cable straight flat. As a result, the cable is wide and flat. Its name comes from its resemblance to a piece of ribbon.



Figure 9 Ribbon Cables

I. LED

In electronics, a light-emitting diode (LED) is a semiconductor device that emits infrared or visible light when charged with an electric current. Visible LEDs are used as indicator lamps in many electronic devices, as rear-window and brake lights in automobiles, and as alphanumeric displays on billboards and signs or even full-color posters. Infrared LEDs are also employed in autofocus cameras and television remote controls, and as light sources in fiber-optic telecommunication systems.



Figure 10 Light Emitting Diode

J. SOFTWARE REQUIRED

The following software must be used to complete this overall project:

Arduino Software(IDE):

The Arduino Integrated Development Environment – or Arduino Software (IDE) – consists of a text editor for writing code, a message area, a text console, a toolbar with buttons for common tasks, and a series of menus.

Programs written using the Arduino Software (IDE) are called sketches. These sketches are written in a text editor and saved with the file extension . The editor has features to cut/paste and find/replace text. The message area responds and displays errors when saving and exporting. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The configured

board and serial port displays in the lower right corner of the window. Toolbar buttons allow you to verify and upload programs, create, open and save sketches, and open the serial monitor.

Android Application:

An Android app is a software application running on the Android platform. Because the Android platform is built for mobile devices, a typical Android app is designed for a smartphone or tablet PC running the Android OS.

Although an Android app may be made available by developers through their websites, most Android apps are uploaded and published on the Android Market, an online store dedicated to these applications. The Android Market has both free and paid apps. An Android app is software designed to run on an Android device or emulator. The term also refers to the APK file which stands for Android Package. This file is a zip archive containing the app code, resources and meta information.

Android applications are organized as a collection of components. There are four types of components, and each type can be composed of one or more applications. A dynamic instance of a component corresponds to an application subset that can be executed independently of the others. Therefore, in many ways, an Android application can be thought of as a collection of interacting components. Android application components come in four flavors:

- Activities - User-facing components that implement display and input capture.
- Services - background components that operate independently of any user-visible activity.
- Broadcast receiver - A component that listens for and responds to system-wide broadcast announcements.
- Content providers - components that make application data accessible to external applications and system components.

IV. FLOW CHART

The flowchart shows the overall operation of the system following software to alert the patients.

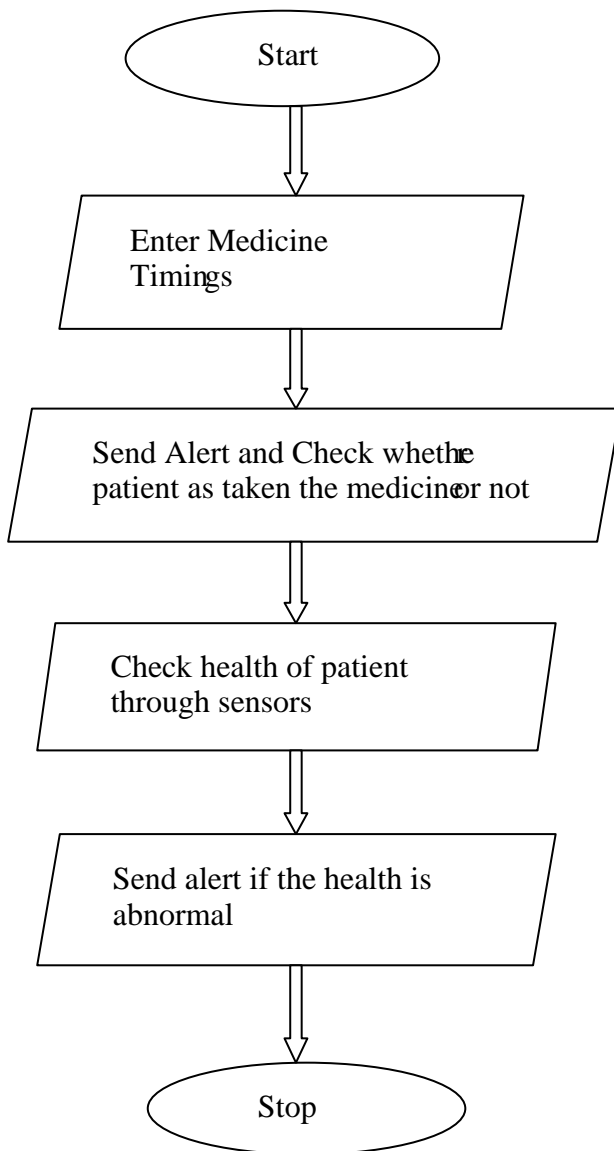


Figure 11 Flowchart of Proposed System

V. HARDWARE SYSTEM DESIGN

Here, every components is connected with arduino nano. The time for the medicine is predetermined.

On the basis

of recipe it is divided as,

- intracameral cefuroxime (1mg) □ Moxifloxacin (1-1.5mg) and
- OFLOXACIN (one drop).

IR sensor is used to detect and indicate the presence of pill/medicine in the pill box. Ultrasonic sensor is used to detect the level of eye drops present in the bottle. At the time of medicine, a message is sent to the care taker from the GPS. The message contains the details of the medicine and dosage. And the buzzer also rings during the set time. LCD is used to display drug details and drug intake. The figure 12 shows the design of hardware that was designed with a different electronic components is displayed.

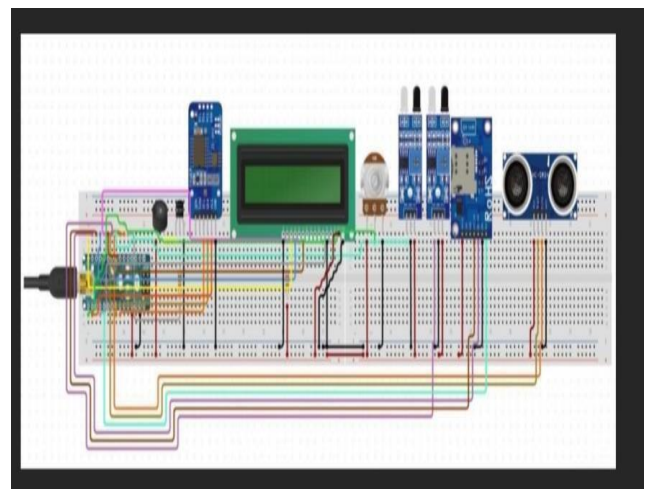


Figure 12 Hardware System Design

VI. RESULT

Experimental Result and Analysis for our project, we divided our work into two section.

1. Survey: We took a survey about 100 people on different age group. In the

survey we asked the several questions about the features of our application. Which features are they like most and which they don't?

2. Observation: We took around 10 patients of different aged and observed them according to our survey. We focus on when they mainly took their medicine while with the buzzer.

In this proposed system, we are monitoring the patients who have undergone cataract surgery with the help of iot. For the first step, the system must connect to the Arduino nano. Then, three different pills and drops in three sub boxes. In each box, we have to set the IR sensor and Ultrasonic sensor, it will detect that pills is available or not. If pills is not available, the led will glow and buzzer is alert three times. In this firstly we must choose our components that are required, and design them according to the circuit diagram and as we are using arduino nano, we must code it by giving proper instructions and start debugging.

The LCD is used to display the medicine details and also the intake of the medicine. Finally we would obtain the output.

VII. APPLICATION

- The monitoring system will be good choice for old age people and old age home. It can handle capsules of any size.
- Contactless monitoring of the patients .
- Maximum three times the box will alert the patients, the number alerts can also be increased since the system is dynamic.

VIII. CONCLUSION AND FUTURE SCOPE

Timely medication is very necessary for the cure of any eye problem. 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. With the help of our project we aim to tackle the problem of timely reminders. This system is useful for to take the medicine on time . This system has alarm which alerts them to take the medicines. It also includes a android application 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.

We have demonstrated a mobile application that generates alarm signals to remind a patient to take medication. We focus on helps patients and improving the monitoring system. The application Medicare is easily accessible. Combination of a sensing system with android application helps us to measure how well a patient can take their daily medication in real-time. The availability of sensors and other medicinal services gadgets (IoT) work better in consideration of patients. It allows real-time monitoring. Better compliance in terms of the taking of medicine can be acquired with the use of our proposed framework.

Future work, we are wanting to improve our drug update framework by presenting extra highlights utilizing portable application and incorporate other medical services.

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Cite this article as :

Ms. K. Raja Saranya, Navin Raj M, NithyaNagalakshmi M, Pavithra S, Prabhakaran U, "Cataract Surgical Monitoring System with Timely Reminders", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 9 Issue 1, pp. 63-71, January-February 2023.

Journal URL : <https://ijsrcseit.com/CSEIT2390117>