

Development of Smart Medicine Box using IoT

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Abstract— In this project our medicine box is targeted on users who regularly take medicine or vitamin supplements or nurses who take care of the older patients. Our medicine box is programmable that allows nurses or users to specify the pill quantity and day to take pills and the save times for each day. Our smart medicine box contains six separate sub-boxes. [7] Therefore, doctors/nurses or users can set information for six different pills. When the pill quantity and time have been set, the medicine box will remind users or patients to take pills using sound and light. A LCD, placed in controller unit will provide the information about the pills. Compared with the traditional pill box it requires users or nurses to load the box every day or every week. Smart medicine box would significantly release nurses or users' burden on frequently preloading pills for patients or users. [2] To make it a grand success, internet of things is one of the latest internet technology developed. Various designs have already been proposed and have advantages as well as disadvantages. The project is a review of smart medicine box based on IOT. [5] Doctors/Nurses can send the entire prescription to the smart medicine box using a mobile application. [2] Our system will store data in its local serve to user in more efficient manner.

Keywords— Smart Medicine Box, IOT, Node MCU, Smart Pill Box

I. INTRODUCTION

Capturing and sharing of vital data of the network connected devices through a secure service layer is what defines IOT. Collection of real-time data and recording database of patients has become easy due to the use of Internet of Things.

One of the most common reasons for the failure of a method to cure a patient is because of not taking the medicine at the prescribed time. People aged 50 or above are prone to diseases such as high blood pressure, diabetes, Alzheimer's and Parkinson's to name a few. Missing a dose for such a patient can prove to be very harmful. Hence it is vital for the patients to take the medicines on time. It has been observed that people in general neglect their health and give preference to other things than taking their medicines.

This project will be helpful for people who forget to take their medicines or even to those who have to take a lot of medicines and get confused about which medicine to take at what time. So this project will help people provide information about the patient's status whether he has taken the medicine or not. In this era, it is difficult for the family members to be present all the time for the aged. Today, most of the families in our society are a nuclear family. [1] Elderly prefer staying independent, but it is a worry for their children. Sometimes despite their best efforts, the aged fail to take the medicine on time. This device is one approach to help them take the medicines effectively.

The Smart Medicine Box is successfully designed in helping the introvert patients taking their medicine without

help of others. [7] Our medicine box is targeted on users who regularly take medicine or vitamin supplements or nurses who take care of the older or patients. [4] Our smart medicine box contains six separate sub-boxes. Therefore, doctors/nurses or users can set information for six different pills. When the pill quantity and time have been set, the medicine box will remind users or patients to take pills using sound and light. A LCD, placed in the controller unit will provide the information about the pills. Compared with the traditional pill box it requires users or nurses to load the box every day or every week. Our smart medicine box would significantly release nurses or users' burden on frequently preloading pills for patients or users. To make it a grand success, internet of things is one of the latest internet technology developed.

II. PRODUCT SPECIFICATION

A. NODE MCU (ESP8266 Wi-fi Module)

It will give your project access to wi-fi or internet. It is a very cheap device but it will make your projects very powerful. It can communicate with any microcontroller and make the projects wireless. It is in the list of most leading devices in the IOT platform. It runs on 3.3v and if you will give it 5v then it will get damage.



B. LCD (16*2)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores

the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

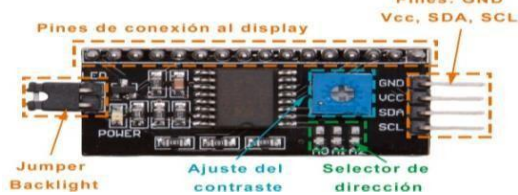


These black circles consist of an interface IC and its associated components to help us use this LCD with the MCU. Because our LCD is a 16*2 Dot matrix LCD and so it will have (16*2=32) 32 characters in total and each character will be made of 5*8 Pixel Dots. So Now, we know that each character has (5*8=40) 40 Pixels and for 32 Characters we will have (32*40) 1280 Pixels.

C. I2C Buss

Inter-integrated Circuit (in short I2C) is a two-wire short distance communication protocol. In I2C the external devices have an I2C address for different external devices like LCD Backpack, OLED Display, etc. By using the address the data is sent to the specific device connected on the same I2C Bus.

The message is broken into two frames and sent serially via the I2C Bus. The first frame contains the address, once the address matches with any device on I2C bus, that device will send an acknowledge signal to the master. After receiving the acknowledgment from the slave the data bits are sent. By this method an I2C bus works.



D. SPDT switch

A Single Pole Double Throw (SPDT) switch is a switch that only has a single input and can connect to and switch between the 2 outputs. This means it has one input terminal and two output terminals.

A Single Pole Double Throw switch can serve a variety of functions in a circuit. It can serve as an on-off switch, depending on how the circuit is wired. Or it can serve to connect circuits to any 2 various paths that a circuit may need to function in. For example, a SPDT switch can connect to create a Ready Mode and a Standby Mode in a printer.



E. Female bug strip

These header pin blocks use the industry standard spacing and are designed for soldering directly into printed circuit boards (PCB's). They are supplied best for extension of pins of Microcontrollers and ICs.



F. Smartphone

An android phone is a powerful, high-tech smart-phone that runs on the android operating system developed by Google and is used by a variety of mobile phone manufactures. Pick any one android mobile phone with android version 2.0 or above and have to use applications as per requirement. [3]



III. WORKING PRINCIPLE

In this project, the system is going to intimate the patients to take proper dosage according to the prescription at right time. This portable and economical system would help aged patients, especially to the illiterate patients. Our smart pill box can reduce elderly family member's responsibility towards by reminding them to take the medicine on time. [4]

In this pill box, there are six sub boxes. [5] There are six LEDs corresponding to six sub boxes indicates the sub box from which medicine is to be taken. All these LEDs are connected to the pins D3 to D8 of Node MCU through resistor. To make this connection we need to know the functionalities of those pin. VCC and GND have general uses. As prescribed by the Doctor, by using the App developed in the smart phone, first we schedule the time slot when the medicines to be taken. Then as per the time given by the user, Node MCU sends the signal to the corresponding sub box. Pin number D0 in Node MCU is connected to the Buzzer for alarming. A LCD display has been connected to the system using a two wire interface (TWI) for showing the timing of the medicines. TWI uses SCK & SDA pins of the node MCU for enabling serial communication between these two devices as well as for saving GPIO (General Purpose Input/output) pins of the node MCU for other uses.

Now inside a Node MCU a Wi-Fi shield called ESP8266 is used to make the connection to server. The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language.

The internal connection of ESP8266 to the micro controller is somewhat like this –

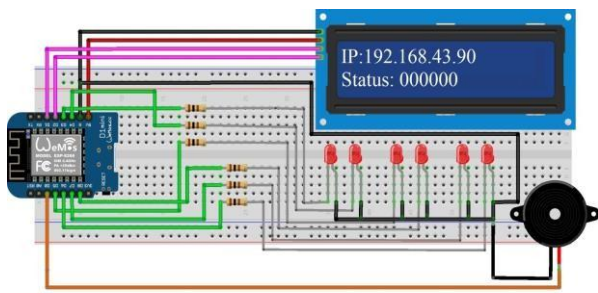
UNO	ESP-01
RX	TX
TX	RX
3.3v	VCC
GND	GND

3.3v RST
3.3v CH_PD

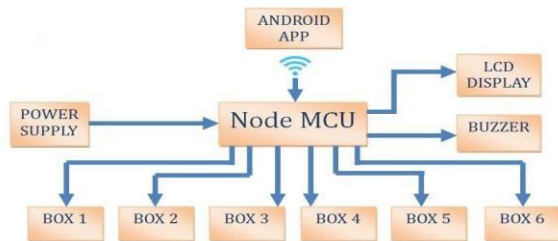
So, after making all the connection now our aim is to connect the node MCU to the server. A 'wifi.begin (ssid, password)' command is used to connect node MCU with any wifi network. After making a successful connection we need to create a new Wificlient object. 'Wificlient.connect (server, port)' is used to make connection to the destination server. After connection we need to create a string data in the following format: "<apiKey>&<fieldName><dataToSend>\n\n\n" then using the 'Wificlient.print (data)' command we can upload the data to our desired destination.

It is a combination of physical and digital reminder for a patient that will be helpful for people of any age, but especially helpful for geriatrics who forgets taking their medicines. The main aim is to keep the system easy to handle and make it cost-efficient. We have used MIT app inventor tool for making this android application. IP address of the Node MCU plays an important role to create the connection. By inserting valid IP address displayed in the LCD the user needs to create the connection.

IV. CIRCUIT DIAGRAM



V. BLOCK DIAGRAM



VI. APPLICATION

- In this IOT project, users can set a notification time according to a message from the mobile application
- This system is a very good to apply in the hospital because it can make the nurse job easier besides making the patients more comfortable to stay at the hospital. [6]
- The goal of our project is to provide healthy and tension free life to those users who are taking regularly pills and to provide this product at affordable cost also.

- Generates a notification sound and displays a bright light in certain pill boxes, so that the patient will know the specific number of boxes from which they should take out medicine

VII. SCOPE FOR FUTURE DEVELOPMENT

Although this system was well operating, several adjustments can be made in order to increase its use and ameliorate its behavior. In future we will modify this project using Servo motors for each sub box. [7] By modified in such a way each sub box will automatically open as per the schedule when any patient will take the medicine and after few seconds it will automatically close. In near future we can use this device commercially. Also, the system can be designed using a smaller surface which may lead to a reduced box size.

ACKNOWLEDGMENT

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