

IoT BASED MEDICINE IN-TAKE SCHEDULER, REMINDER AND MONITORING SYSTEM

¹M.Nisha, ²S.Nivedhidha, ³D.Prabakaran

Abstract— *The IoT is an emerging technology that is being developed in many platforms. All the fields were implementing IoT to make their work easier and connecting this from the long distance by using the internet technology. Using this technology in the medical field can also create a good impact towards the developments in this field. A modern IoT based medicine box which will be used to schedule the medicine and also reminds and monitors the medical data is proposed here. This is made to be operated using the IoT technology and the medicine box has been controlled by arduino Node MCU microcontroller. It will also notify via message to the respective person.*

Keywords: *IoT technology, arduino Node MCU microcontroller, medicine box.*

I. INTRODUCTION

The latest trend in medical field is smart medication system, which means checkups and healthcare services by smart methods such as tele-medicine, remote medicine or medication, without nearing the hospital people wants to consult their doctor and the hospitals were also being developed with lots of technologies from initially putting entry to a patient to Discharge them. It is difficult to maintain a record or case history of a patient and observing patients in the hospitals were number of patients getting admitted. The proposed system is an IoT based medicine in-take scheduler reminder and monitoring system, which can be used in the wars of the hospital and can be used by the patients in a customized manner also and this will be useful in providing medicine at the correct time.

II. LITERATURE SURVEY

Aaksh sunil salgia, K. Ganesh and Ashwin ragunath [1] of VIT University, Tamilnadu, India have discussed about their smart pill box in which they told about the untimed medicine administration always show adverse effects on health of the patient. This system helps patient to take medicine in the right proportion at right time. Integrating the principle of alarm clock, with light based slot sensing on a normal pill box. Light based sensing method with capacitive field is also used, which makes it more constant. This is inbuilt with a GSM module for alerting and also chemist at the needed instant

¹ Department of Electronics and Communication, UG Student, IFET College of Engineering, Villupuram, Tamil Nadu, India

² Department of Electronics and Communication, UG Student, IFET College of Engineering, Villupuram, Tamil Nadu, India

³ Associate Professor, Department of Electronics and Communication, UG Student, IFET College of Engineering, Villupuram, Tamil Nadu, India

Hibazeidan, khalil, karam [2] and their team members have proposed a medicine box that assist the patient to in-take their pills on time, this system characterize two main functions, safety that assures the wellbeing of patient and good functioning of the system that maintains to keep away from the children. This system is entirely controlled by the mobile application to remind the patient about their medicine, the major drawback is, it can contain only one type of medication.

Kayo monterio, Elisson rocha, Emerson silva, Gutoleoni santos [3] have exhibited about the research on improving the quality of life. Promoting quality of life is one of the most important studies that are going worldwide. In order to develop new applications that can promote quality of life and the services based on the vital sign monitoring, fall detection system, heart attacks, etc. these can be monitored by IoT. The progress of e-health services using Iot for data acquisition, fog and short term storage and cloud for data processing, analyze and long term storage. In this system the data delay may be crucial for patient's welfare and life, to provide all these facilities at low cost smart phones with sensors were used.

Mr. Khyamling, A. Parane, Mr. Naveenkumar, C. Patil, Mr. Shivanandha, R. Poojara, Mr. Tejashkumar, S. Kamble [4] were the group of professors and students defined about a technology to identify the health status of the vital organs of the patient's body at the initial stage of any disease. This will be supportive for the effective treatment by using high quality hand carried invasive healthcare system and devices. This cloud based technology provides accurate medication for the people at anytime, anywhere via the internet. It has number of sensors connected to the human body, though the sensors were used the observation on the health parameters were made as the result of simulations. It can be developed by using bio-sensors to find the effective way to provide data security.

Milan ramljak [5] have discussed about the smart working solution, how a smart home can be utilized to help people with medicine reminders, here the scanning of QR code of the prescription is made. It is delivered from the e-health centre, which holds the certain set of information, treatment, next visit to doctor etc, here 3 types of notifications were made, and they are smart phone notification, home voice notification and the video notification.

Moudhi ali almuzaini, M. Abdullah-al-wadud [6] from Saudi Arabia have proposed a medicine kit for visually challenged people, the most challenging thing is that, visually impaired patients face their routine life activities were linked to drug identification and there are no certain pharmaceutical services provided to them to in-take their medicines, for visually challenged people there may be chance to taking wrong medicine, here bar code and near field communication readers (NFC) were used to identify the medicine with the computer vision technology.

Priyanka .k [7] of Maharashtra, India have proposed a home health monitoring system which is made to remind about the medicine schedule, remote monitoring and updating new medicine consumption data of the patient, which will be done by the prescription through IoT

M.Srinivas, P. Durgaprasadarao and V. Nagaprudhvi raj [8] of AP India have discussed about the intelligent medicine box that gives alert to the patient for the medication at the respective time the medicine box is connected to the internet to make periodical updates about the patient's medicine and notify them in their smart phone. This is operated by the Bluetooth module.

P. Szakaes-simon, S.A. Moraru, L. Perniu [9] have proposed a system that express about the development of android mobile phone application to the extension of data communication range of the wireless health monitoring devices is

presented. The purpose of this system is to monitor people at risk in the home or outside home.

An android mobile phone is reliable to data transfer, tracking, and alerting. Here the device is made to interact with the mobile phone using Bluetooth and the user's real location is monitored using the GPS location sensor and technologies. This can be developed in the area of indoor accuracy; in case of multilevel building it is easy to find in which floor level the patient is by involve other embedded mobile phone sensor.

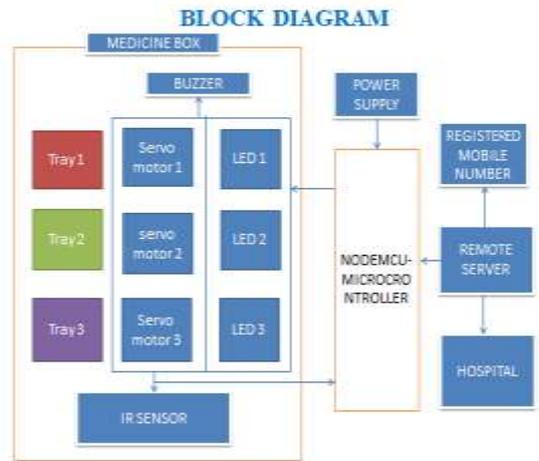
Wei Zhao, Chaowei Wang, YorieNakahira [10] were discussed that IoT has entered into the NGN (next generation network) with current IoT, this proving the services in imaginary space and IoT based on real world; here the sensors were used to linking things and the body conditions of the patient and the surrounding conditions can be determined by using the wireless communication technology, by combining the internet technology and IoT together to observe the effects in the physical world and imaginary space in a single platform and providing the advanced constraints to focus the people.

This can provide huge possibility for the innovations to develop the personalized health care services and to overcome several health problems by using this technology. Establishing remote health care is the most effective way to solve the various healthcare problems and the monitoring and managing systems were also need to be developed in order to overcome serious health issues.

Wissam Antoun and Abdallah Kassem [11] have proposed a system which helps the patient to take medicine without the possibility of missing pills, and also reduce the risk of over and under dosage. It is indicated to the patient or their caregivers by touch interface available as an application on their mobile phones.

III. PROPOSED SYSTEM

By using the IoT technology we have designed a scheduler, reminder and the monitoring system for our medication, this helps to take our medicines on time. It is used in the wards of the hospitals which hold the schedule of all the patients in the ward; people can use this in their home also. In case they failed to take medicine it will remind us via the notification also. The doctor from the hospital will also monitor our medication system to prescribe or to change our medicine after times. For this purpose NODEMCU microcontroller is being used to control the medicine box which will remind us to take medicine. And a web page will be created at the hospital side to monitor the patient.



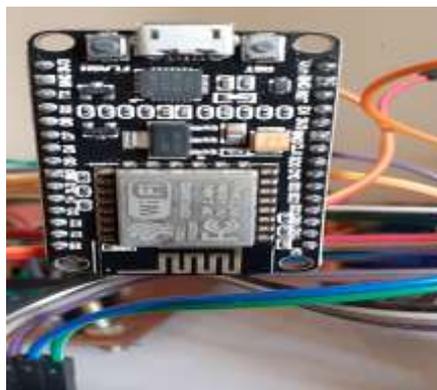
A. WORKING OF THE SYSTEM

Here the NODEMCU microcontroller which has inbuilt Wi-Fi, this controller is used to control the operations of the servo motor and IR sensor. Servo motor is used here for the opening and the closing operation for each tray of the box. IR sensors were operated by means of the stepper motor and signals from the controller, if the box is opened and closed the action is sensed by this sensor and observed by the hospital. A LED is connected to each tray to indicate which tablet the patient has to take along with a buzzer sound is also produced which is also for indication purpose. A web page is created for the hospital side to monitor the patient's medication activities. If they fail to take their medicine; the IR sensor alerts the microcontroller and the controller produce signal to the hospital side. A notification message is sent to the patient's closely relative people who were with them. By this action patient can able to take the medicine.

IV. HARDWARE DESCRIPTION

1. NODE MCU

It is an open source firm and a development tool basically used to develop IoT based products. It is developed or introduced by the ESP8266 Open source community. The memory of this Node MCU is 128kb and storage of 4mb. The main advantage of using this Node MCU is; it is a cost efficient Wi-Fi enabled microchip with the characteristics of TCP/IP stack.



NODE MCU

There are 13 general purpose input / output pins in Node (MCU D0-D12). Each pin has an internal GPIO mapping, in which D0-D8 were GPIO pins, D9 acts as a receiver, D10 as transmitter, D12 as a respond for GPIO/ pulse width modulation / interrupt functions and the D0/GPIO16 is for read/write function and no special functions are used in it.

2. SERVO MOTOR

It is a rotator or a linear actuator which is used to control the angular or linear positions. It has a suitable motor coupled to a sensor to produce a positioning feedback. The function of the servo motor is to get the input signal the defines a certain output position of the shaft and apply the dc power to move the shaft to that specified position, we use this mechanism to open the medicine box in a particular or desired angle, so that patient can able to take only the required amount of medicine.

The servo control contains two main parts inside they are DC motor control circuit and Potentiometer. The motor is fixed with the gears to produce rotation in the control wheels; so that the resistance of the potentiometer is changed then the control unit can easily detect the number of movements and the direction in which the motor is to be rotated.

The pulse range is calculated by determining the difference between the maximum pulse width and the minimum pulse width.

The pulse width per degree is determined by the ratio between the pulse range to 181 (181 is defined as the degrees from 0 to 180).

Normally the range of the servo motor is 0° to 180° degrees. Here the tray is made to be opened at the angle at 30° which is sufficient to the patient to take the medicine in a correct limit.

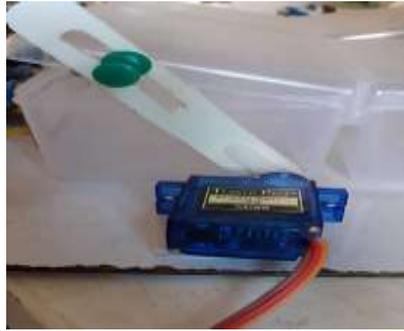
$$\text{pulse range} = \text{max pulse width} - \text{min pulse width}$$

$$\frac{\text{pulse width}}{\text{Degree}} = \frac{\text{pulse range}}{181}$$

The connection made between the arduino and the servo motor is given below, command where given to move the motor in a rotation scheme from 0° to 180°. And the specified angle is made to be checked and the angle is fixed in the motor, so that the motor rotates to the specified angle.

```
Servo servo_test; // initialize a servo object for the connected servo.  
  
servo_test.attact(9); // attach the signal pin of the servo to pin 9 of arduino.  
  
tot(angle=0; angle<180; angle +=1) // command to move from 0 to 180 degree.
```

```
servo_test.write(angle); // command to rotate the servo to specified angle.
```



SERVO MOTOR

3. IR SENSOR

It is defined as an infrared sensor, it emits a radiation when it senses some object in the surrounding, generally in the infrared spectrum all objects emits certain thermal energy and this energy is termed as a radiation. This sensor is capable of measuring the temperature being emitted and also detects the motion of the object. The role of IR sensor in this medicine box is to detect whether the patient takes their medicine and notify to the server side.

The IR sensor is placed at the distance of 10 mm from the medicine tray and this is made to sense the patient is taking their tablet or not.

The connection made between the arduino and the IR sensor in order to communicate with the server side, the syntax for the IR sensor connection with arduino is given below,

```
int IRSensor = 2; // connect ir sensor to arduino pin 2

int LED = 13; // conect Led to arduino pin 13

pinMode (IRSensor, INPUT); // sensor pin INPUT

pinMode (LED, OUTPUT); // Led pin OUTPUT

int statusSensor = digitalRead (IRSensor);

if (statusSensor == 1)

digitalWrite(LED, LOW); // LED LOW

digitalWrite(LED, HIGH); // LED High
```



IR SENSOR

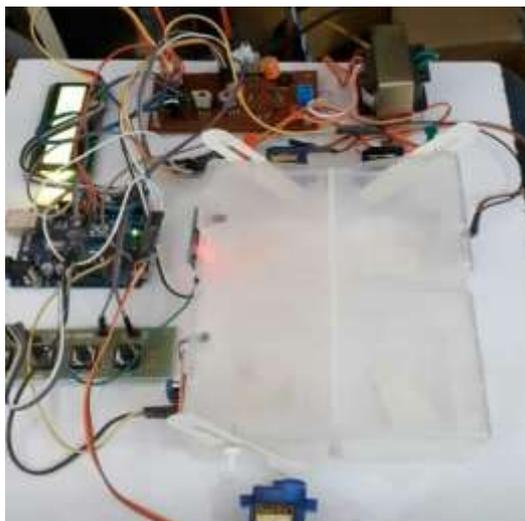
V. RESULT

This system will be very useful for many people to remind about their medicine on the right time. The interfacing of the medicine box and the server also done easily with the internet source, in case there is a problem in the network or connection the manual switch is given in the box; by using that patient can open their medicine box.

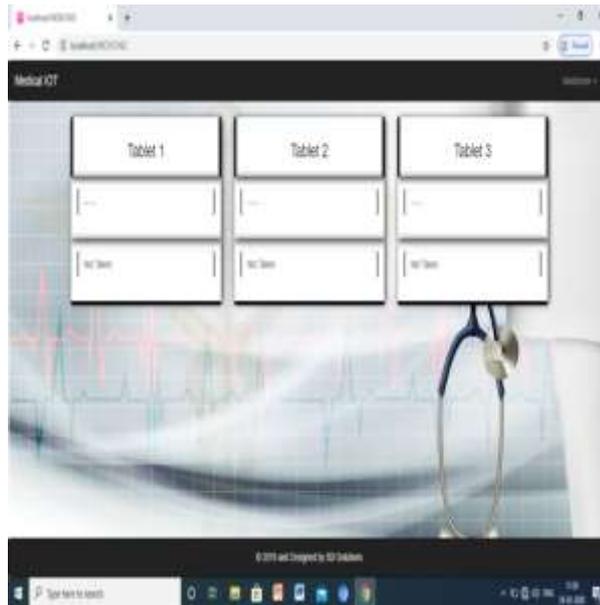
1) ADVANTAGES

- It is useful to remind about the medicine schedule.
- Can be maintained for many patients as possible.
- Helpful for aged people to take their medicines.
- It can also work when there is no internet source by manual switching method.

2) OUTPUT IMAGES



MEDICINE BOX



SERVER PAGE

These were the software and the hardware part created and assembled as a single medicine box.

VI. CONCLUSION

This work proposes an automatic medicine in-take reminder and scheduler using the IoT technology in the embedded architecture; the proposed scheme can accurately indicate the medicine schedule of the patient. The indication of medicine on the respective tray by glowing of the LED and the buzzer sound is more efficient. Using this in hospital wards as well as in home based on the patients requirements.

FUTURE SCOPE

This work may also have some limitation on monitoring of in-taking the medicine. The future work depends on checking the glucose level of the patient to know whether the medicine in taken by the patient.

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