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SMART MEDICINE DISPENSER

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***Abstract*— Health related problems are becoming the major issue in today's world , every other person seems to be undergoing more than one problem irrespective of the age , either that problem be related to heart or brain .Forgetting things has become the most common human error nowadays and such carelessness seen in the case of taking medicines might lead to results which are catastrophic and has direct impact onto the health of an individual .Thus this papers describes how with the help of smart dispensers an individual be able to take his medicines without any external human assistance .The proposed dispenser abridged the gap between technology and medical field , as it has been seen that technology is more developing in other arena over the area of medicine.**

***Keywords*—Raspberry pi3, GSM module,IR sensor, Pill box, Humidity sensor.**

I. INTRODUCTION

Health has become the most important issue in today's scenario , number of journals and magazines are impregnated with the articles on the health of an individual which is plummeting due to their laxity of taking medicines on time [1]. It is often seen that individuals prefer to follow the diet plan over taking their medicines on time , but for old people it can be conceded due to their age[2] .The life of a person has become so hectic that it is not possible for him to vacate even a single minute to look after himself, thus negligence towards taking medicines has become conventional . The course of taking medicines prescribed by a practitioners are often recessed due to the forgetfulness of taking the same at the right time .Thus the course gets discontinued at the earliest . Such negligence should be avoided or else the results come out are often catastrophic , hence a permanent solution to this problem is rendered through the medium of this paper. In order to palliate such problems we have come up with smart medicine dispenser which helps in assisting the individuals for taking their medicines on time. These dispensers keep on notifying the patients until the medicines have not been taken out of the box[3] . The dispensers available in the markets are often used just for notifying purposes , the case of change in the potency of medicines are not been discussed so far . This paper propose a model which notifies the caretaker about the medicines taken by the person under examination. Most of the medicines prescribed by the practitioners do contain liquid for instance drugs like Advil , keeping liquid medicines beyond the room temperature often alters the potency of the drug so it is advisable to keep the drugs under normal room temperature[4].Thus IOT plays an important role in order to overcome these problems and eventually we triggered ourselves to build these smart dispensers for the betterment of our society[5] . The whole model is segregated into three compartments each of them are equipped with an led and a buzzer which gets enabled when gets signaled through the controller or processor. The processor raspberry pi has an inbuilt timer which is used here to set the time of taking the medicines , once that set time is reached it signals the led and enable the buzzer and that compartment details onto the LCD(Liquid Crystal Display). It uses GSM(Global System For mobile Communication) module interfaced with processor which notifies the patient when to imbibe medicines[6]-[7]. The humidity of the place where the box is kept is unveiled using the LCD screen interfaced with the processor, each of the compartment consists an led which indicates the compartment to be unlocked when signaled at the time of taking the medicine. The Infrared sensor used in this dispenser gets activated when its obstructed by the person taking out the medicine from the compartment indicated , hence a message gets sent to the caretaker .

II. REQUIREMENTS

The whole dispenser embraces the following devices: Raspberry Pi3, LCD display, DHT 11, Infrared sensor, Global System of Mobile(GSM) SIM900A,Buzzer.

A. Raspberry Pi3

It's a 64-bit processor including Broadcom BCM2837 system on chip, having an ARM Cortex –A53 CPU and thus much faster than other models. It comprises of Dual Core Video Core IV Multimedia Co-Processor, provides open GL ES 2.0, hardware-accelerated open VG, and 1080p30 H.264 high-profile decode. It comes with various

connectors which aggrandized it's market price but in comparison to other processors the price is affordable with the option of more interfacing. Ethernet, video output, audio output,GPIO connector, camera connector are points where the modules can be interfaced easily .

B. GSM(Global System for Mobile Communication)

Global System for Mobile Communication (GSM) is a standard developed by the European Telecommunications Standards Institute (ETS). These modules often used for interfacing with various microcontrollers. SIM 900A and SIM800l are the two main modules widely used in different countries [9]. The SIM900A is a complete Dual-band GSM solution in a SMT (Surface Mount) module which can easily be embedded with any controllers or processor. The compact and slim design of this module enables it for various user applications ,GSM is often checked using AT(Attention) commands as shown in Fig.1, these commands are used for it's configuration.

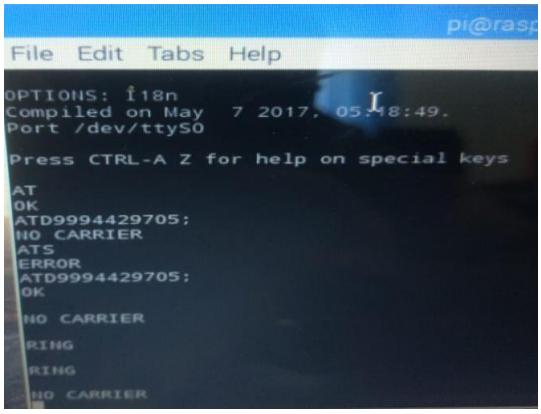

Fig.1 Attention Commands

C. Liquid Crystal Display

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 two such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.LCD(Liquid Crystal Display) is interfaced in order to unveil the compartment number and the humidity level . The humidity level keeps on refreshing after every second .

D. DHT11

DHT11 temperature and humidity sensor is capable of addressing the values of the surrounding temperature and humidity . It uses the exclusive digital-signal-acquisition technique and ensures high reliability and excellent long-term stability. It includes a resistive –type humidity measurement component and an NTC(Negative Temperature Coefficient) temperature measurement component. Each DHT11 element is strictly calibrated and offers accuracy on humidity calibration. The calibration coefficients are stored as programmers in the OTP memory, which is acquired by the sensor's internal signal detecting process. It is a four-pin single row pin package and is convenient enough to connect .The prime purpose of using this sensor is to display the temperature and humidity of the surrounding of the dispenser, thus any hike in the value notifies the person for changing it's place .

E. IR(Infrared Sensor)

These are the detectors with a photocell that are tuned enough to listen the infrared light , they are often used for the case of detection only.IR detectors have a demodulator inside that looks for modulated IR at 38Khz .The semiconductor inside the sensor must be power with 3-5V to function .Interfacing this sensor with controllers and processors is too straightforward .The purpose of addressing it into this project is for the detection of human interference which ensures that the medicine has been taken out .

III." IMPLEMENTATION

The whole system is segregated into two parts, the first includes taking up of medicines from the dispenser and notifying the authority about the same, the second includes notification of the sudden hike in the value humidity and temperature which evince the change of it's place from the current position. There are three compartments been divided and are differentiated from each other with the help of using different light emitting diodes. Each compartment is equipped with buzzer which gets enabled once the time of taking medicine is reached .The raspberry pi 3 is coded using the programming language python , we have made use of internal timer which facilitates to trigger the alarm[8]-[9] . The time is set using the python library import time , the day , date and month are all set into the code .At the time of execution once it reaches that set time an alarm along with an led gets enabled , the LCD screen unveils the compartment number and a beep starts generated of that particular compartment .The patient gets an indication on such activity and thus try to procure the same , at that time the IR sensor catches the infrared rays due to such obstruction while taking out the medicine[10]-[11] . The IR sensor is placed in front of the dispenser and gets activated when the Infrared rays are emitted mostly these are emitted by human beings[12].Thus this indicates the patient has taken his medicines and eventually a message is sent to the caretaker about the same[13] .

IV." FLOW DIAGRAM AND FLOW CHART

The whole working of the system can be easily depicted from it's architecture which is presented in Fig.2 with the help of flow diagram. It depicts the how each of the modules and sensors are interfaced with each other. The flow chart shown in Fig.4 depicts the how the execution has taken place , how the internal timer allows to set the time , the conditions executed and implemented are all included through the help of the flow chart .All the conditions that have to be implemented have been discussed through the medium of both the figures stated above.

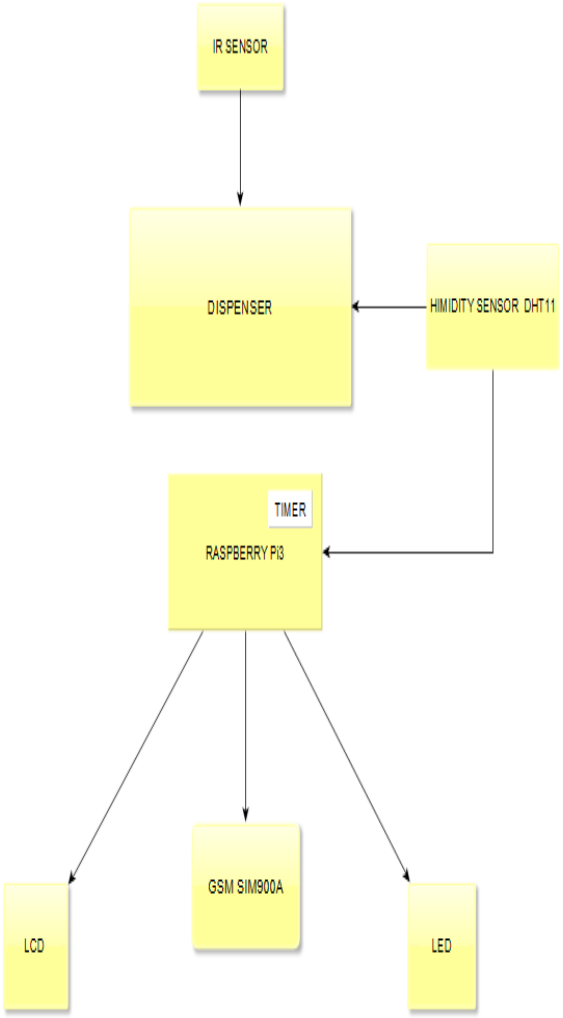

Fig.2 System Architecture

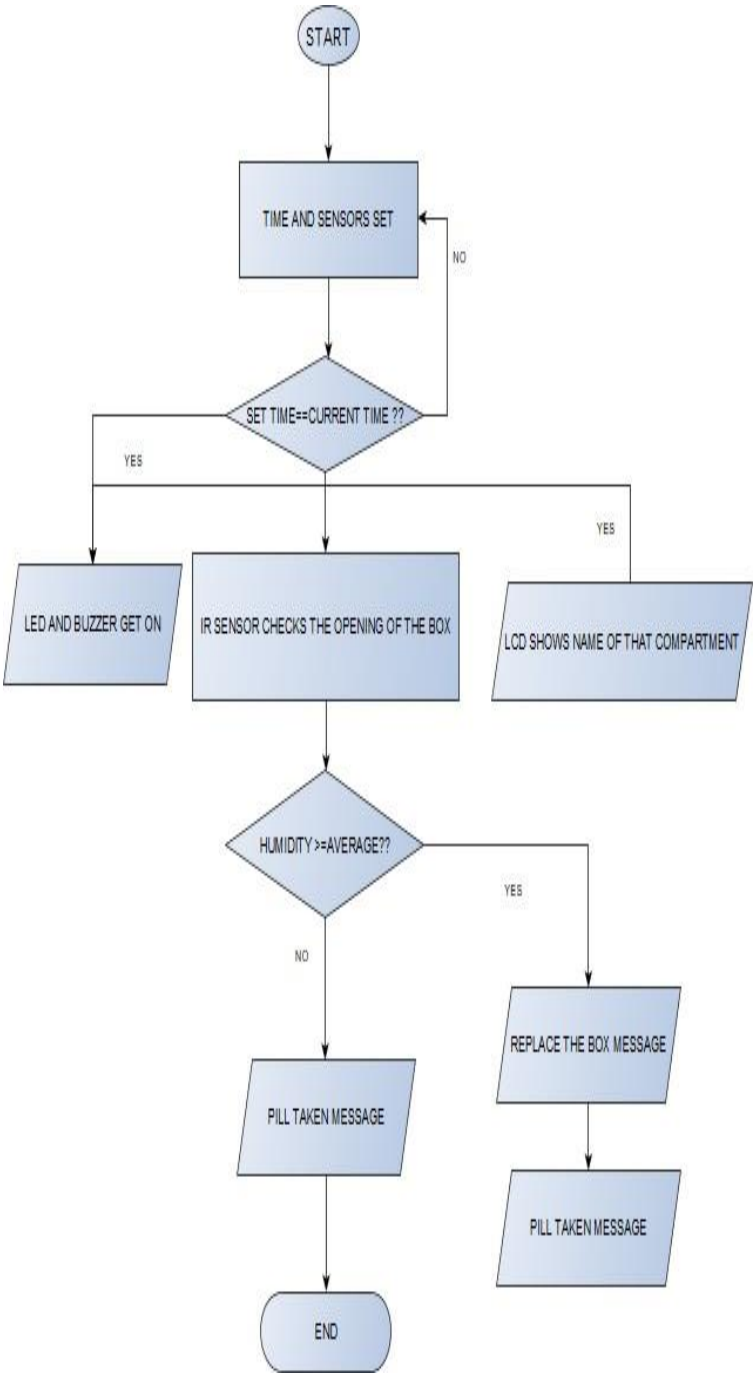

Fig.3 Flow Chart

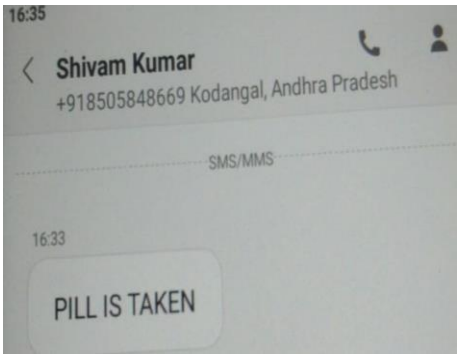

Fig.4 Pill Notification

V." OUTCOMES

The model proposed through the medium of this paper, indeed facilitates the patients in reminding them off taking the medicines on time. It's easy circuitry allows an individual to use it without any hindrance [14]-[15] .When the internal timer of raspberry pi3 is reached to the scheduled time a continuous beep of buzzer gets enabled and the light of that compartment from which the medicine has to be taken gets enabled .This allows the patient to take medicines from the dispenser , his movements disrupt the Infrared signal which eventually results in sending a notification onto the mobile phone of caretaker or patient as shown in Fig.4, this actually ensures that medicine has been taken out of the dispenser .Such technology is not seen in the dispensers available at high cost , secondly the notification of changing the place of the box is also being appended for ensuring no change in the potency of the medicine as minor alterations in the temperature and humidity often leads to change in the potency which has its own adverse effects on human body .The notification for change of place presented in Fig.5. The circuitry attached with the dispenser as shown in Fig.6 imparts straightforward connections and the chances of connection debacle are rare. The compartment identification can be easily differentiated with the help of the light emitting diodes attached to the dispenser which is shown in Fig.6 and Fig.7, these are the two different compartments having dissimilar color of diodes for proper identification. The Liquid Screen Display is used to impart the information of the compartment to be opened once signaled from the processor. If the signaled compartment is first the LCD will display "COMPARTMENT FIRST" as a notification to the patient or to the person who is taking care of that patient see Fig .8 which illustrates how the display will showcase the name of that specific compartment .The DHT11 is just to ensure the temperature and humidity of the surrounding of the dispenser , minor changes if neglected will surely give rise to major complication. Thus the proposed model helps in assisting an individual who keeps forgetting to take his medicines, along with that a notification of changing the place of dispenser on hike in humidity values make it dissimilar from the ones presently available in market.

Fig.5 Notification for altering the place

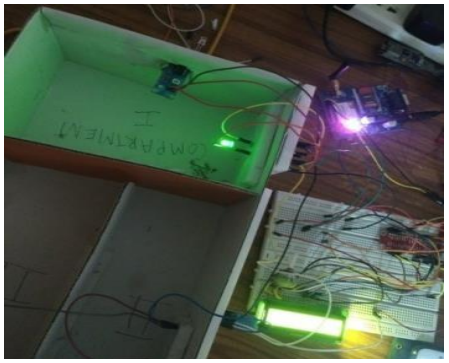

Fig.6 Circuit connection and 1st compartment

Fig.7. Third compartment illuminated

VI." CONCLUSION AND FUTURE RESEARCH

This paper imparts almost all the aspects expected ,whether it is notifying the caretaker or change of the place of the box everything has been rendered through this paper .The prime motive of this research is just to help the ones suffering from amnesia or the ones who could not keep a track of their medicines and eventually leads to pathetic conditions .The future work which can be incorporated for improvising it further can be the count of medicines taken out of the dispenser and to be displayed onto the smart phones , this will help in creating a record of more number of patients under examination. Along with that a website can be created in order to store ample of data and on analyzing that data a schedule of that patient must be altered according to the practitioner .Thus our aim of giving assistance and to abate the case of amnesia is rendered through this paper .

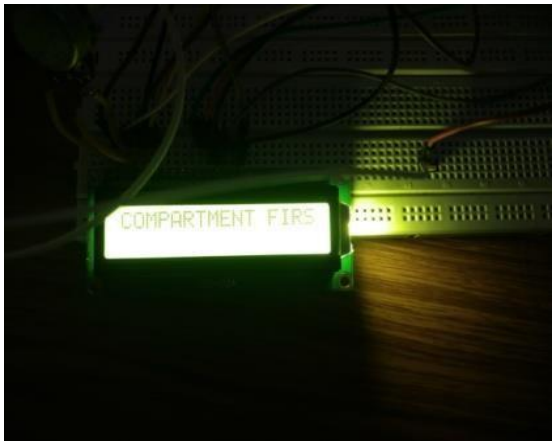

Fig.8 First compartment display on LCD

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