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Automatic Pill Dispenser and Consumption Monitoring System

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***Abstract*: In the contemporary world, people take medicine for every health problem. For chronic diseases people have to take medicines for prolonged period of time. Older adults have to take medicines at the right time and also with the right proportion. If people forget to intake the medicines or if the medicines are taken in wrong proportion, the disease will not be cured and might also lead to fatal effect. Hence older adults are ought to be treated with utmost care. And so, it is necessary to design a system with an automatic medication to ensure the proper intake of the pills. An automatic medicine dispenser is designed, to provide the prescribed pills at the prescribed time, by using PIC16F877A. The Speaker is designed in a way that it alerts when it is time for medication. GSM is used to provide message indication regarding the status of medicinal intake to the caretaker. Thus the medicinal intake is ensured and monitored by the caretaker.**

***Keywords*: Medicine Dispenser, Pills, Real time Clock, Global monitoring System.**

1. Introduction

In this decade, people especially old aged individuals have a tendency to forget to consume the prescribed pills or medication at the right time. In certain occasions they completely forget to take the medicines. Most people recognized with chronic diseases are required to take medications over a prolonged period of time in order to stabilize their conditions. If they fail to intake the medicine regularly, it may lead to death. In order to live a better life we need to take medicines regularly as prescribed. From the report of The Center's for Disease Control and Prevention (CDCP), it is estimated that the non-adherence of the medicinal intake causes 30 to 50 percent of chronic disease treatment to fail and over 125,000 deaths per year. It is also found that only 51 percent of patients taking medications for high blood pressure are supposed to continue taking their medication during their long-term treatment. To avoid such kind of deaths one has to take medicines regularly.

The project is aimed to overcome the issues mentioned above and to help the people to take medicines at the right time and at regular and prescribed intervals of time. The medicinal combinations for each time of consumption (say morning, afternoon and night) are stored in separate slots. A real time clock is used to monitor the time for the consumption of medicine.

At the right time of medication, the required combinations of pills are collected in a dispatch slot where the pills are ready to be taken by the desired individual once the button is pressed.

2. Proposed system

The capsules are stored in different separated slots. Different combinations of pills to be taken at different times are given as input to the microcontroller. The controller monitors the time delay as programmed to dispatch the right combination of pills at that time. When it is time for medicinal intake, the stepper motor will rotate to one step. The dispatcher will dispatch the first the pills to the patient by using stepper motor and alarms so that the desired individual becomes aware that it is time to take medicine. If the pills are taken out a message is sending that "the person has consumed the medicine" will be sent to the guardian/caretaker. If the pills are not taken out its waits for 5 minutes and then alarms again, this time sending a message which says "the required medicines are not taken on time" to the guardian/caretaker. This way we can ensure that the right medicine is taken at right time by the patient.

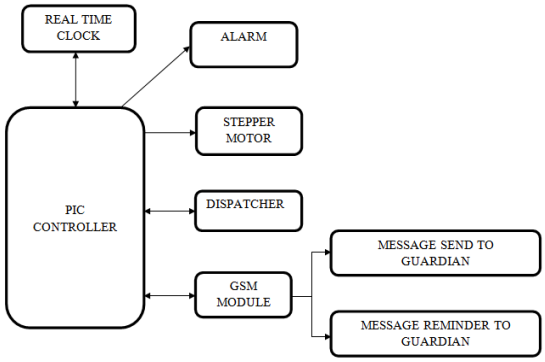

Fig. 1. Block diagram of pill dispenser

3. Hardware components

A. *PIC microcontroller*

The availability of best feature and cost the effective PIC 16F877A microcontroller is chosen to implement the work. PIC

is a 8 bit microcontroller. It has a RAM of 256 bytes. The PIC16F877A has features of 256 bytes of EEPROM data memory. It is a self-programming microcontroller. The synchronous serial port can be configured as either 3 wire serial peripheral interface or 2 wire inter-integrated circuit bus and a universal asynchronous receiver transmitter. The PIC microcontroller is the main basic component among all the other components as it is the controller that controls all the inputs given and produces the appropriate outputs. PIC microcontroller and stepper motor is interfaced then stepper motor is taking inputs from the microcontroller and rotating each step as programmed early in the controller. It also accepts the input from the push button, GSM module. GSM module gets input from push button then sends alert message to the care taker.

Fig. 2. PIC16F877A Microcontroller

B. *Global system for mobile communication*

The availability of market and better way for communication a GSM module is incorporated in this work. A GSM modem is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone. The Global System for Mobile communication is used to send the message to the number stored in the controller it can be changed according to the user's convenience with the help of keypad in the system. GSM module is a chip or circuit that will be used to establish communication between a mobile device and a computing machine.

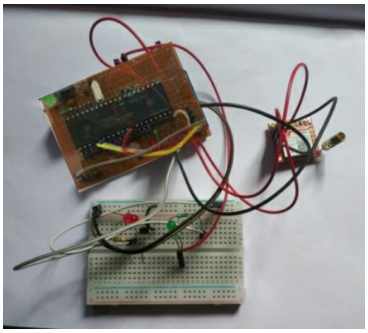

Fig. 3. Circuit setup of GSM module

C. *Real time clock*

The time precision and the gap between the medicine intake is very important for quick recovery. The monitoring of medicine intake interval must be match with the real time world. The RTC is used to give exact real time than human units. It will avoid time confusion. In this project real time helps to intake medicine at right time. So patients can intake pills at their regular interval of time without any delay.

Fig. 4. RTC Module

D. *Stepper motor*

No. of pills deliver at right time is most important in this work. The work which is carried by stepper motor combine with Real time clock. The stepper motor is a brushless DC electric motor that divides a whole rotation into equal number of steps. It is also called step motor. The position of motor can be moved and also hold at the any step without any sensor. A supply of 12v is given to the stepper motor. It can be driven by using driven circuit. In our project at every step of rotation the tablet will be dispensed from the divided slot.

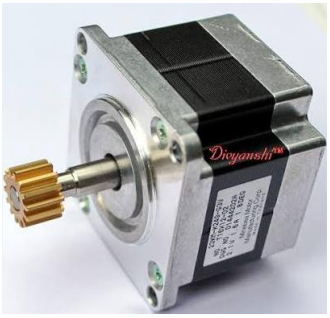

Fig. 5. Stepper Motor

E. *Alarm system*

Alarm system is necessary to alert the people. Here sound is used to indicate the patients. So it remembered the patient to intake the medicine. The sound system makes the people concentration towards the medical kit to take the pill. It ensures the regular medication of the patients.

Fig. 6. Buzzer

4. Results and Discussion

The output of the simulation ensures the rotation of stepper motor and pills deliver at correct manner with the help of PIC microcontroller. Stepper motor and PIC microcontroller is

interfaced by using ULN2003 driven motor. The proteus and mikroC software has been used to verify the communication between PIC microcontroller and stepper motor. This simulation will ensure that pill is dispatched to the patient at every rotation. The expected output of pill dispenser will dispense the tablets and also intimate to the patients by giving the buzzer sound at the programmed interval of time. Once the patient consumed medicine a message indication will send to the care take that "patient has consumed medicine". After the slots will rotate and will be ready to dispense next routine of medicine. If the patient did not consume pills after certain time, the buzzer indication will be provided to the patient and also alert message will be sent to the caretaker stating "patient did not consume medicine".

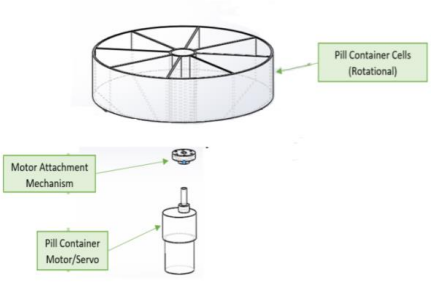

Fig. 7. Design model of pill dispenser

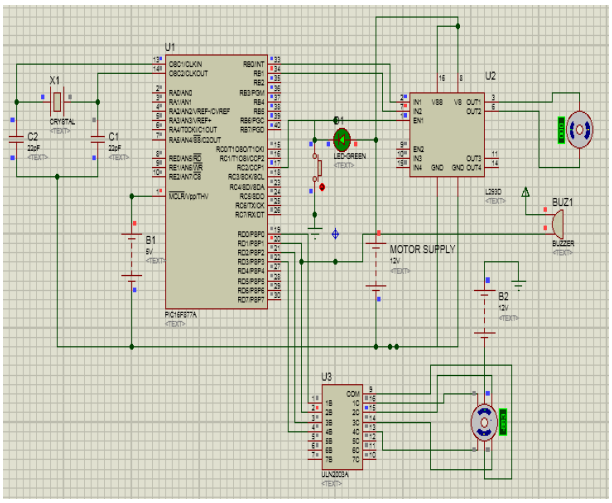

Fig. 8. Circuit connection of pill dispenser

Fig. 9. Output of message remainder to caretaker

5. Conclusion

The system has made the process of monitoring the patients or the elderly people, as it is used to find if the desired individual has taken the medicine at the right time or not as the message is sent to the caretaker once the medicines are taken. The GSM module is interfaced with the PIC microcontroller as it is used to send the message to the caretaker. The initial frame work is designed to engage a week. In future the availability of pills in the system and automatic purchase order placed and doctor consultancy appointment with permission will be included to make the older people live without any worries.

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