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Smart Electronic Pill Popper System with Circular Containers

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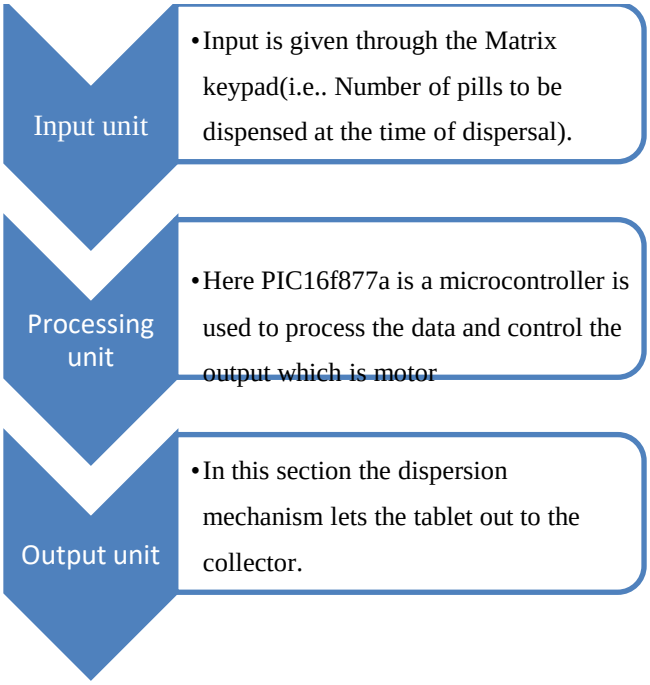
Abstract
Most of the elderly patients will not take their pills on time or forget to take pills and complete the course of medication. In hospitals the attender/nurse will not able to remember each patients course of medication. This automatic pill dispenser will overcome these drawbacks in hospitals and also for the patients who are in the house treatment.
Keywords—pill dispenser, pill popper

I. INTRODUCTION

Pill dispensers are items which release medication at specified times. Their purpose is to help senior citizens and other people who may suffer from impaired ability to adhere to their prescribed medication regime.Pill dispensers are commonly used to serve medical purposes, as well as to help individuals, be that the elderly or chronically ill, take their prescription medication, OTC medication or daily supplements at a given date and time. There are telehealth products in the health care industry such as automated or electronic pill boxes that function to alert the patients when it is time to take their medications.

II. FLOW DIAGRAM



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III. WORKING

INPUT SECTION:

It is necessary to provide medication to the aged in time. Automatic medication which is tablet dispensing is designed specifically for users who take medications without close professional supervision.It relieves the user of the error-prone tasks of administering wrong medicine at wrong time.

The major components of this medication dispenser are a microcontroller interfaced with an

i. Alphanumeric keypad
ii. An LCD display
iii. Motor Controller
iv. Multiple pill container
v. Dispenser.

PROCESSING AND OUTPUT SECTION: -

The overall operation is to facilitate the user to set the timings to dispense multiple pills at required timings.Here PIC16f877a is a microcontroller is used to process the data and control the output which is motor according to the program which upload into the microcontroller.According to the time which is set inside the microcontroller motor will rotate accordingly. Matrix Keypad is used to control this process manually by pressing the switches. The major objective is to keep the device simple and cost efficient.The software used is reliable and stable.Elderly population can benefit from this device as it avoids expensive in-home medical care.

COMPONENTS

- PIC 16F877A
- DC motor
- RELAY
- KEYPAD
- LCD
- DS3231 RTC Module

A. PIC 16F877A:

PIC is a Peripheral Interface Microcontroller. It is controlled by software and programmed in such a way that it performs different tasks and controls a generation line. PIC microcontrollers are used in different new applications such as smart phones, audio accessories and advanced medical devices**.**

There are many PICs available in the market ranging from PIC16F84 to PIC16C84. These types of PICs are affordable flash PICs. Microchip has recently introduced flash chips with different types, such as 16F628, 16F877 and 18F452.

The 16F877 costs twice the price of the old 16F84, but it is eight times more than the code size, with more RAM and much more I/O pins, a UART, A/D converter and a lot more features.

B. DC Motor:

A **DC motor** is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy.

The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors

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have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors are the most common type of motors used in robotics. DC motors appear in a large variety of shapes and sizes: permanent magnet iron core, permanent magnet ironless rotor, permanent magnet brushless, wound field series connected, wound field shunt connected, wound field compound connected, variable reluctance stepper, permanent magnet stepper, and hybrid stepper motors.

C. Relay:

A **relay** is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or whereseveral circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called *protective relays.*

D. Keypad:

A matrix keypad is nothing but a systematic arrangement of buttons in horizontal and vertical fashion. For example, a 4×4 Keypad consists of 16 keys or buttons that are arranged in 4 Rows and 4 Columns. The following image shows a typical Button Type 4×4 Matrix Keypad.

Keypad-Working:

As mentioned earlier, a 4×4 Matrix Keypad consists of 16 Keys or Buttons arranged in four rows and four columns. The internal circuit of the 4×4 Keypad with all the 16 buttons is shown in the following image.

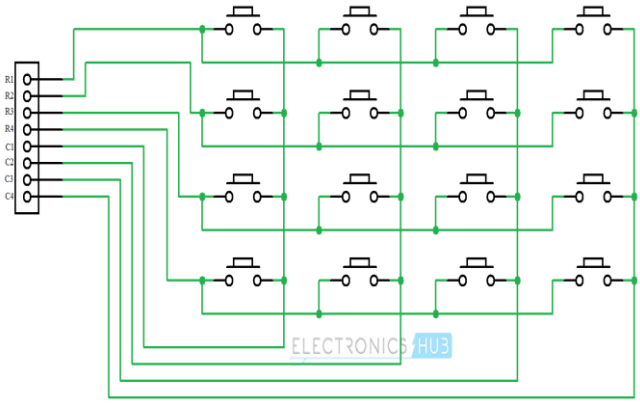

FIG.1-Circuit of Keypad.

Now, when a key is pressed, the corresponding column will become LOW as the current flows from HIGH Column Pin to LOW Row Pin. The Microcontroller (or Arduino) can easily identify the Column of the Key just by scanning for LOW on Columns.

E. LCD:

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. LCD's technologies allow

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displays to be much thinner when compared to cathode ray tube (CRT) technology.

F. DS3231 RTC Module:

RTC means **Real Time Clock**. RTC modules are simply TIME and DATE remembering systems which have battery setup which in the absence of external power keeps the module running. This keeps the TIME and DATE up to date. So, we can have accurate TIME and DATE from RTC module whenever we want.

DS3231 RTC Pin Configuration

DS3231 is a six-terminal device, out of them two pins are not compulsory to use. So, we have mainly four pins. These four pins are given out on other side of module sharing the same name.

Pin Name	Description
VCC	Connected to positive of power source.
GND	Connected to ground.
SDA	Serial Data pin (I2C interface)
SCL	Serial Clock pin (I2C interface)
$\overline{SQW}$	Square Wave output pin
32K	32K oscillator output

TABEL 1-PIN CONFIGURATION OF DS3231 RTC.

DS3231 RTC MODULE Features

- RTC counts seconds, minutes, hours and year.
- Accuracy: +2ppm to -2ppm for 0ºC to +40ºC, +3.5ppm to -3.5ppm for -40ºC to +85ºC
- Digital temperature sensor with ±3ºC accuracy
- Two Time-of-day alarms
- Programmable square wave output
- Register for Aging trim
- 400Khz I2C interface
- Low power consumption
- Automatic power failure battery switch circuitry
- CR2032 battery backup with two to three-year life.
- Potable size.

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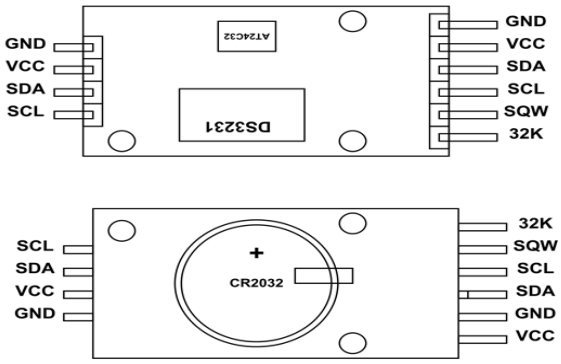

FIG.2(a)-DS3231 RTC pin.

RTC module is through **I2C interface**. The data is sent to the module or received from the module though I2C interface. So, we have to get the information of DATE and TIME through this interface. The default **circuit diagram of DS3231 RTC module** interface is shown below.

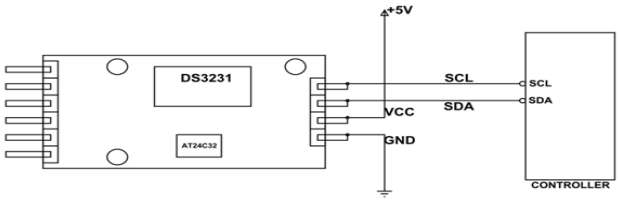

FIG.2(b)-DS3231 RTC pin connection.

As shown in circuit diagram the module is connected to +5V power supply. The module can work on +5V regulated power and higher voltage may damage the module. The I2C interface is established as shown in figure. All you need to do is connect SDA of module to SDA of controller and SCL is connected to SCL of controller.

The communication between controller and module is really complex. Usually the information is sent or received byte to byte. So, using libraries which are written for the module DS3231 is ideal. Using libraries makes the communication easy. All you need to do is download these libraries and call them in programs. Once the header file is included, the controller performs the communication by itself and provides the date and time for you. The alarm clock can also be set or changed easily using libraries.

When the power goes down, the RTC module chip draws the power from battery source connected to it automatically. So, the time will be up to date. And when the system restarts the controller can get the real time from module without error.

RESULT :

With the references, we have made a pill popper system which has 2 modes

1. Automatic Mode
2. Manual Mode

Automatic mode is the one where we got a pill when the timer is fixed.

Manual Mode is the one where we have a switch, when we press the switch, respective tray will open and we should take our medications.

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REFERENCES

1. "Med-e-lert Medication Pill Box Reminder Dispenser", http://www.amazon.com/Med-E-Lert-Medication-Pill-Reminder-Dispenser/dp/B0029K03I8
2. "Alarm Pill Box Pill Mate Event Reminder", http: //www.amazon.com/Alarm-Pill-Mate-Event-Reminder/dp/B000R3EETI
3. Mei-Yeing Wang, "A Mobile Phone Based Medicine In-take Reminder and Monitor", 9th IEEE International Conference, June 2009.
4. Mei-Ying Wang, John K. Zao Wedjat: A Mobile Phone Based Medication Reminder and Monitor.
5. Kuperman GJ, Bobb A, Payne TH, et al. "MedicationRelated Clinical Decision Support in Computerized Provider Order Entry Systems: A Review" Journal of American Medical Informatics Association, 2007.
6. Liu JWS, Shih CS, Tsai PH, Yeh HC, Hsiu PC, Yu CY, Chang WH, "End-User Support for Error Free Medication Process," Proceedings of High-Confidence Medication Device Software and Systems, pp. 34 – 45,June 2007.
7. Tsai PH, Shih CS, and Liu JWS, "Algorithms for scheduling multiple interacting medications," Technical Report TR-IIS-08-001, Institute of Information Science Academia Sinica, Taiwan, April 2008.
8. Tsai, P. H., C. S. Shih, and J. W. S. Liu, "Algorithms for scheduling multiple interacting medications," Institute of Information Science, Academia Sinica, Taiwan, Technical Report TR-IIS-08-001, April 2008 Pei Hseun Tseui, "Smart Medication Dispenser: "Design, Architecture and implementation", IEEE journal, Vol-5, March-2011.