Smart Medical Box using PIC Micro controller

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Abstract - These project is "SMART MEDICINE BOX" where it is design because from the survey, people are always busy with that their schedule that they tend to forget about their medication. There is much medicine storage available in the market with different design and sizes but this storage does not have the reminder to remind us of our medication. These storages maybe practical and convenient to the normal people but not to disable people, these people especially blind people are unable to see the medicine Box thus it will be hard for them to know which pills to consume and at what time. They have to rely on other people to remind them about their medication and help them with It. It is also difficult for them to search for their medicine box in case they lost it Somewhere. I did some background study to further increase the understanding of the Problem and figure out the best solution to overcome it. So, I had come up with a design for the product and built a small, lightweight and portable medicine box from Combination of materials like nylon, plastic and aluminum.

Key Words: PIC Microcontroller, LED (Light Emitting Diode), Keypad, Buzzer, RTC(Real Time Clock).

1.INTRODUCTION

With the tremendous growth in medical technology, there is cure for many dreadful diseases through the intake of several new medicines. The number of medicines to be taken by each person has increased. It has become hard for us to remind ourselves to take the medicines at particular time. This Smart Medicine Box helps us in reminding us of the medicine that we should take at that particular time.

1.1 Components used in Smart Medical Box

PIC Micro controller:

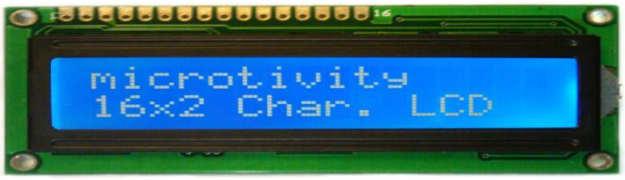
The PIC16F178X are the first PIC MCUs to implement the new programmable switch-mode controller (PSMC), which is an advanced 16-bit pulse-width modulator (PWM) with 64 MHz operation and high-performance capabilities. This combination of features enables higher efficiency and performance, along with cost and space reductions. The MCUs also feature extreme low power (XLP) technology for active and sleep currents of just 32 µA / MHz and 50 nA, respectively, helping to extend battery life and reduce standby current consumption. Low-power consumption in combination with advanced analog and digital integration make the PIC16F178X MCUs ideal for LED and other lighting applications, battery management, digital power supplies, motor control, and general-purpose applications.

Keys:

Keys are used for the user or nurse to enter the information of time when the smart box would send "reminder" (displaying numbers and playing synthesized voice). It is also used for the user to enter a number to command a specific pill box to open on a specific time. (say, open No.1 pill box), and user can also enter the frequency information to take pills for each day. Keys contain four buttons. Alarm, enter, increment, decrement.

Liquid Crystal Display(LCD):

The 2 line, 16 characters LCD screen is used to display the instruction information, that the pills need to be taken now, and the current time and date.



Speaker Module:

The speaker module is used to play the synthesized sound to remind the user to take pill.

Pill boxes:

We used a pillbox system containing 3 separatesmall pillboxes. Each box has a led display placed on the box. For our pill system, the user can store up to three different types of pills, which can be stored in those three small separate boxes. He or she can also specify the different combinations of pill boxes to be open for each day. Microcontroller: PIC is used to execute all the commands mentioned above.

Real time clock in PIC Microcontroller:

PIC has a Real Time Clock Built into it. The real time clock running in our system is implemented by using MCU 16-bits timer to generate 1-second base. Firstly, we will open the compare match interrupt service routine, and set the compare value to 249. Also, we scale the running frequency of timer1 to 1/64. Then, the interval time between each interrupt routine is 0.001 second. We have a volatile variable to run the clock function every 1000 interrupt routines. Then, in the clock function, it will run like a clock. We have separated variable for two digits of seconds, minutes and one variable for hours. We do not store the year information because we think it is unnecessary.

1.2 Working

As we switch on our device, the current time and date that is stored in the RTC is displayed on LCD. The device initially asks the user to set the alarm timings using the keys. A speaker module is connected to the PIC microcontroller. The playback voice should be initially recorded in it through the microphone in it. The alarm time is compared to the current time by the microcontroller and when they match, an interrupt is generated. Then the LED on the pillbox glows and a voice play back is also generated indicating which pill should be taken.

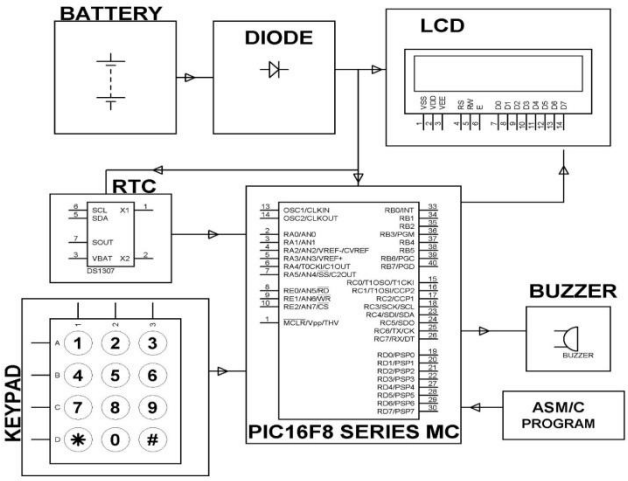


Fig-1: Block Diagram of Smart Medical Box

2. SOFTWARE IMPLEMENTATION

Firmware implementation deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation.

In the present work, we have used the Tina design software for Printed Circuit Board(PCB) circuit design, the Keil µv4 software development tool to write and compile the source code, which has been written in the C language. The Flash magic programmer has been used to write this compile code into the microcontroller.

2.1 Software Tools Required

- MPLAB IDE
- MPLAB IPE
- EAGLE

MPLAB are design specifically for PIC MCU, MPLAB IDE and MPLAB IPE are the two software tools used to program microcontroller and to burn the PIC MCU. The working of each software tool is explained below in detail.

2.2 Programming code description

A compiler for a high level language helps to reduce production time. To program the PIC microcontroller, the C programming is used. The programming is done in the embedded C language or Assembly language. MPLAB is a suite of executable, open source software development tools for the microcontrollers hosted on the Windows platform.

One of the difficulties of programming microcontrollers is the limited amount of resources the programmer has to deal with. In personal computers resources such as RAM and processing speed are basically limitless when compared to microcontrollers. In contrast, the code on microcontrollers should be as low on resources as possible.

2.3 MPLAB IDE & IPE

MPLAB IDE are designed specifically for PIC MCU Architecture. It provides software solutions to the developers. MPLAB IDE & IPE are easy to use and quick to learn for the programmer. It includes pro level optimization and largest library of built in functions.it easily define setup and manage interrupts

2.4 EAGLE

EAGLE contains a schematic editor, for designing circuit diagrams. Schematics are stored in files with. SCH extension, parts are defined in device libraries with. LBR extension. Parts can be placed on many sheets and connected together through ports.

The PCB layout editor stores board files with the extension .BRD. It allows back-annotation to the schematic and auto-routing to automatically connect traces based on the connections defined in the schematic.

3. FUTURE SCOPE

There are several aspects we need to work on our devices in the future to meet the users need. Firstly, we should develop strategies and modify the device based on user's evaluation results. This includes creating a user manual, choosing a large LCD display, using metal or plastic box cover the entire circuitry placing switch and LCD display on the surface of the box and using the pill boxes. We can also use this sort of implementation, not only in medical applications, but also in industrial and automotive applications were time management is critical.

4. CONCLUSION

There is a great need for timely intake of medicines which is often skipped by many people. Our Smart Medicine Box helps to remind us to take medicines regularly and also which medicine to take. Thus this implementation, though small and simple, will be a very great and useful step in the field of medicine.

REFERENCES

[1] Wandless I, Mucklow JC, Smith A, and Pradhan D Improving oral medication compliance with an electronic aid Engineering in Medicine and Biology Magazine.

[2] M3DITRACK3R: A Design of an Automated Patient Tracking and Medicine Dispensing Mobile Robot for Senior Citizens published in Computer, Communications, and Control Technology (I4CT), 2014 International Conference on Date 2-4 Sept. 2014 at Langkawi.

[3] A smartphone-enhanced pill-dispenser providing patient identification and intake recognition C. Crema, A. Depari, A. Flammini, M. Lavarini, E. Sisinni published in Medical Measurements and Applications

[4] M. Ati, "Knowledge capturing in autonomous system design for chronic disease risk assessment, "Biomedical Engineering and Sciences

[5] C. H. Yang, K. S. Cheng, J. L. Wang and K. L. Lin, "The Daily Activity Analysis of Patient with Cardiovascular Diseases at Home," Genetic and Evolutionary Computing (ICGEC), 2011 Fifth International Conference on, 2011, pp. 142-145, 2011.

[6] W. Einthoven, G. Fahr, de Waart A., "On the direction and manifest size of the variations of potential in the human heart and on the influence of the position of the heart on the form of the electrocardiogram", Am. Heart J. 40:(2) 163-211, 1950.

[7] J. Sundnes, G. T. Lines, X. Cai, B. F. Nielsen, K. A. Mardal, and A. Tveito, "Computing the Electrical Activity in the Heart", Springer-Verlag, Chap.1, 2006