

A Smart Home Security Locker using Microcontroller

Surya Prasada Rao Borra¹ Geetha Devi Appari²

ECE, PVP Siddhartha Institute of Technology, Vijayawada, A.P. India

Received 20 June 2021; Accepted 05 July 2021

Abstract:

In the recent times with the rapid development of technology there is also a need for a secure and safe environment for every one of us. With the use of microcontrollers specific problems can be addressed in many different ways and the solutions can be unique to different individual circumstances. This paper is an attempt to understand how to make a home of an individual to have a secured and safe way to authorize access to a room or into a vault. This work is developed on the basis of UART communication between the microcontroller (MSP430) and the processor of the Personal Computer. Themajor feature of MSP430 is that it enters into a low power mode when interrupt sub-routines are utilized. This project can also be extended into different types of securing activities. There can also be added in Bank lockers, hotel security services, auto-mobile security and other safety features.

Key Word: MSP 430 Launch Pad, UART Communication, Smart Home, Password based Lockingsystem.

I. INTRODUCTION

In the recent times with the rapid development of technology there is also a need for a secure and safe environment for every one of us. With the use of microcontrollers specific problems can be addressed in many different ways and the solutions can be unique to different individual circumstances. This project is an attempt to understand how to make a home of an individual to have a secured and safe way to authorize access to a room or into a vault.

Home Security Locker

Through this project we can understand the UART communication of the microcontroller (MSP430) with the processor of the Personal Computer. There is also understanding of interrupt sub-routines through which the controller enters into a low power mode which is the major feature of MSP430. This project can also be extended into different types of securing activities. There can also be added in Bank lockers, hotel security services, auto- mobile security and other safety features.

Programming platform

We will use the native Code Composer studio platform instead of using the Arduino IDE, this way as a designer, we get more flexibility. Code Composer Studio is an integrated development environment (IDE) that supports TI's Microcontroller and Embedded Processors portfolio. Code Composer Studio comprises a suite of tools used to develop and debug embedded applications. It includes an optimizing C/C++ compiler, source code editor, projectbuild environment, debugger, profiler, and many other features.

II. MATERIAL AND METHODS

Harware Requirements

- Msp 430 lunch box - For controlling operations
- 2 Led's - For Light Indication (opened/closed)
- Jumper wires - For connecting components
- Bread board - For connecting on the base

Software Requirements

- Code Composer Studio (CCS) - IDE used for the project
- PUTTY - To interface Microcontroller with PC

MSP430 Advanced Microcontroller Features:

- Low Supply-Voltage Range: 1.8V to 3.6V
- Five Power Saving Modes (LPM0-LPM4).

- Ultra-Fast Wake-Up from standby mode in less than 1 μ s.
- Two 16-Bit Timer A with Three Capture Registers.
- On Chip Comparator.
- Universal Serial Communication Interface(USCI)
 - UART.
 - IRDA Encoder and Decoder.
 - Synchronous SPI (Serial Peripheral Interface).
 - I2C (Inter IC Communication).

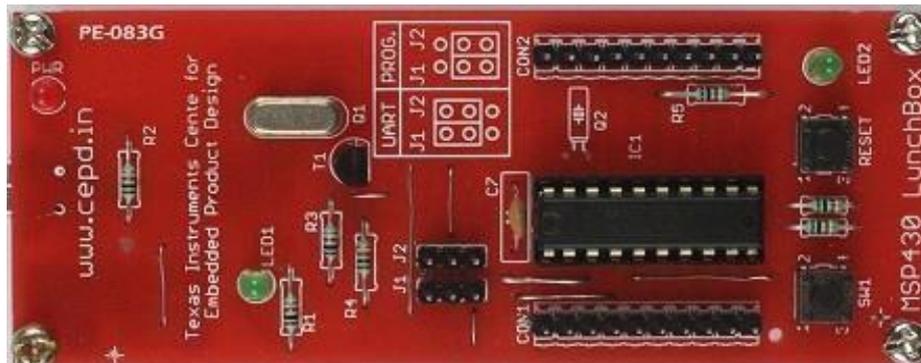


Fig. MSP430 lunchbox Microcontroller Evaluation kit.

MSP430 is 16-bit microcontroller, it is designed with low cost and specifically low power consumption and has operating power at 3.3V and can be integrated in any embedded applications. Most of its applications are related to industry based general purpose sensing and measurement. The advantage of MSP430 controller is it is very cheap when compared to other microcontrollers but it is also limited to its computational capacity. Even with this lesser computational power we can achieve many applications and it is also highly efficient in power consumption it also offers a full 16MHZ internal clock source for communicating with peripheral devices thus reducing the need for external crystal.

Circuit diagram and Working

Circuit Diagram

The figure 2.1 represents the connections that are made in the construction of this project. The UART connection between the computer and msp430 is established via a USB-mini, the LEDs are connected as follows:

- the cathodes of both the LEDs are connected to the common ground of the microcontroller
- the anode of the red LED is connected to pin 2 of port 2
- the anode of the green LED is connected to pin 0 of port 2

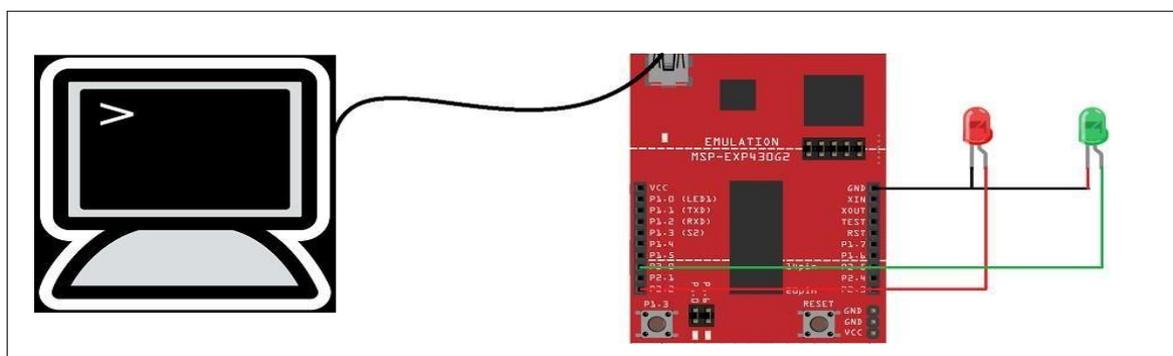


Fig 2.1 Circuit Diagram of Security Home Locker

Working

In this work a password based digital security locker is built using MSP430 low power 3.3v logic level microcontroller. The password input is taken through “putty”, a serial communication software for computers. The communication is established through UART protocol. The microcontroller is configured to make serial communication with the connected computer to take user input, which is the required password to open the lock. After receiving, the input is later compared with the security key that has been previously set in the microcontroller. If the user input matches the set password then the microcontroller is programmed to light a green LED, which is connected to pin 0 of port-2. In case of any mismatch the microcontroller will light up a red led on pin 2 of port-2 to indicate incorrect password.

To establish serial communication between the computer and msp430, the required UART registers of msp430 are configured with a baud rate of 9600. When the microcontroller is powered on first it will establish serial connection with the connected computer and then it will wait in low power state for user input. When serial data is available the corresponding interrupt based subroutines will be called to process the data. The user input is dynamically compared with the set-password character by character and will indicated the status accordingly through the red and green LEDs.

III. RESULT

The outputs obtained the work are explored using the figures Fig. 3.1 and Fig .3.2.. In this work a password, “123c”has been setup for testing. When correct sequence of password is entered as shown in Fig. 3.1(a) then automatically the Green LED in the circuit will glow as shown in the Fig 3.1. (b). If any incorrect password is entered as shown in Fig 3.2(a), automatically the blue LED in the setup will glow (Fig.3.2(b))

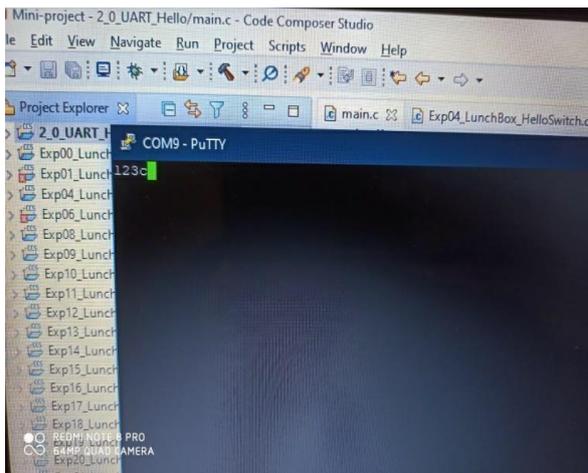


Fig.3.1(a) – Password entered correctly. “correct password”.

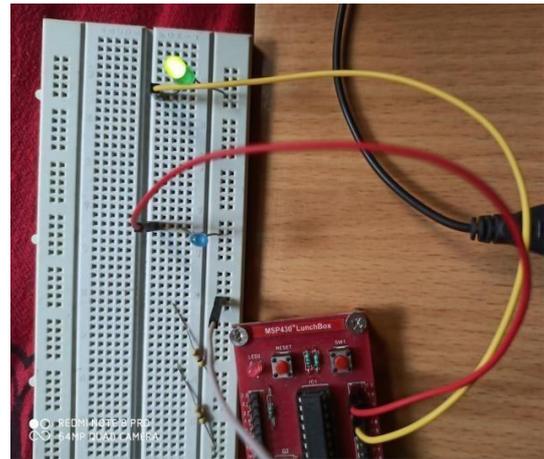


Fig.3.1(b) - Green LED is glowing to indicate

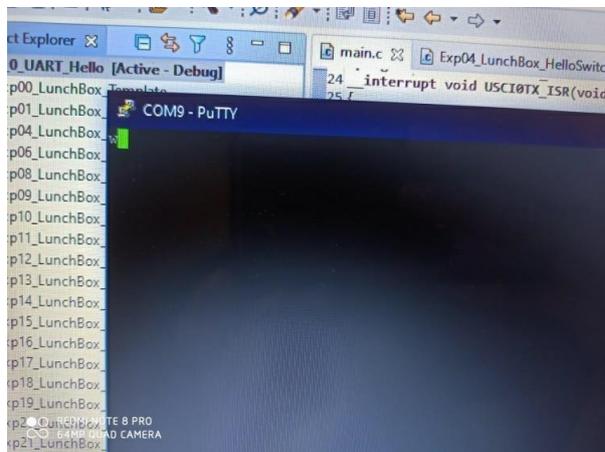


Fig.3.2(a) – Password entered incorrectly. indicate “incorrect password”

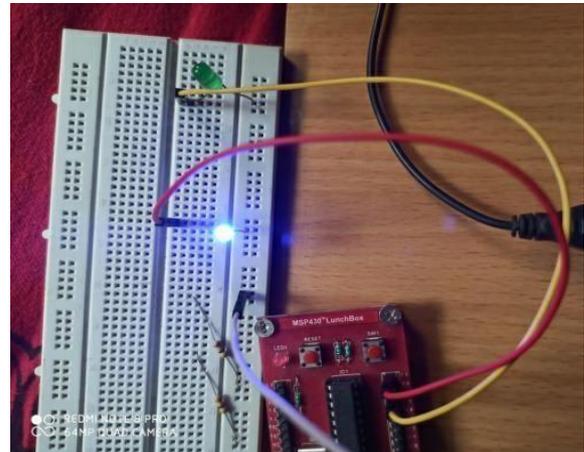


Fig.3.2(b) - Blue LED is glowing to

IV. CONCLUSION

Conclusion

In this demonstration of Home Security Locker system a minimum amount of components are used to achieve the applications purpose. The main use of such locker's is one can safeguard their things without any doubt in its security. The use of Low power mode in MSP 430 gets the absolute best of the microcontroller and consumes very less power which ensure the longer life of the system. This system is robust to its maximum extent, the length of the pass code can be modified which increases the security of the system. This locker can be used either to doors or safety vaults. There can be various utilizations of this system and it fits in perfectly in each and every situation with very minor modifications.

Future scope

This project can be further developed and various fields can be improved so as to make the project more accessible to the users. The following areas can be blown into a large sector and different developments can be made. There can be developments in software as well as hardware domains of the project a few of them are

- The input peripheral device can be added to the locker system
- There is also room for the code to improve and have features like reset password.
- It can also incorporate a connectivity element in it such as a wifi module or Bluetooth module to have more connectivity
- The entire system can be made into a robust PCB so that it can be more portable and can be fitted into any location without much disturbance to the wiring

REFERENCES

- [1]. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
- [2]. <https://www.ti.com/microcontrollers-mcus-processors/microcontrollers/msp430-microcontrollers/overview.html>
- [3]. <https://gist.github.com/yasser-khan/4404813>
- [4]. <https://circuitdigest.com/microcontroller-projects/getting-started-with-msp430-using-code-composer-studio>
- [5]. <https://wtfleming.github.io/2013/11/10/msp430-blink/>
- [6]. <https://circuitdigest.com/microcontroller-projects/blinking-led-sequence-with-msp430-digital-read-write-pins>
- [7]. https://www.xanthium.in/Serial-Communication-MSP430-UART-USCI_A
- [8]. <https://www.win.tue.nl/san/education/2IN26/MSP430%20UART.pdf>
- [9]. https://www.nskelectronics.in/index.php?route=product/category&path=94_222248
- [10]. https://people.kth.se/~maguire/DEGREE-PROJECT_REPORTS/131201-Rafid_Karim_and_Haidara_Al-Fakhri-with-cover.pdf
- [11]. <https://circuitdigest.com/microcontroller-projects/16x2-lcd-display-interfacing-with-msp430-using-code-composer-studio>
- [12]. <https://circuitdigest.com/microcontroller-projects/interrupts-in-msp430-writing-gpio-interrupt-program-using-code-composer-studio>
- [13]. <https://circuitdigest.com/microcontroller-projects/interfacing-hc-05-bluetooth-module-with-msp430-launchpad-to-control-an-led>
- [14]. F. Shawki et al., "Microcontroller based smart home with security using gsm technology", IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308, Volume: 04 Issue: 06 | June-2015, PP:20-28
- [15]. .Mohammed, Salma & Alkeelani, Abdul. (2019). Locker security system using keypad and RFID. 10.1109/ICCSRE.2019.8807588. Conference: The 2nd international conference of Computer Science and Renewable Energies 2019

Surya Prasada Rao Borra, et. al. "A Smart Home Security Locker using Microcontroller." *IOSR Journal of Engineering (IOSRJEN)*, 11(07), 2021, pp. 01-04.