COMP9032 Project
Smart Airplane Window Controller

designed by z5219960 Lin, Heng-Chuan

Design Pattern:

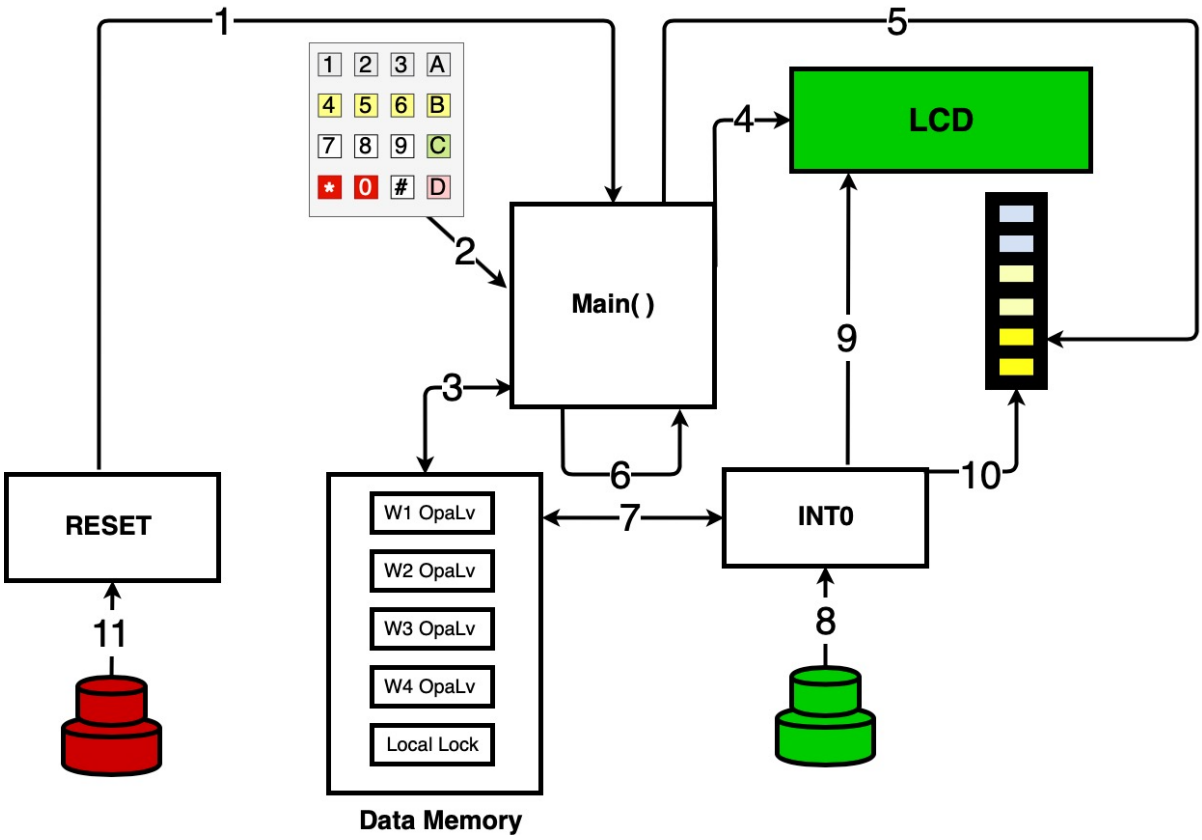

Figure2. Flow Char of Design

It is noted that some repeating of procedures might be neglected in this diagram.

1. General *Reset* (Initiation)
2. *Main()* read the input from *KeyPad*
3. *Main()* fetched the *OpaLv* then stored the modified OpaLv back
4. *Main()* put the *OpaLv* of each window on the *LCD*
5. *Main()* put the *OpaLv* of each window on the *LED Bar*
6. *Main()* would wait 0.5 sec and loop forever
7. When a *Push (Emergency) button* was pressed, *Push Button* would trigger Interrupt *INT0*
8. *INT0* fetched *OpaLv* of each window then stored the *OpaLv*=0 of each window back
9. *INT0* put the *OpaLv* of each window on the *LCD*
10. *INT0* put the *OpaLv* of each window on the *LED Bar*
11. When *RESET Button* was pressed, Reset the follow program

Design Thoughts:

Interrupt and Priority:

In order to give feature of priority, interrupt is applied in this system. Reset button has the highest priority as always, then Push button. It is noted that INT0 is for detection of failing edge. Both RESET and INT0 were generated by physically pressing the button. On the other hand, Central Control generated Lock to restrict the local control by implementation.

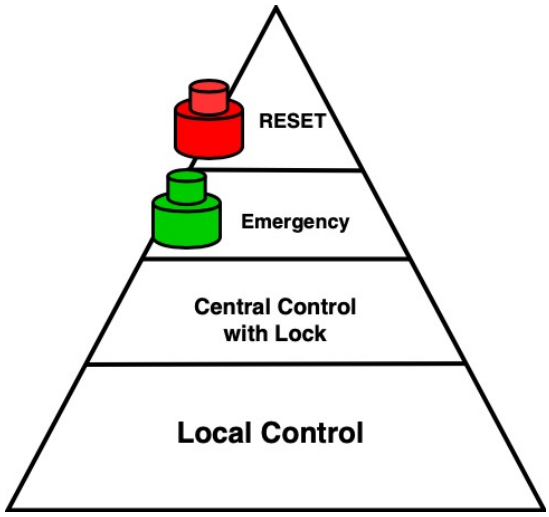

Figure. Hierarchy of control

PWM for LED:

In this system, out PORTX with register aren't applied for LED. Instead, phase correct PWM are applied to achieve the different opaque levels. Timer3 and Timer5 handle 4 windows, secondary pin on the same source are used to set 8 single LED Bars (4 pairs). By changing the PWM duty cycle of each window, the opaque level could be demonstrated in a visual way on the LED pairs.

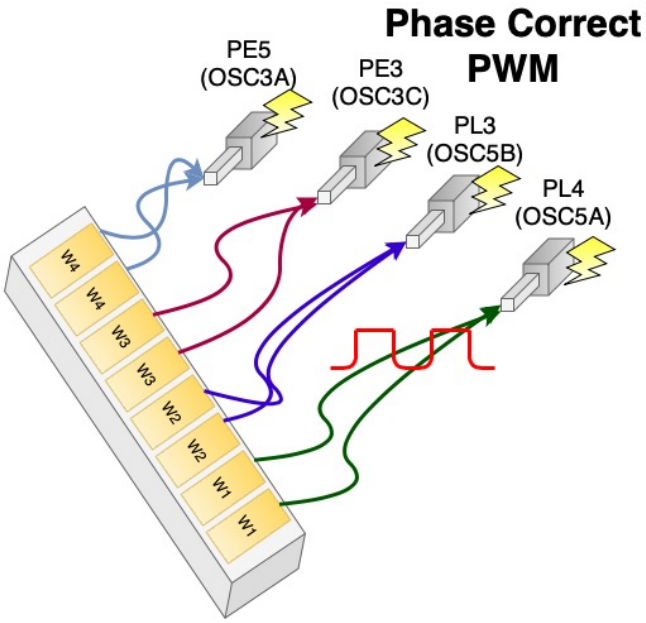

Figure. Concept of connecting each led pair to timer pin

Design of Parallel-input KeyPad:

To obtain the parallel input, the DDRMASK is introduced to the system. By shifting the mask and abandoning rowmask, this algorithm allows program to handle multiple inputs in one scan. DDRMASK is here to solve the issue when pressing multiple buttons in the same row, and bit clear detection is here to read through entire row in each column.

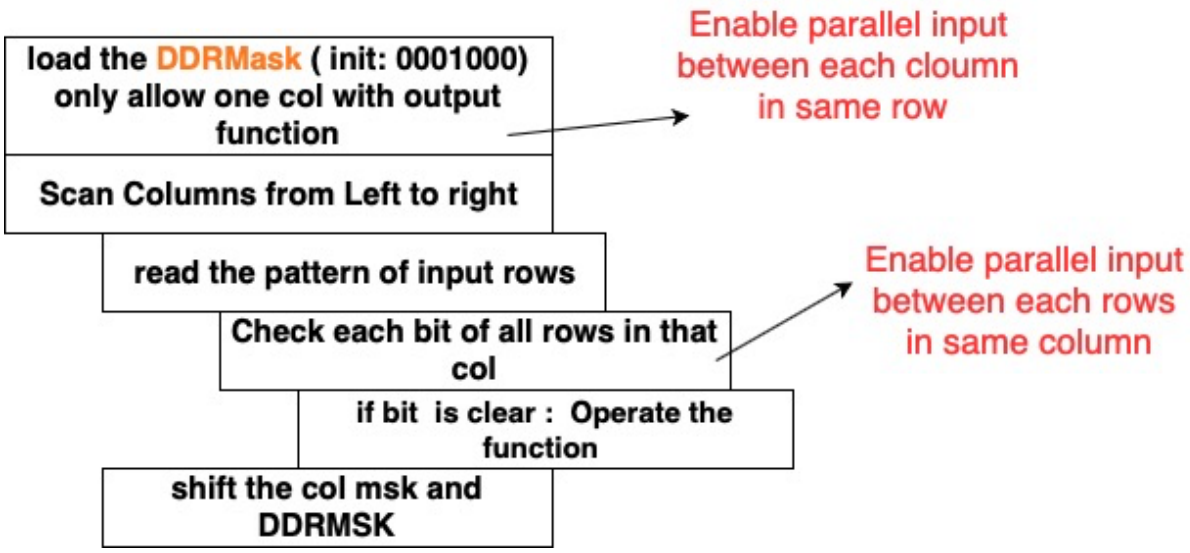

Figure. Design of parallel input detection

Components:

Here we have are:

1. A *LED Bar*: to demonstrate different opaque levels of each window
2. A *LCD Display*: to show the control status and opaque levels of each window
3. A *Push(Emergency) Button*: to generate emergency status
4. A *RESET Button*: to reboot the system
5. A *KeyPad*: to control the local windows and central operation

   Important:
   For keypad, LOCAL Lock is designed for disable local adjustment. by pressing *, only central-related service, emergency status and Reset button are functional. Keep in mind that Central control and Emergency control all enable LOCAL Lock after operation. MAKE sure to press '0' on the keypad to unlock individual local adjustment for opaque level of each window.

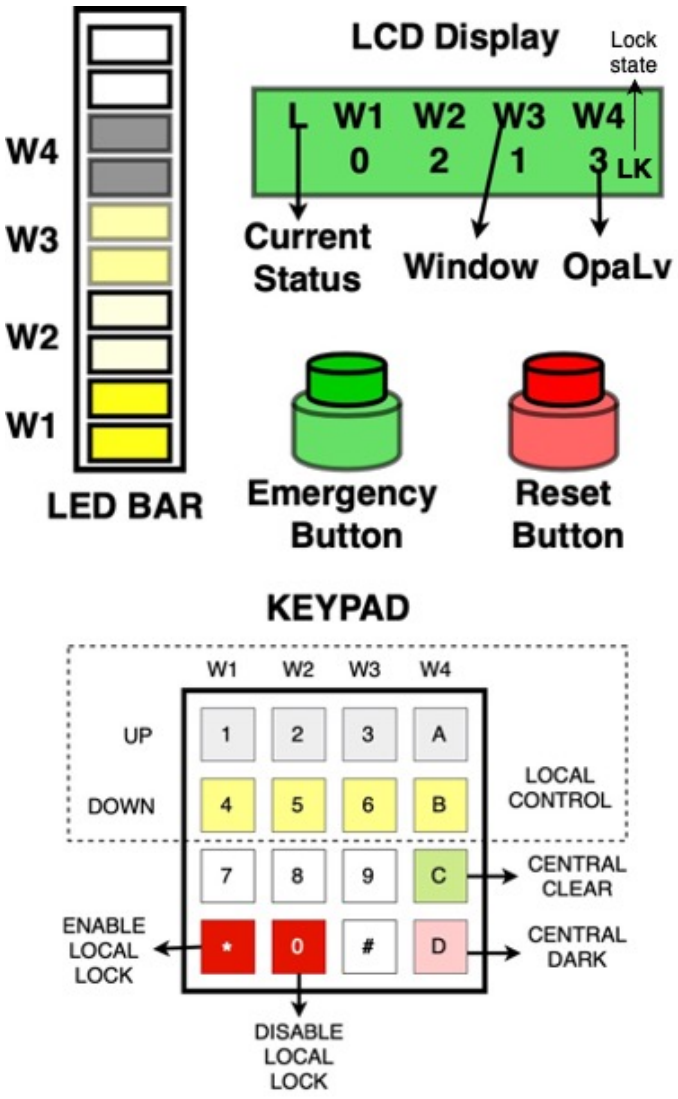

Figure. Components of the smart window control system

Wiring Table:

LCD DATA	D0-3	PORTF	PF0-3
LCD DATA	D4-7	PORTF	PF4-7
LCD CRTL	BE-RS	PORTA	PA4-7
INPUT	PB0	PORTD	RDX4
KEYPAD	C3-0	PORTC	PC0-3
KEYPAD	R3-0	PORTC	PC4-7
LED BAR	LED8-9	PORTL	PL4 (2PINS)
LED BAR	LED6-7	PORTL	PL3 (2PINS)
LED BAR	LED4-5	PORTE	PE3 (2PINS)
LED BAR	LED2-3	PORTE	PE5 (2PINS)

Example of Operation: