

Introduction to Microcomputers

Lab3

The goal of this lab is to emulate the looping constructs using PIC16F877A instructions.

Assignment

Zibonacci numbers are recursively defined as follows:

$Zib(0) = 1;$

$Zib(1) = 2;$

$Zib(N) = (Zib(N-1) \& 0x3f) + (Zib(N-2) \mid 0x05) \text{ for } N \geq 2$

Iteratively, the following C code can be used to compute the N^{th} Zibonacci number:

```
uint8_t zib0 = 1;
uint8_t zib1 = 2;
uint8_t zib;
uint8_t i = 2;
int N = 13;
for (i = 2; i <= N; i++) {
    zib = (zib1 & 0x3f) + (zib0 | 0x05);
    zib0 = zib1;
    zib1 = zib;
} //end-for
// When we come here, zib contains the Nth Zibonacci number
```

Here are the Zibonacci numbers from 2 to 13:

N	Fib(N) [Decimal]	Fib(N) [Hex]	Fib(N) [Binary]
2	7	0x07	00000111
3	14	0x0E	00001110
4	21	0x15	00010101
5	36	0x24	00100100
6	57	0x39	00111001
7	94	0x5E	01011110
8	91	0x5B	01011011
9	122	0x7A	01111010
10	153	0x99	10011001
11	152	0x98	10011000
12	181	0xB5	10110101
13	210	0xD2	11010010

Instead of computing just the Nth Zibonacci number and displaying the result on the LEDs connected to PORTD, you will display each and every Zibonacci number from 2 to 13 within the while loop on the LEDs, and wait for the user to press Button3 (RB3 on PICSIM) to move on to the next iteration of the loop. Also make a 250ms delay before checking if the button is pressed and moving on to the next iteration of the loop. Essentially, you will be implementing the following C code:

```
BANKSEL TRISB    ; Select the Bank where TRISB is located (Bank 1)
TRISB = 0xFF     ; Make all pins of PORTB as input pins
TRISD = 0x00     ; Make all pins of PORTD as output pins

BANKSEL PORTD    ; Select the Bank where PORTB is located (Bank 0)
CLRF    PORTD    ; Turn off all LEDs

uint8_t zib0 = 1;
uint8_t zib1 = 2;
uint8_t zib;
uint8_t i = 2;
int N = 13;
for (i = 2; i <= N; i++) {
    zib = (zib1 & 0x3f) + (zib0 | 0x05);
    zib0 = zib1;
    zib1 = zib;

    PORTD = zib;          ; Display the current Zibonacci number on the LEDs
    DelayMs(250)         ; Wait for 250ms
    while (PORTB3 == 1) ; ; Wait for Button3 (RB3) to be pressed
} //end-for
while (1);              ; Infinite loop
```