Practical 1B: Introduction to C - Decimal to radix-n converter

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Practical Venue: Red Lab
Date: 21st April 2018

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RMehta   21st April 2018

Signature   Date

SOLUTIONS

(a) The LEDs are connected to:
PB0, PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB10, PB11 // PB = PortB

(b) The code outputs the following text:

EEE2046F Prac 2B
****

(c) GPIOB->MODER means that we are accessing the MODER Register which is stored in the structure by dereferencing the pointer GPIOB

(d) i) This will set the 17th bit from the Least Significant Bit (LSB) to 1 on the member AHBENR of the structure. This is done to enable the clock for port A

ii) This changes the MODER Register referenced by the GPIOB pointer to set all GPIO pins connected to the LEDs in digital output mode

iii) This sets the ODR Register referenced by the GPIOB pointer to set PB0, PB1, PB2, PB3 and PB10 to HIGH. Ie: sets the first 4 red LEDs on and the RG LED to red

(e) (RCC*).AHBENR = (RCC*).AHBENR | 1<<17;

(f) The code inverts the bits in the ODR followed by a short delay

(g)

```
#include "lcd_stm32f0.h"
#include "stm32f0xx_conf.h"

void init_GPIOB(void);

void main (void)
{
        init_GPIOB();
        init_LCD();                           // Initialise lcd
        lcd_putstring("RONAK MEHTA");         // Display string on line 1
        lcd_command(LINE_TWO);                // Move cursor to line 2
        lcd_putstring("MHTRON001");           // Display string on line 2

for(;;)
        {
                GPIOB->ODR = ~GPIOB->ODR;
                for (int i = 0 ;i<=100;i++)
                        for(int j = 0;j<=5000;j++);
        }                                     // Loop forever
}                                             // End of main
```

(h)

```
#define  DELAY1  1000
#define  DELAY2  3000

void Delay(void)
{
    int i,j;
    for(i=0; i<=DELAY1; i++)
      for(j=0; j<=DELAY2; j++);
}
```

(i)

```
i)   uint8_t bitpattern1 = 0;
ii)  uint8_t bitpattern2 = 0b11111111;
iii) uint8_t bitpattern3 = 0b10101010;
```

(j)

```
#include "lcd_stm32f0.h"
#include "stm32f0xx_conf.h"
#include <stdint.h>
//====================================================================
// SYMBOLIC CONSTANTS
//====================================================================
int DELAY1 = 1000;
int DELAY2 = 3000;
uint8_t bitpattern1 = 0;
uint8_t bitpattern2 = 0b11111111;
uint8_t bitpattern3 = 0b10101010;
//====================================================================
// GLOBAL VARIABLES
//====================================================================
// FUNCTION DECLARATIONS
//====================================================================
void init_GPIOB(void);
void Delay(void);
//====================================================================
// MAIN FUNCTION
//====================================================================
void main (void)
{
      init_GPIOB();
      init_LCD();                          // Initialise lcd
      lcd_putstring("RONAK MEHTA");        // Display string on line 1
      lcd_command(LINE_TWO);               // Move cursor to line 2
      lcd_putstring("MHTRON001");          // Display string on line 2

      for(;;)
      {
            GPIOB->ODR = bitpattern1;       // Turns all LEDs off
            Delay();                       // Delays for 1 second
```

```
              GPIOB->ODR = bitpattern2;       // Turns all LEDs On
              Delay();                        // Delays for 1 second
              GPIOB->ODR = bitpattern3;       // Alternatives LEDs from on to off
              Delay();                        // Delays for 1 second
       }                                      // Loop forever
}                                             // End of main

//====================================================================
// FUNCTION DEFINITIONS
//====================================================================
void init_GPIOB(void)
{
       RCC  ->AHBENR |= 1<<18;
       GPIOB->MODER  |= 0x00505555;
       GPIOB->ODR     = 0b0000010000001111;
}

void Delay(void){
       for(int i=0; i<DELAY1; i++){
              for (int j = 0; j < DELAY2; ++j) {
              }
       }
}
//********************************************************************
// END OF PROGRAM
//********************************************************************
```

(k)

```
#include "lcd_stm32f0.h"
#include "stm32f0xx_conf.h"
#include <stdint.h>
//====================================================================
// SYMBOLIC CONSTANTS
//====================================================================
int DELAY1 = 1000;
int DELAY2 = 3000;
uint8_t bitpattern1 = 0;
uint8_t bitpattern2 = 0b11111111;
uint8_t bitpattern3 = 0b10101010;
uint8_t bitpatternx = 1;
//====================================================================
// GLOBAL VARIABLES
//====================================================================
// FUNCTION DECLARATIONS
//====================================================================
void init_GPIOB(void);
void Delay(void);
//====================================================================
// MAIN FUNCTION
//====================================================================
void main (void)
{
       init_GPIOB();
       init_LCD();                      // Initialise lcd
       lcd_putstring("RONAK MEHTA");    // Display string on line 1
       lcd_command(LINE_TWO);           // Move cursor to line 2
       lcd_putstring("MHTRON001");      // Display string on line 2
```

```
        for(;;)
        {
                if (bitpatternx == 65535) {   // ODR has 16 subpins. 2^16 = 65536
                        break;                // So max value will be 65536-1 =65535
                }
                GPIOB->ODR = bitpatternx;     // Giving ODR value of bitpatternx
                bitpatternx++;                // Incrementing bitpatternx by 1
                Delay();                      // Gives a 1 second delay
        }
}
//====================================================================
// FUNCTION DEFINITIONS
//====================================================================
void init_GPIOB(void)
{
        RCC  ->AHBENR |= 1<<18;
        GPIOB->MODER  |= 0x00505555;
        GPIOB->ODR     = 0b0000010000001111;
}
void Delay(void){
        for(int i=0; i<DELAY1; i++){
                for (int j = 0; j < DELAY2; ++j) {
                }
        }
}
//********************************************************************
// END OF PROGRAM
//********************************************************************
```

(l) and (m)

```
#include "lcd_stm32f0.h"
#include "stm32f0xx_conf.h"
#include <stdint.h>
//====================================================================
// SYMBOLIC CONSTANTS
//====================================================================
int DELAY1 = 1000;
int DELAY2 = 3000;
uint8_t bitpattern1 = 0;
uint8_t bitpattern2 = 0b11111111;
uint8_t bitpattern3 = 0b10101010;
uint8_t bitpatternx = 1;
//====================================================================
// GLOBAL VARIABLES
//====================================================================
//====================================================================
// FUNCTION DECLARATIONS
//====================================================================
void init_GPIOB(void);
void Delay(void);
//====================================================================
// MAIN FUNCTION
//====================================================================
```

```c
void main (void)
{
       init_GPIOB();
       init_LCD();                            // Initialise lcd
       lcd_putstring("RONAK MEHTA");    // Display string on line 1
       lcd_command(LINE_TWO);                 // Move cursor to line 2
       lcd_putstring("MHTRON001");      // Display string on line 2
       for(;;)
       {
             if (bitpatternx == 0)      // Once bitpatternx value reaches 0
             {                          // It resets to 1 and continues the loop
                    bitpatternx = 1;
             }
             GPIOB->ODR = bitpatternx;        // Giving ODR value of bitpatternx
             bitpatternx = bitpatternx<<1;    // Shifting 1 value to the left
             Delay();                         // Gives a 1 second delay
       }                                      // Loop Forever
}                                             // End of main

//====================================================================
// FUNCTION DEFINITIONS
//====================================================================
void init_GPIOB(void)
{
       RCC  ->AHBENR |= 1<<18;
       GPIOB->MODER  |= 0x00505555;
       GPIOB->ODR     = 0b0000010000001111;
}
void Delay(void){
       for(int i=0; i<DELAY1; i++){
             for (int j = 0; j < DELAY2; ++j) {
             }
       }
}
//********************************************************************
// END OF PROGRAM
//********************************************************************
```