Blinker

ELE 271: Laboratory 3

Introduction

The basic goal of this experiment is to learn how to use the general purpose input output (GPIO) pins for digital output. For this purpose we will use a logic analyzer and the built-in green LED connected to Port A pin 5 (by default), denoted here PA.5, to observe the output.

Part 1

Enable the GPIO PA.5 pin by setting all the the relevant registers:

- RCC -> AHB2ENR
- GPIOA -> MODER
- GPIOA -> OTYPER
- GPIOA -> OSPEEDR
- GPIOA -> PUPDR

Turn the LED on and off by toggling bit 5 of GPIOA output data register:

- GPIOA -> ODR

```
#include "stm32l476xx.h"

// PA.5  < --> Green LED

void configure_LED_pin () {
// Enable the clock to GPIO Port A
    RCC -> AHB2ENR = 0x????????;

// Set the GPIO Port A mode to output
    GPIOA -> MODER = 0x????????;

// Set the GPIO Port A output type to push - pull
    GPIOA -> OTYPER = 0x????????;

// Set the GPIO speed to low
    GPIOA -> OSPEEDR = 0x????????;

// Set GPIO Port A Push - Pull to no pull - up, no pull - down
    GPIOA -> PUPDR = 0x????????;
}
```

```
int main (void) {
  int i;
  configure_LED_pin();

// turn on LED
  GPIOA -> ODR = ?;

// Dead loop & program hangs here
      while (1) {
          for (i = 0; i < 1000000; i++);
// toggle LED
              GPIOA -> ODR = ?;
      }
  }
```

If all the control bits are set correctly you should see a blinking green LED.

Part 2

Determine the voltage level of a high output on a GPIO pin by connecting PA.5 to the oscilloscope and measuring the voltage.

Part 3

Adjust the count value the signal on PA.5 has an approximately 1 second period. Use the logic analyzer to display the signal and validate your result.

Part 4

Modify the code to vary the duty cycle of the output signal. For example, while maintaining a 1 second period, turn the LED ON for 0.25 seconds and OFF for 0.75 seconds. Use the logic analyzer to display the waveform and to validate your result.

Part 5

Use the methods of Part 3 and 4 to repeatedly display the Morse code SOS message (see https://en.wikipedia.org/wiki/Morse_code):
three short ON/OFF sequences followed by three long ON/OFF sequences and followed again by three short sequences. The long signals should be about 3 times longer then the short signals.