

# Button-Controlled LED Blinking

## Objective

The objective of this lab is to implement a program in Arm assembly that controls the blinking of an LED based on the state of a button press.

## Prerequisites

- Understanding of branching instruction, memory read-write, and subroutines in assembly.
- Understanding of button and LED interfaces, including configuration.

## Pre-Lab Questions

- How can a microcontroller's GPIO pins be configured to interface with external devices such as buttons and LEDs?
- Explain the concept of debouncing when dealing with button input in microcontroller applications.
- Explain the concept of memory-mapped I/O and how it is different from port-mapped I/O. Provide an example of a situation where you would prefer to use memory-mapped I/O over port-mapped I/O, and vice versa.

## Lab Assignment

In this lab, you will write an ARM assembly program to achieve the following tasks:

1. Continuously monitor the state of the pushbuttons connected to Port D Pin4 and Pin5 using the GPIO input register.
2. Implement a delay function to control the blink rate of the LEDs.
3. When Pin4 is pressed, toggle the states of the LEDs connected to Pin0 and Pin1 by writing to the GPIO output register.
4. When Pin5 is pressed, make the LEDs connected to Pin0 and Pin1 blink once.

## Instructions

1. Create a new assembly file named "ButtonLEDControl.s" within your Keil uVision project.

2. Write the ARM assembly code to implement the above tasks. You can use the provided code as a reference.
3. Include *startup\_stm32f10x\_cl.s* file (you can download it from github).

```

1.  EXPORT __main
2.  EXPORT SystemInit
3.
4.  AREA led_button, CODE, READONLY
5.
6.  SystemInit PROC ; Code for clock setting and GPIO configuration
7.      ; Configure GPIO pins and clocks here
8.      ; ...
9.
10.
11.     BX LR
12.     ENDP
13.
14.     delay PROC ; Delay subroutine
15.         ; Implement the delay function here
16.         ; ...
17.
18.     BX LR
19.     ENDP
20.
21.     ; Start of the main program
22.     __main PROC
23.         ; Main program logic here
24.         ; ...
25.
26.
27.     BX LR
28.     ENDP

```

## Submission

1. Include the assembly code (ButtonLEDControl.s) as part of your lab report. Ensure that your code is well-documented with comments explaining each section.
2. Explain how you implemented the delay function and its effect on LED blinking.
3. Include any observations or challenges encountered during the lab.