VILNIUS UNIVERSITY
ŠIAULIAI ACADEMY

BACHELOR PROGRAMME SOFTWARE ENGINEERING

Programming of Embedded Systems

Laboratory work No. 1

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Aim of the laboratory work:

The aim is to practice and understand the basics of MicroPython programming for microcontrollers, working on STM32 Nucleo F756ZG board with solder bridges and learn how to configure several I/Os and power supply pins for compatibility. Understanding pull-up and pull-down resistors.

Variant No 2.

Button 1			Button 2		
Pin	**Pull Up/Down**	**Action on button press**	**Pin**	**Pull Up/Down**	**Action on button release**
A1	Pull Down	Increment variable	A2	Pull Up	Toggle LED1

Code and Comments:

Importing library to control and read from microcontroller pins and another to work with delays.

Configures the pin "LED1" as an output for an LED. A1 as input and pull down (0) and A2 as input and pull up (1)

Declaration of the state of button presses and variable, to count increment.

```
from machine import Pin
import time
green_LED = Pin("LED1", Pin.OUT)
pin_A1 = Pin("A1", Pin.IN, Pin.PULL_DOWN)
pin_A2 = Pin("A2", Pin.IN, Pin.PULL_UP)
b1_state = True
b2_state = True
iterator = 0
```

Here is while true statement, to keep the code running, so the board can detect presses.

If the button pressed -> increase iterator, print variable and change the state of the pressed button.

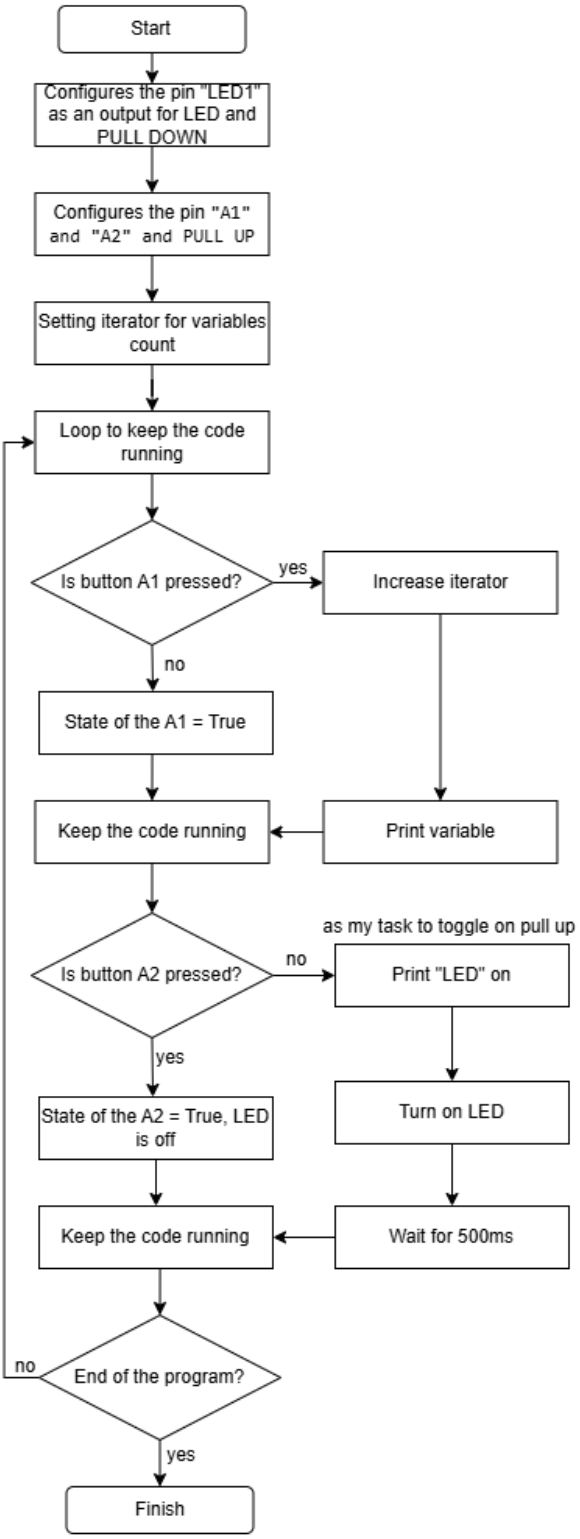
If the button released, the statement keep it's position.

```
while True:
    if pin_A1.value()==1:
        if b1_state:
            iterator += 1
            print(f"Variable value: {iterator}")
            b1_state = False
    else:
        b1_state = True
```

The next if statement change the LED to off, as pressed, as my task was to toggle the LED on pull up, so the default position is equal to 1. If the button released the light is on.

```
    if pin_A2.value()==1:
        if b2_state:
            print("LED on")
            green_LED.high()
            time.sleep_ms(500)
            b2_state = False
    else:
        b2_state = True
        green_LED.low()
```

Algorithm:


Start
Configures the pin "LED1" as an output for LED and PULL DOWN
Configures the pin "A1" and "A2" and PULL UP
Setting iterator for variables count
Loop to keep the code running
Is button A1 pressed?
yes
Increase iterator
no
State of the A1 = True
Keep the code running
Print variable
Is button A2 pressed?
as my task to toggle on pull up
no
Print "LED" on
yes
State of the A2 = True, LED is off
Turn on LED
Keep the code running
Wait for 500ms
End of the program?
no
yes
Finish

Conclusion:

In this study, we successfully practiced the basics of MicroPython programming on the STM32 Nucleo F756ZG microcontroller, explored hardware configurations, including solder bridges, were ocusing on configuring and using digital inputs and outputs and learned how to handle pins, and in general this project provided hands-on experience with microcontroller I/Os.

Code as a text:

```
from machine import Pin

import time

green_LED = Pin("LED1", Pin.OUT)

pin_A1 = Pin("A1", Pin.IN, Pin.PULL_DOWN)

pin_A2 = Pin("A2", Pin.IN, Pin.PULL_UP)

b1_state = True

b2_state = True

iterator = 0

while True:
    if pin_A1.value()==1:
        if b1_state:
            iterator += 1
            print(f"Variable value: {iterator}")
            b1_state = False
    else:
        b1_state = True
    if pin_A2.value()==1:
        if b2_state:
            print("LED on")
            green_LED.high()
            time.sleep_ms(500)
            b2_state = False
    else:
        b2_state = True
        green_LED.low()
```