VILNIUS UNIVERSITY
SIAULIAI ACADEMY

PROGRAMŲ SISTEMOS BACHELOR STUDY PROGRAMME

Software engineering

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Programming of Embedded Systems

Laboratory work No.1

I/O Ports

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Laboratory Work Report

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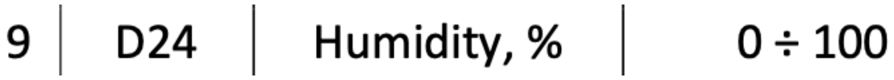
1. The Aim of the Laboratory Work

The aim of this laboratory work is to develop a MicroPython program for the NUCLEO_F756ZG microcontroller to generate an analog output using DAC2 (on pin D13). The output voltage should be controlled by pressing a button (SW), which adjusts the voltage in predefined steps (either increasing or decreasing). The generated voltage is connected to an ADC pin (D24) and read by the program. The program then converts the ADC value to a corresponding sensor measurement, such as humidity, and displays the result in the terminal.

2. Variant No and Data

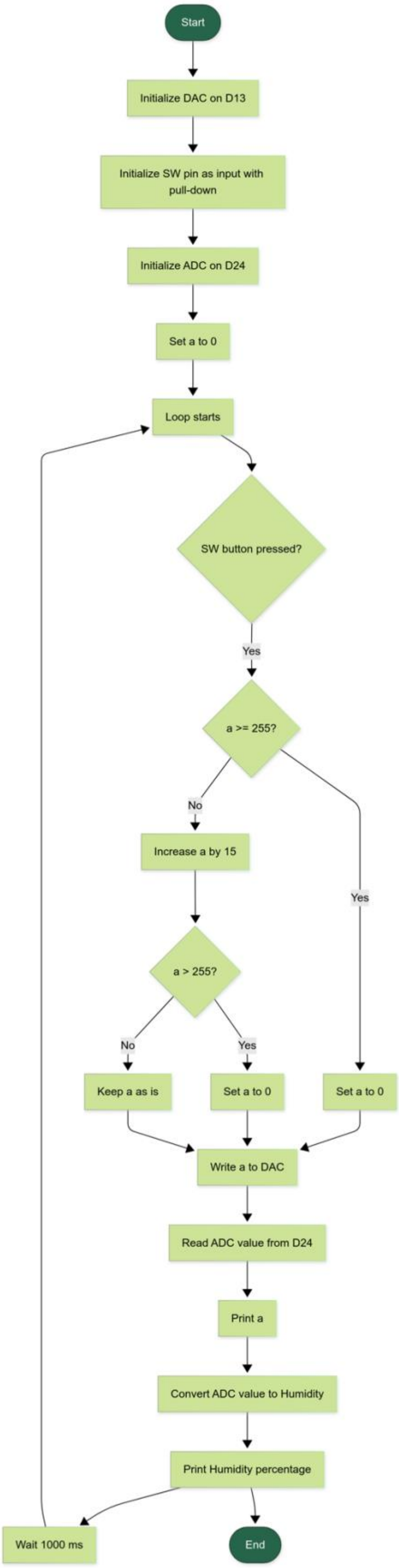
Variant No: 9



9	D24	Humidity, %	0 ÷ 100

Date: 18/02/2025

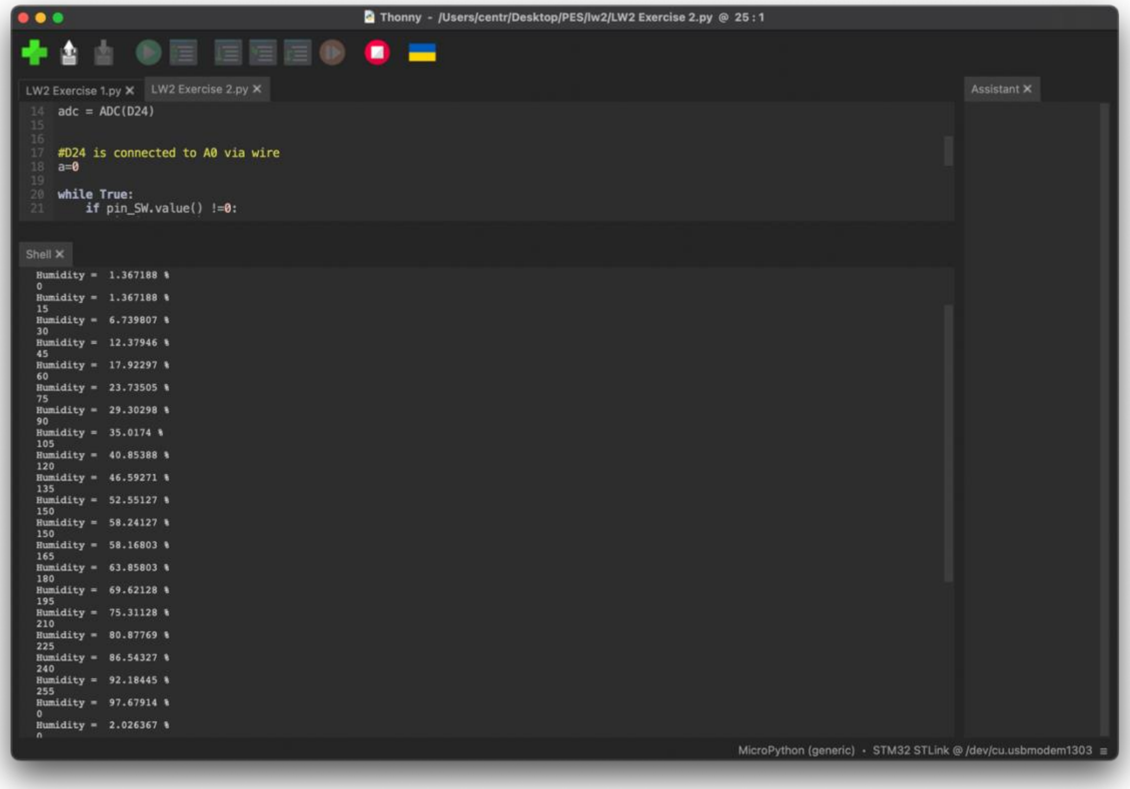
3. Program Algorithm



4. Program Body with Comments

```
# main.py -- put your code here!
from pyb import DAC
from machine import Pin
from machine import ADC
import time


# create DAC 2 on pin D13
dac = DAC(2)
pin_SW = Pin("SW", Pin.IN, Pin.PULL_DOWN)

# write a value to the DAC (makes D24 1.65V)
D24 = Pin("D24", Pin.ANALOG)
adc = ADC(D24)


#D24 is connected to A0 via wire
a=0

while True:
    if pin_SW.value() !=0:
        if (a >= 255):
            a = 0
        else:
            a += 15
            if (a > 255):
                a=0


    dac.write(int (a))
    val = adc.read_u16()



    #print value in 16 bit ADC range
    # print (val)
    print (a)

    #print value in Volts
    print ("Humidity = ",val*(100/65536),"%")
    time.sleep_ms(1000);
```

5. Screenshot of execution


Thonny - /Users/centr/Desktop/PES/lw2/LW2 Exercise 2.py @ 25 : 1
LW2 Exercise 1.py ✕
LW2 Exercise 2.py ✕
Assistant ✕
Shell ✕
MicroPython (generic) • STM32 STLink @ /dev/cu.usbmodem1303 ≡

```python
adc = ADC(D24)


#D24 is connected to A0 via wire
a=0

while True:
    if pin_SW.value() !=0:
```

```
Humidity =  1.367188 %
0
Humidity =  1.367188 %
15
Humidity =  6.739807 %
30
Humidity =  12.37946 %
45
Humidity =  17.92297 %
60
Humidity =  23.73505 %
75
Humidity =  29.30298 %
90
Humidity =  35.0174 %
105
Humidity =  40.85388 %
120
Humidity =  46.59271 %
135
Humidity =  52.55127 %
150
Humidity =  58.24127 %
150
Humidity =  58.16803 %
165
Humidity =  63.85803 %
180
Humidity =  69.62128 %
195
Humidity =  75.31128 %
210
Humidity =  80.87769 %
225
Humidity =  86.54327 %
240
Humidity =  92.18445 %
255
Humidity =  97.67914 %
0
Humidity =  2.026367 %
0
```

6. Conclusions

In this laboratory work, a MicroPython program was created to control the output voltage on pin D13 using the DAC2 feature of the NUCLEO_F756ZG microcontroller. The voltage was adjusted by pressing a button (SW), which either increased or decreased the voltage by a specified step. The voltage output was connected to the ADC input (D24), and the program successfully read and converted the ADC value into a humidity percentage, which was then displayed in the terminal. The program worked as intended, providing an effective way to control and monitor the voltage output and sensor readings. This task provided practical experience with using DAC and ADC peripherals in MicroPython.