FirstTerm Project

Pressure detection system

LEARN-IN-DEPTH

BY: Ahmed Ayman Elsherbeeny

1-Case Study:

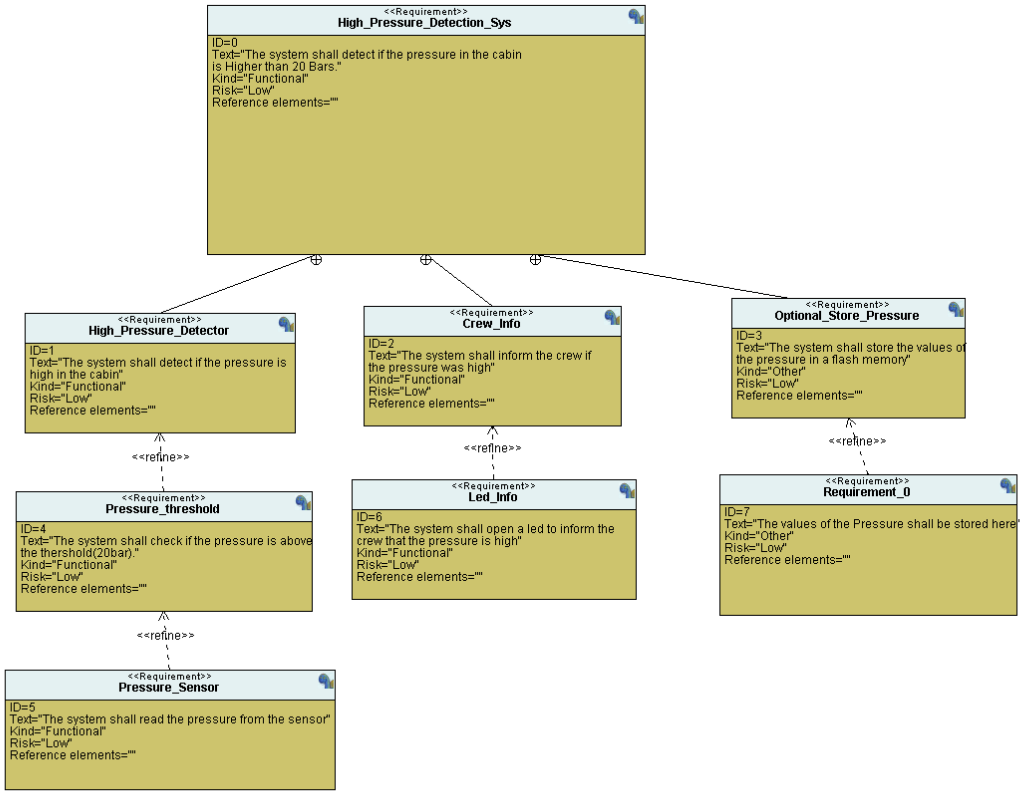
A pressure detection system that detects the pressure in the cabin a informs that crew if the pressure have exceeded 20 bars.

2- Method:

The method used in this project is Vmodel because Vmodel is a systems engineering methodology that can be used to design, develop, and test complex systems. It is a flexible methodology that can be adapted to different types of systems, and it is well-suited for use in safety-critical applications such as aircraft. Vmodel is a comprehensive methodology that can be used to design, develop, and test complex systems such as pressure detection systems for planes. It is a flexible methodology that can be adapted to different types of systems, and it is well-suited for use in safety-critical applications.

3-Requirements:

Requirements node is a module that allows you to define and manage the requirements for your Node.js project. It can be used to track the status of requirements, to generate reports, and to automate the testing of your project.



4-Design space exploration:

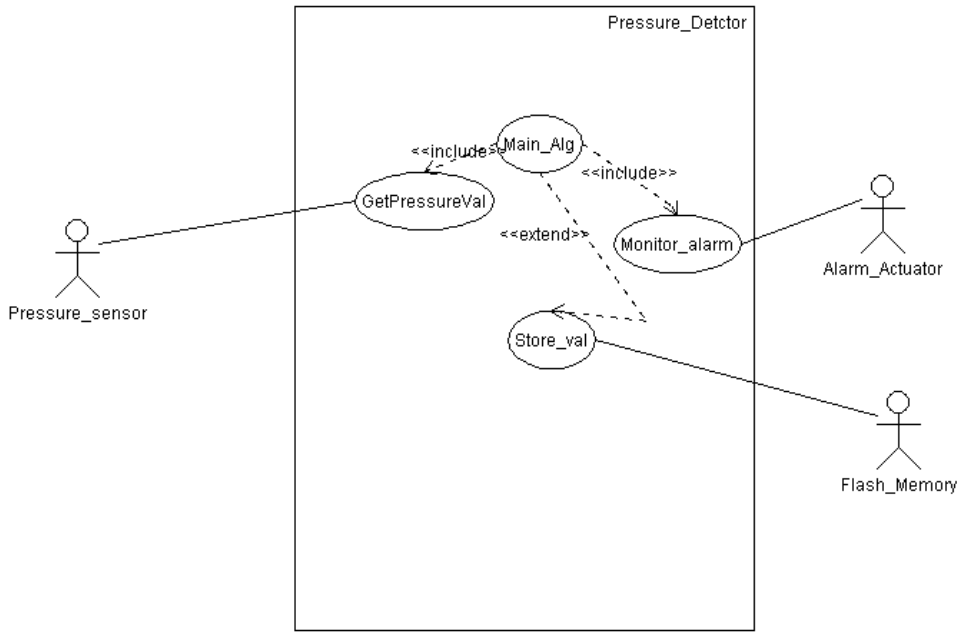
STM32103 was used in this project, in our opinion it’s the most suitable SOC to use because it is a powerful microcontroller with a wide range of features. The STM32103 has a 32-bit ARM Cortex-M3 processor, 512 KB of flash memory, and 64 KB of RAM. It also has a wide range of peripherals, including GPIO, timers, ADCs, DACs, and UARTs. This makes it a versatile microcontroller that can be used for a variety of projects.

It is affordable and easy to find. The STM32103 is a relatively inexpensive microcontroller, and it is readily available from a variety of vendors. This makes it a good choice for projects where cost is a factor.

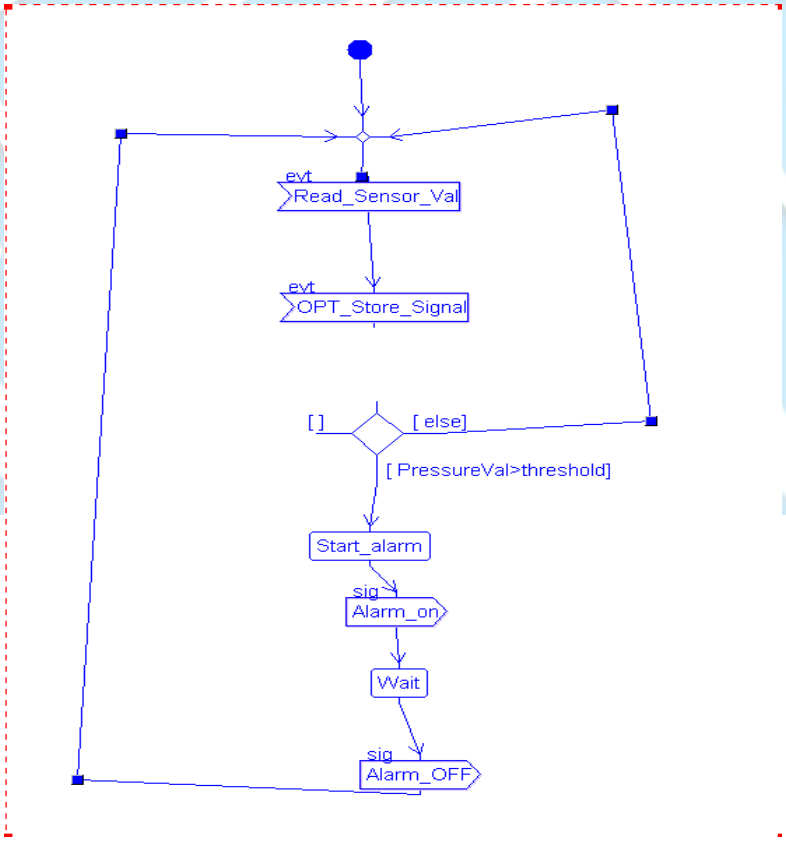
It has a large and active community. There is a large and active community of developers who are using the STM32103. This means that there is a lot of support available for the microcontroller, including documentation, libraries, and forums. This can be helpful if you are new to the STM32103 or if you need help with your project.

6-System analysis

1.Case diagram:Shows what the system does and who uses it

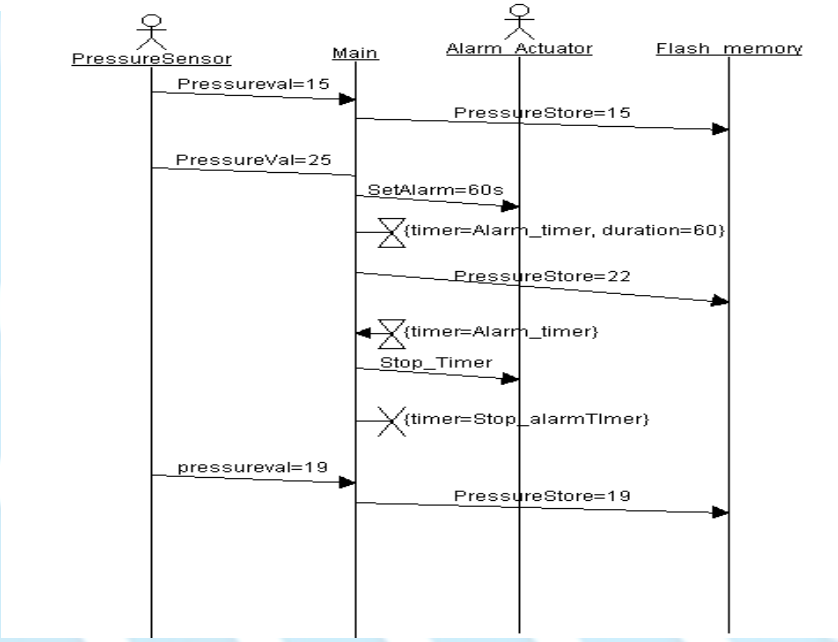


2.Activity Diagram:Activity diagrams describe the workflow behavior of a system

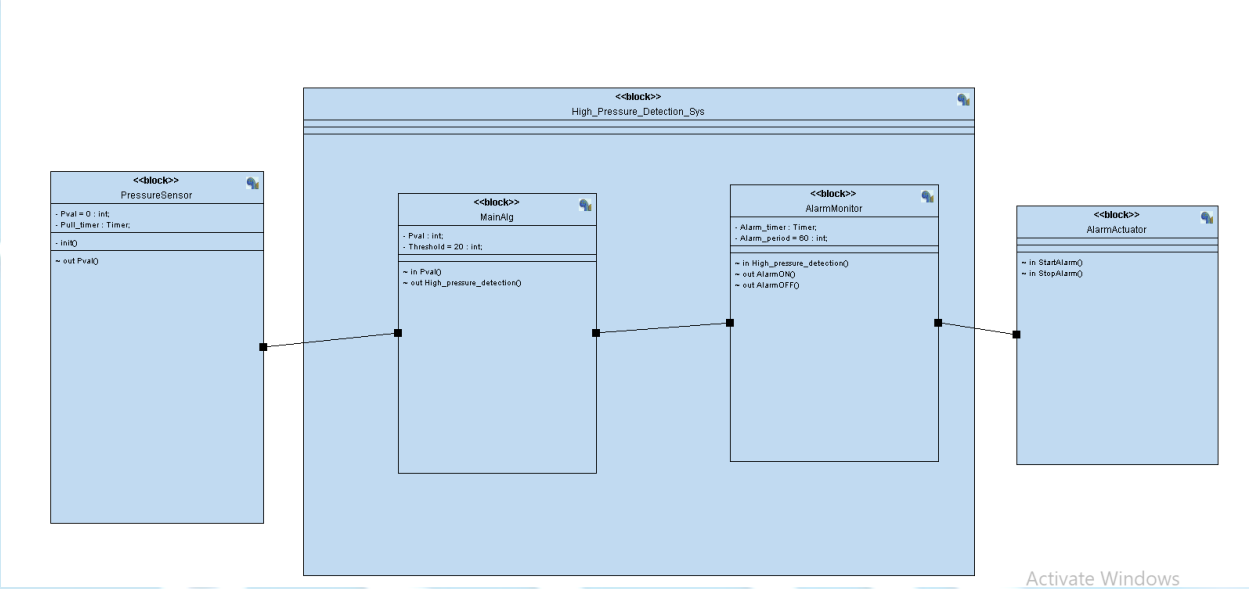


3. Sequence Diagram:

An interaction diagram that details how operations are carried out.

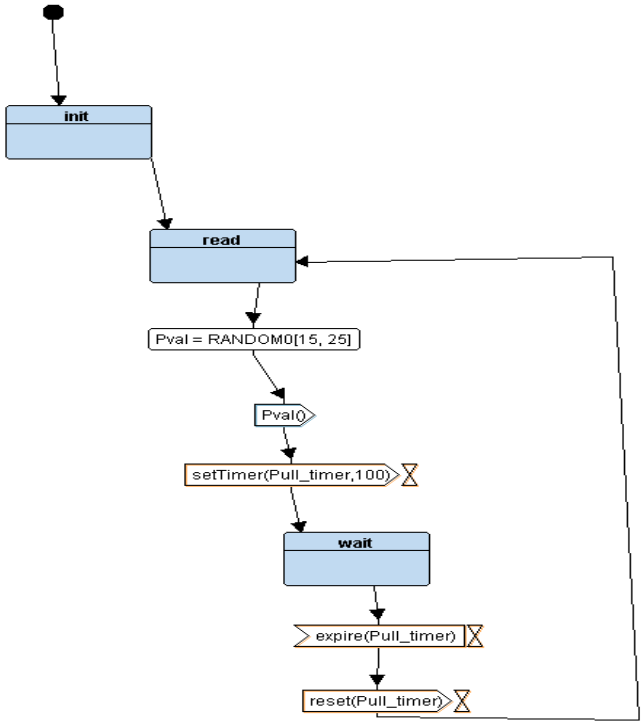


7-System Design:

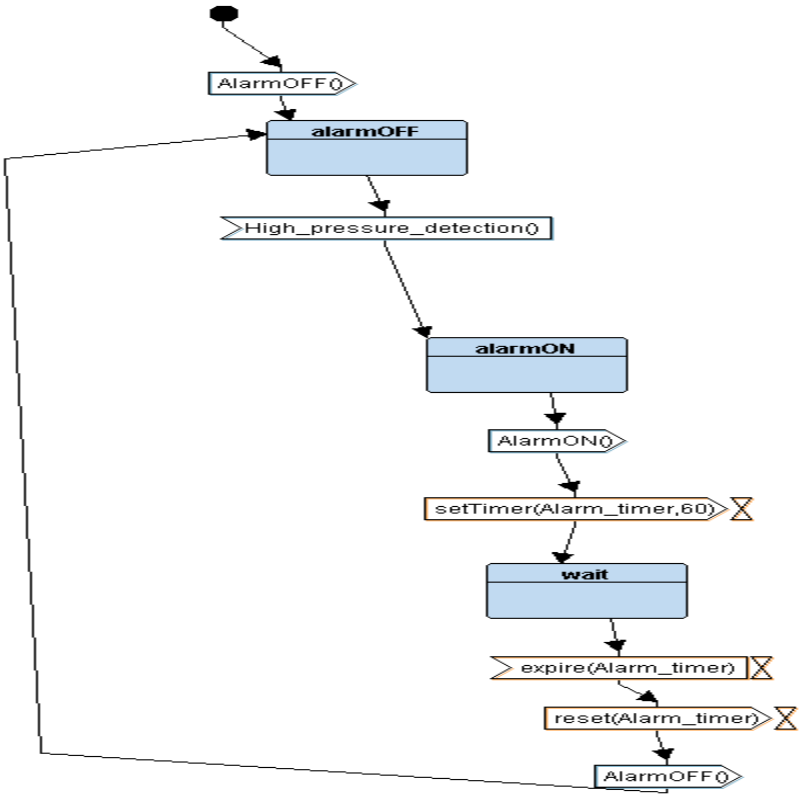


Activate Windows

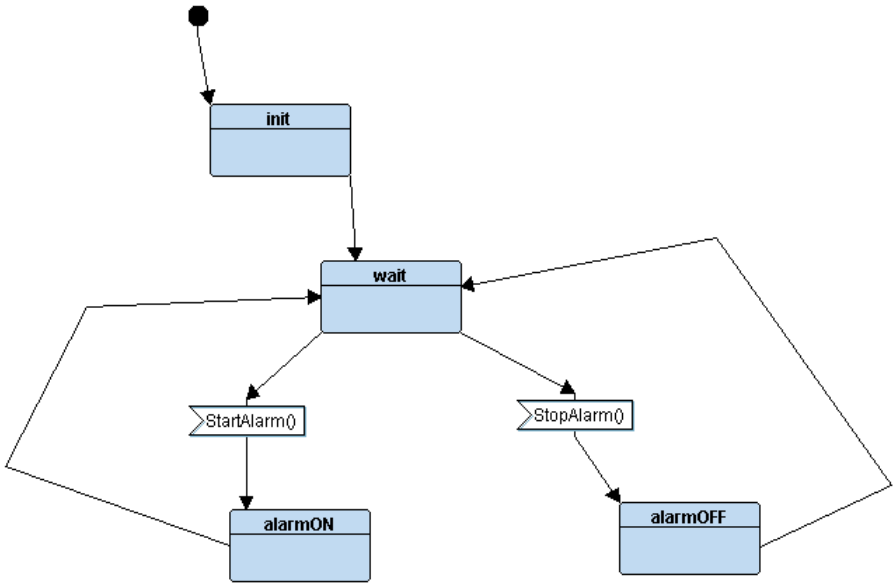
1.Pressure Sensor Block:



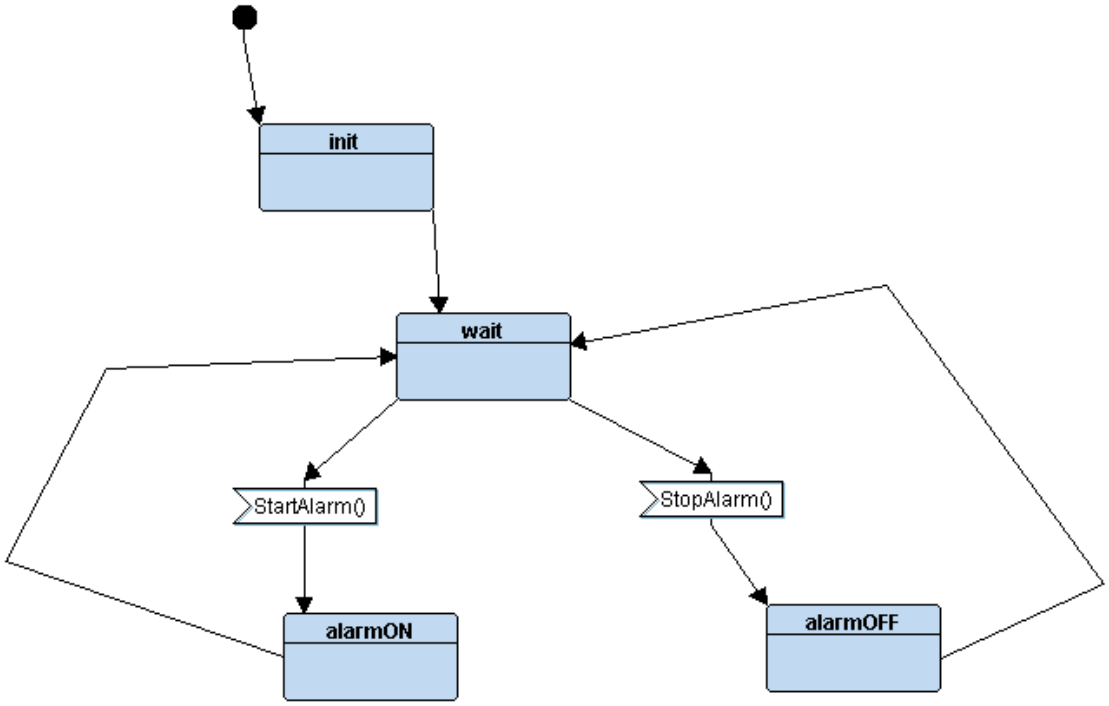
2.Alarm Monitor Diagram:



3.Alarm Actuator Diagram:



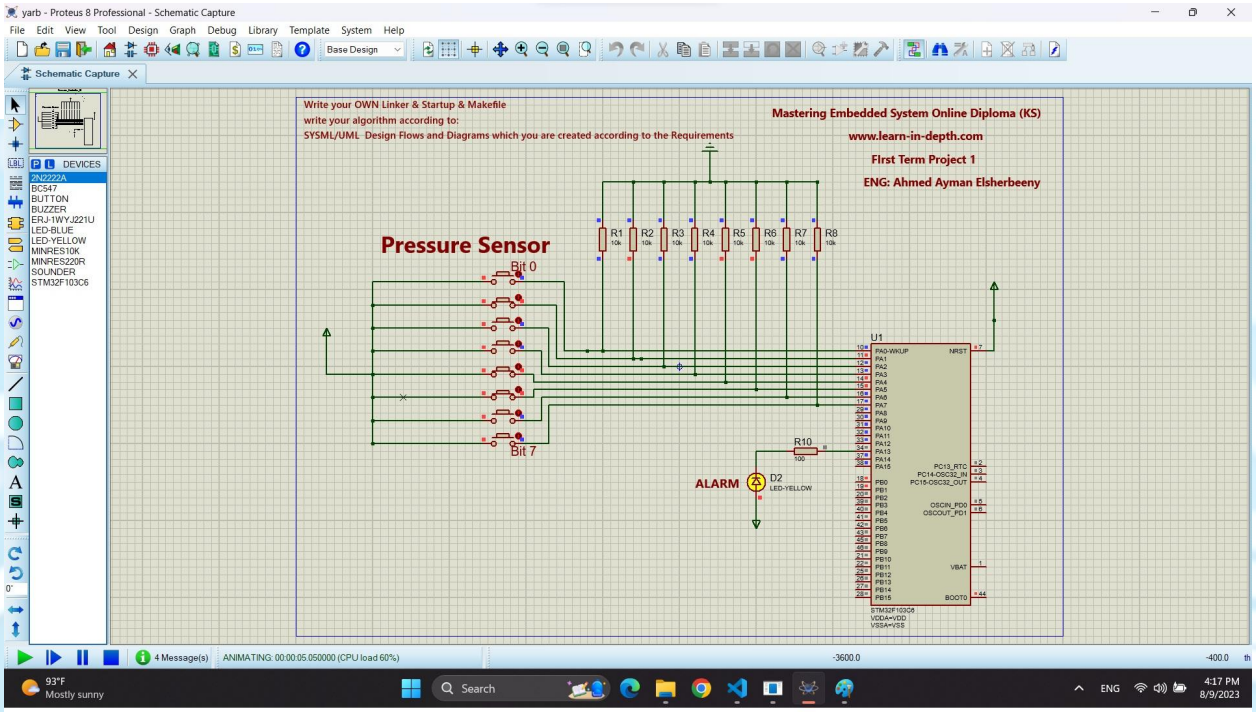
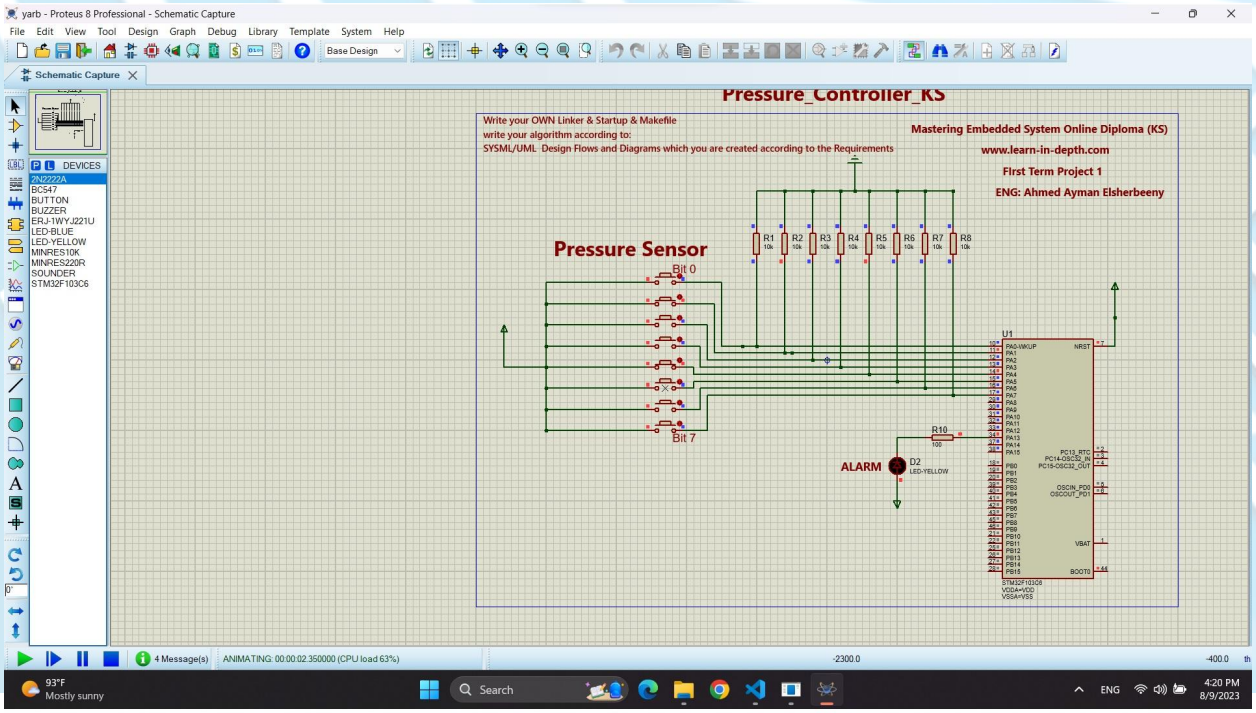
4.Main Alg Diagram:



Map File:

```
Allocating common symbols
Common symbol       size            file

Alarm_Monitor_State
                0x4             alarm_mointor.o
Alarm_Act_state_id  0x1             alarm_act.o
Pressure_Sensor_State
                0x4             pressure_sensor.o
Alarm_Act_State     0x4             alarm_act.o
Main_Alg_State      0x4             main_alg.o
Main_Alg_State_id   0x1             main.o
Alarm_Monitor_State_id
                0x1             alarm_mointor.o
Pressure_Sensor_State_id
                0x1             main.o

Memory Configuration

Name            Origin          Length          Attributes
flash           0x00000000      0x20000000      xr
sram            0x20000000      0x20000000      xrw
*default*       0x00000000      0xffffffff

Linker script and memory map


.text           0x00000000      0x490
 *(.vectors*)
 .vectors       0x00000000      0x10 startup.o
                0x00000000              g_p_fn_Vectors
 *(.text*)
 .text          0x00000010      0x70 alarm_act.o
                0x00000010              Alarm_ON
                0x0000002c              ALarm_OFF
                0x00000048              ST_Alarm_Act_OFF
                0x00000064              ST_Alarm_Act_ON
 .text          0x00000080      0xac alarm_mointor.o
                0x00000080              High_Pressure
                0x0000009c              ST_Alarm_Monitor_OFF
                0x000000c8              ST_Alarm_Monitor_Wait
                0x00000100              ST_Alarm_Monitor_ON
 .text          0x0000012c      0x10c driver.o
                0x0000012c              Delay
                0x00000150              getPressureVal
                0x00000168              Set_Alarm_actuator
                0x000001b8              GPIO_INITIALIZATION
 .text          0x00000238      0x90 main.o
                0x00000238              setup
                0x0000028c              main
 .text          0x000002c8      0xb4 main_alg.o
                0x000002c8              Set_Pressure
                0x00000310              ST_Main_Alg_High
                0x00000348              ST_Main_Alg_Not_High
 .text          0x0000037c      0x58 pressure_sensor.o
                0x0000037c              ST_Pressure_Sensor_Reading
                0x000003b0              ST_Pressure_Sensor_Waiting
 .text          0x000003d4      0xbc startup.o
                0x000003d4              H_Fault_Handler
                0x000003d4              Default_Handler
                0x000003d4              NMI_Handler
                0x000003e0              Reset_Handler
 *(.rodata)
                0x00000490              _E_text = .

.glue_7         0x00000490      0x0
 .glue_7        0x00000000      0x0 linker stubs

.glue_7t        0x00000490      0x0
 .glue_7t       0x00000000      0x0 linker stubs

.vfp11_veneer   0x00000490      0x0
 .vfp11_veneer  0x00000000      0x0 linker stubs

.v4_bx          0x00000490      0x0
 .v4_bx         0x00000000      0x0 linker stubs

.iplt           0x00000490      0x0
 .iplt          0x00000000      0x0 alarm_act.o
```

```
.rel.dyn        0x00000490        0x0
 .rel.iplt      0x00000000        0x0 alarm_act.o

.data           0x20000000        0xc load address 0x00000490
                0x20000000                _S_data = .
 *(.data)
 .data          0x20000000        0x0 alarm_act.o
 .data          0x20000000        0x4 alarm_mointor.o
                0x20000000                alarmtime
 .data          0x20000004        0x0 driver.o
 .data          0x20000004        0x0 main.o
 .data          0x20000004        0x4 main_alg.o
                0x20000004                Main_Threshold
 .data          0x20000008        0x4 pressure_sensor.o
                0x20000008                Pull_timer
 .data          0x2000000c        0x0 startup.o
                0x2000000c                . = ALIGN (0x4)
                0x2000000c                _E_data = .

.igot.plt       0x2000000c        0x0 load address 0x0000049c
 .igot.plt      0x00000000        0x0 alarm_act.o

.bss            0x2000000c      0x420 load address 0x0000049c
                0x2000000c                _S_bss = .
 *(.bss)
 .bss           0x2000000c        0x0 alarm_act.o
 .bss           0x2000000c        0x0 alarm_mointor.o
 .bss           0x2000000c        0x0 driver.o
 .bss           0x2000000c        0x0 main.o
 .bss           0x2000000c        0x4 main_alg.o
                0x2000000c                Main_Pval
 .bss           0x20000010        0x4 pressure_sensor.o
                0x20000010                Pval
 .bss           0x20000014      0x400 startup.o
                0x20000414                _E_bss = .
 COMMON         0x20000414        0x8 alarm_act.o
                0x20000414                Alarm_Act_state_id
                0x20000418                Alarm_Act_State
 COMMON         0x2000041c        0x5 alarm_mointor.o
                0x2000041c                Alarm_Monitor_State
                0x20000420                Alarm_Monitor_State_id
 COMMON         0x20000421        0x2 main.o
                0x20000421                Main_Alg_State_id
                0x20000422                Pressure_Sensor_State_id
 *fill*         0x20000423        0x1
 COMMON         0x20000424        0x4 main_alg.o
                0x20000424                Main_Alg_State
 COMMON         0x20000428        0x4 pressure_sensor.o
                0x20000428                Pressure_Sensor_State
LOAD alarm_act.o
LOAD alarm_mointor.o
LOAD driver.o
LOAD main.o
LOAD main_alg.o
LOAD pressure_sensor.o
LOAD startup.o
OUTPUT(First_Project.elf elf32-littlearm)

.debug_info     0x00000000      0x8f0
 .debug_info    0x00000000      0x114 alarm_act.o
 .debug_info    0x00000114      0x167 alarm_mointor.o
 .debug_info    0x0000027b      0x103 driver.o
 .debug_info    0x0000037e      0x1a7 main.o
 .debug_info    0x00000525      0x137 main_alg.o
 .debug_info    0x0000065c      0x103 pressure_sensor.o
 .debug_info    0x0000075f      0x191 startup.o

.debug_abbrev   0x00000000      0x498
 .debug_abbrev  0x00000000       0x92 alarm_act.o
 .debug_abbrev  0x00000092       0xbb alarm_mointor.o
 .debug_abbrev  0x0000014d       0x9d driver.o
 .debug_abbrev  0x000001ea       0xc4 main.o
 .debug_abbrev  0x000002ae       0xa5 main_alg.o
 .debug_abbrev  0x00000353       0x6e pressure_sensor.o
 .debug_abbrev  0x000003c1       0xd7 startup.o

.debug_loc      0x00000000      0x3cc
 .debug_loc     0x00000000       0xb0 alarm_act.o
 .debug_loc     0x000000b0       0xb0 alarm_mointor.o
 .debug_loc     0x00000160       0xc8 driver.o
```

```
 .debug_loc     0x00000228       0x58 main.o
 .debug_loc     0x00000280       0x90 main_alg.o
 .debug_loc     0x00000310       0x58 pressure_sensor.o
 .debug_loc     0x00000368       0x64 startup.o

.debug_aranges  0x00000000       0xe0
 .debug_aranges
                0x00000000       0x20 alarm_act.o
 .debug_aranges
                0x00000020       0x20 alarm_mointor.o
 .debug_aranges
                0x00000040       0x20 driver.o
 .debug_aranges
                0x00000060       0x20 main.o
 .debug_aranges
                0x00000080       0x20 main_alg.o
 .debug_aranges
                0x000000a0       0x20 pressure_sensor.o
 .debug_aranges
                0x000000c0       0x20 startup.o

.debug_line     0x00000000       0x318
 .debug_line    0x00000000       0x55 alarm_act.o
 .debug_line    0x00000055       0x70 alarm_mointor.o
 .debug_line    0x000000c5       0x9c driver.o
 .debug_line    0x00000161       0x9d main.o
 .debug_line    0x000001fe       0x55 main_alg.o
 .debug_line    0x00000253       0x5e pressure_sensor.o
 .debug_line    0x000002b1       0x67 startup.o

.debug_str      0x00000000       0x36e
 .debug_str     0x00000000       0xf5 alarm_act.o
                                 0x149 (size before relaxing)
 .debug_str     0x000000f5       0x92 alarm_mointor.o
                                 0x1cb (size before relaxing)
 .debug_str     0x00000187       0x55 driver.o
                                 0x120 (size before relaxing)
 .debug_str     0x000001dc       0x62 main.o
                                 0x21c (size before relaxing)
 .debug_str     0x0000023e       0x57 main_alg.o
                                 0x168 (size before relaxing)
 .debug_str     0x00000295       0x53 pressure_sensor.o
                                 0x182 (size before relaxing)
 .debug_str     0x000002e8       0x86 startup.o
                                 0x151 (size before relaxing)

.comment        0x00000000       0x11
 .comment       0x00000000       0x11 alarm_act.o
                                 0x12 (size before relaxing)
 .comment       0x00000000       0x12 alarm_mointor.o
 .comment       0x00000000       0x12 driver.o
 .comment       0x00000000       0x12 main.o
 .comment       0x00000000       0x12 main_alg.o
 .comment       0x00000000       0x12 pressure_sensor.o
 .comment       0x00000000       0x12 startup.o

.ARM.attributes
                0x00000000       0x33
 .ARM.attributes
                0x00000000       0x33 alarm_act.o
 .ARM.attributes
                0x00000033       0x33 alarm_mointor.o
 .ARM.attributes
                0x00000066       0x33 driver.o
 .ARM.attributes
                0x00000099       0x33 main.o
 .ARM.attributes
                0x000000cc       0x33 main_alg.o
 .ARM.attributes
                0x000000ff       0x33 pressure_sensor.o
 .ARM.attributes
                0x00000132       0x33 startup.o

.debug_frame    0x00000000       0x2ac
 .debug_frame   0x00000000       0x78 alarm_act.o
 .debug_frame   0x00000078       0x7c alarm_mointor.o
 .debug_frame   0x000000f4       0x78 driver.o
 .debug_frame   0x0000016c       0x48 main.o
 .debug_frame   0x000001b4       0x64 main_alg.o
 .debug_frame   0x00000218       0x48 pressure_sensor.o
 .debug_frame   0x00000260       0x4c startup.o
```

Proteus Simulation: