

Specification

- A pressure controller informs the crew of a cabin with an alarm when the pressure exceeds 20 bars in the cabin.
 - The alarm duration equals 60 seconds.
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System Architecting

1) Case Study(Assumptions)

- i) The controller set up and shutdown procedures are not modeled.
 - ii) The controller maintenance is not modeled.
 - iii) The pressure sensor never fails. The alarm never fails.
 - iv) The controller never faces power cut.
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2) Software Development Life Cycle : agile model.

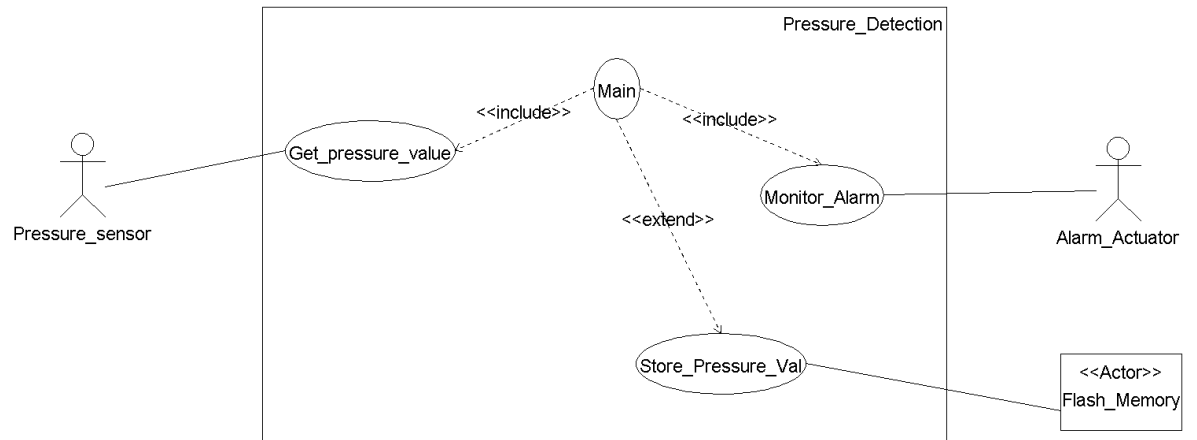
3) Requirement



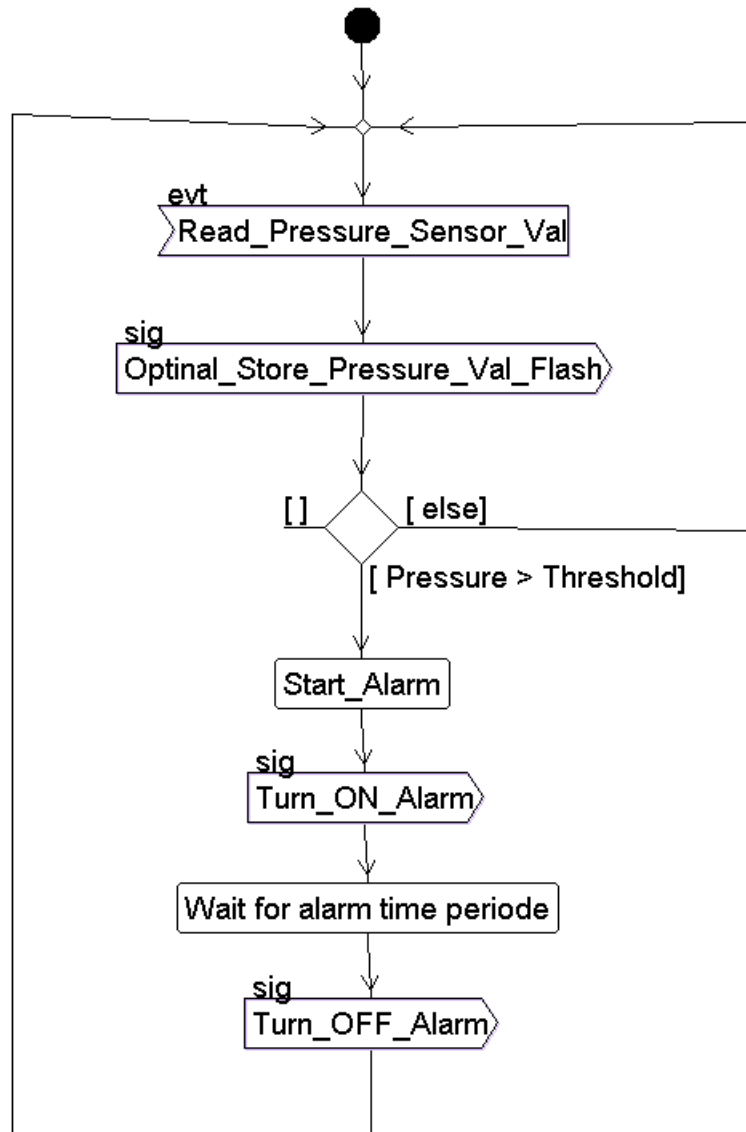
4) Space Exploration : Find an optimal solution

5) System Analysis

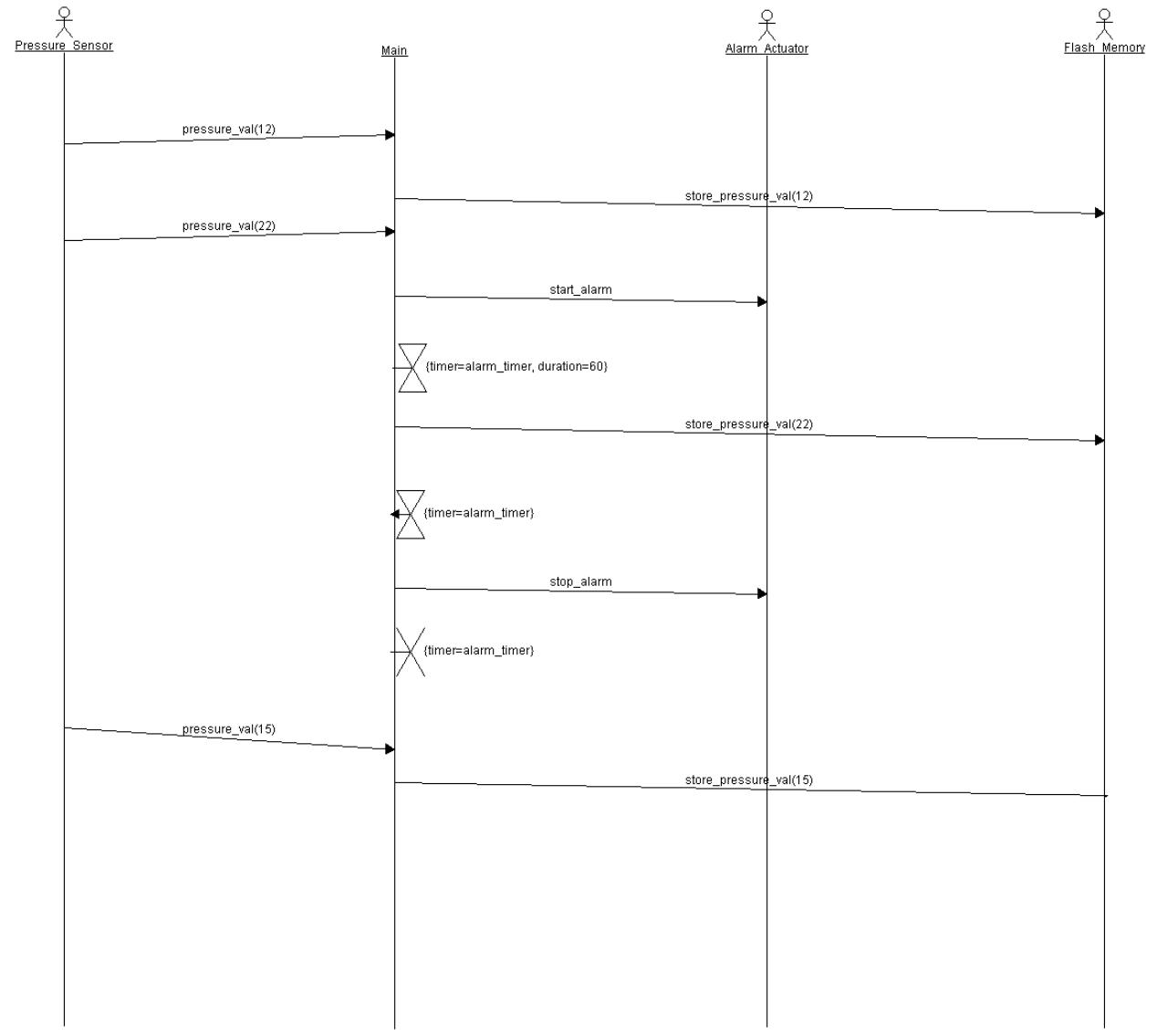
a) Use Case Diagram.



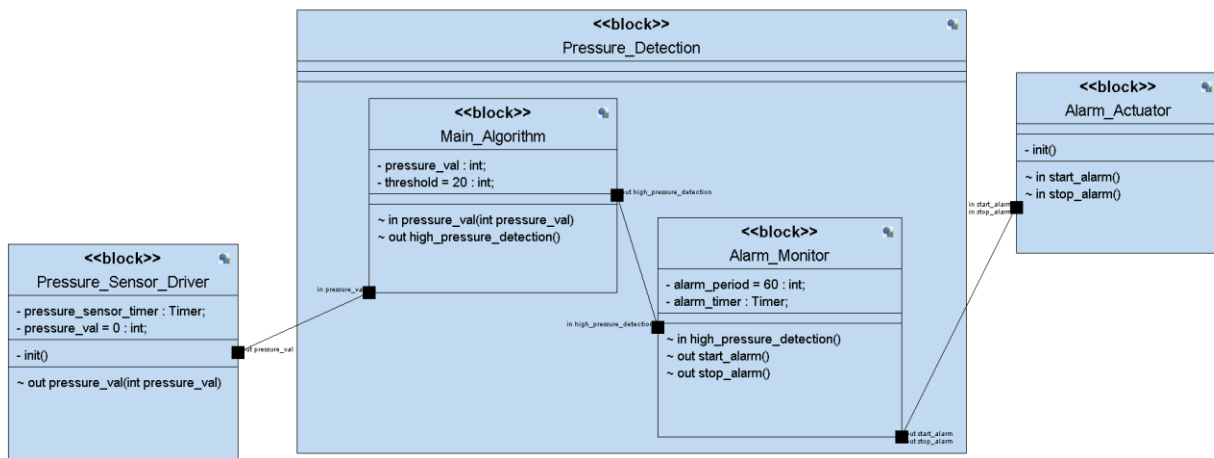
b)Activity Diagram.



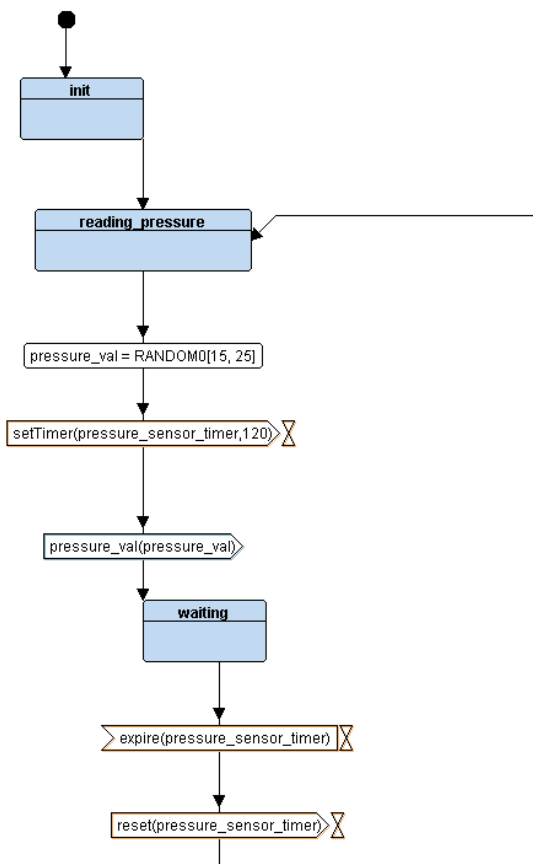
c) Sequence Diagram.



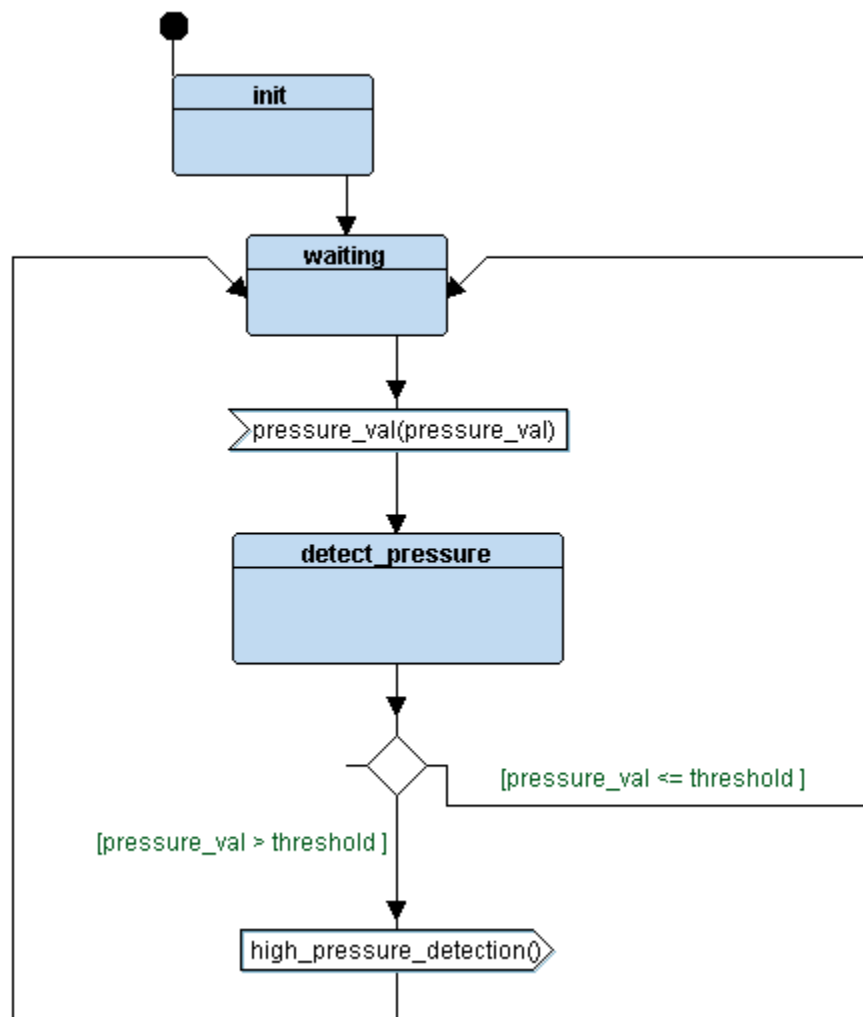
6) System Design



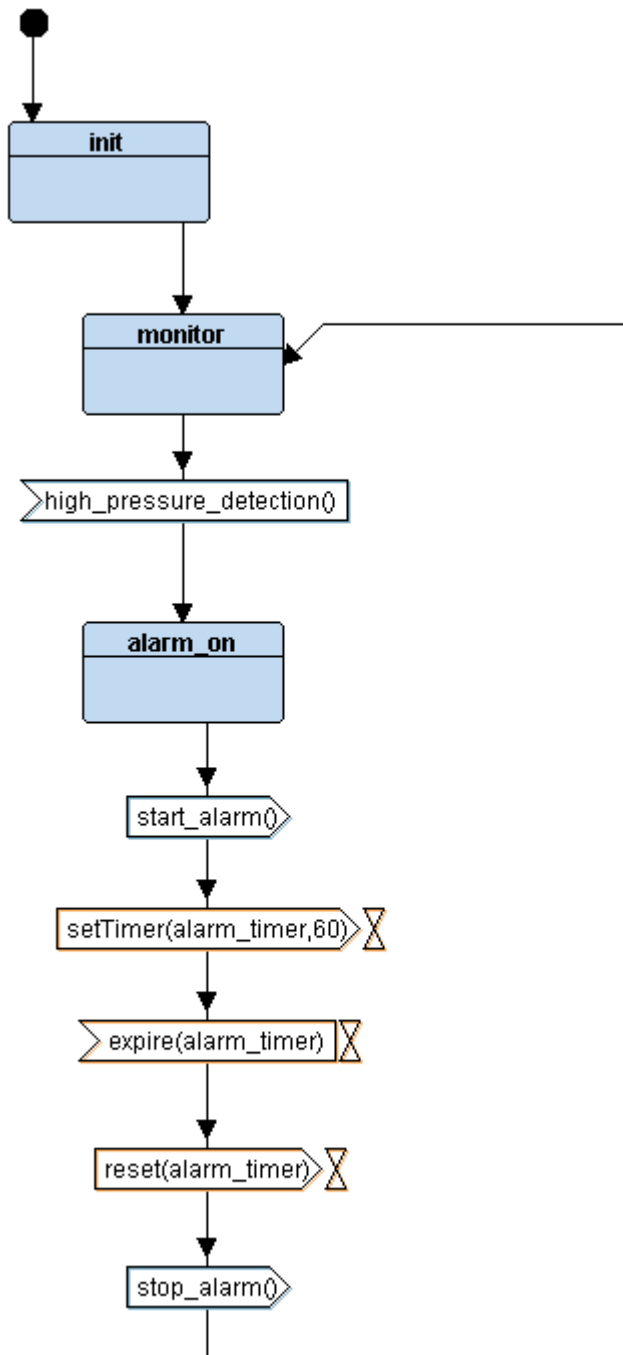
State Machines : pressure_sensor_deiver



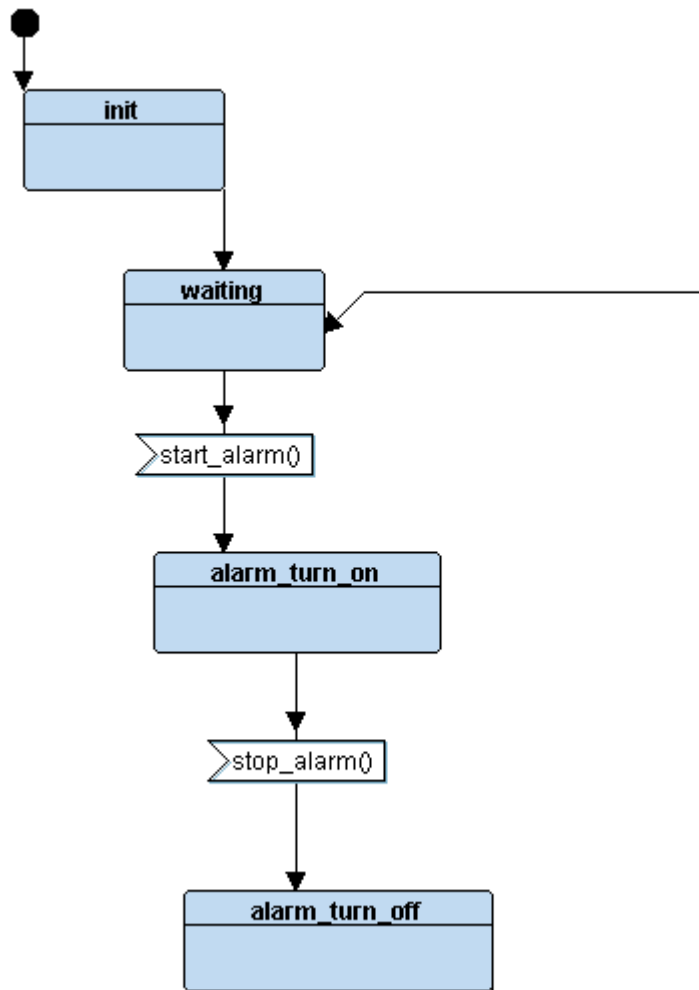
State Machines : main_algorithm



State Machines : alarm_monitor



State Machines : alarm_actuator



Makefile build

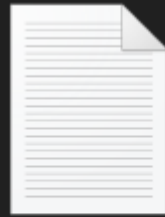
```
moham@DESKTOP-B0RM31F MINGW64 /d/ES - Keroles/Unit 5 first term/first project pressure/src
$ make
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . Alarm_Actuator_driver.c -o Alarm_Actuator_driver.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . Alarm_Monitor.c -o Alarm_Monitor.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . driver.c -o driver.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . main.c -o main.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . Main_Algorithm.c -o Main_Algorithm.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . Pressure_Sensor_Driver.c -o Pressure_Sensor_Driver.o
arm-none-eabi-gcc.exe -c -mthumb -mcpu=cortex-m3 -gdwarf-2 -g -I . startup.c -o startup.o
arm-none-eabi-ld.exe -T linker_script.ld Alarm_Actuator_driver.o Alarm_Monitor.o driver.o main.o Main_Algorithm.o Pressure_Sensor_Driver.o startup.o -o pressure_project.elf -Map=map_file.map
cp pressure_project.elf pressure_project.axf
arm-none-eabi-objcopy.exe -O binary pressure_project.elf pressure_project.bin
----> Build is Done <----
```

Makefile size

```
moham@DESKTOP-B0RM31F MINGW64 /d/ES - Keroles/Unit 5 first term/first project pressure/src
$ make size
arm-none-eabi-size.exe *.o *.elf |tee size.txt
  text    data     bss     dec      hex filename
   264         0         0    264    108 Alarm_Actuator_driver.o
   176         0         0    176     b0 Alarm_Monitor.o
   204         4         4    212     d4 Main_Algorithm.o
   160         0         0    160     a0 Pressure_Sensor_Driver.o
   268         0         0    268    10c driver.o
   148         0         0    148     94 main.o
   216         0         0    216     d8 startup.o
 1436         4    1056   2496    9c0 pressure_project.elf
```

Makefile symbols

```
moham@DESKTOP-B0RM31F MINGW64 /d/ES - Keroles/Unit 5 first term/first project pressure/Src  
$ make symbol  
arm-none-eabi-nm.exe *.o > All_Object_symbols.txt  
arm-none-eabi-nm.exe *.elf > executable.txt
```



executable.txt



All_Object_symbols.txt

First_Term_Project
Pressure Controlling System

```

2000000c B alarm_actuator_state_id
20000014 B alarm_monitor_state_id
080004e0 W Bus_Fault
080004e0 T Default_Handler
080001d4 T Delay
080001b8 T detect_high_pressure
20000008 B E_Bss
20000004 D E_Data
0800059c T E_Text
080000b8 T Fun_AA_alarm_turn_off
0800008c T Fun_AA_alarm_turn_on
0800001c T Fun_AA_init
08000060 T Fun_AA_waiting
0800017c T Fun_AM_alarm_on
08000124 T Fun_AM_init
08000150 T Fun_AM_monitor
080003cc T Fun_MA_detect
08000374 T Fun_MA_init
080003a0 T Fun_MA_waiting
08000440 T Fun_Ps_init
0800046c T Fun_Ps_reading
080004b4 T Fun_Ps_waiting
080001f8 T getPressureVal
08000260 T GPIO_INITIALIZATION
080004e0 W H_Fault_Handler
08000334 T main
20000016 B main_algorithm_state_id
080004e0 W MM_Fault_Handler
080004e0 W NMI_Handler
20000008 B pf_alarm_actuator
20000010 B pf_alarm_monitor
20000018 B pf_main_algorithm
20000020 B pf_Pressure_Sensor
20000004 B pressure_detect
20000015 B Pressure_Sensor_state_id
2000001c B pressure_val
080004ec T Reset
20000004 B S_Bss
20000000 D S_Data
08000000 T S_Text
08000210 T Set_Alarm_actuator
08000410 T set_pressure_val
080002e0 T setup
20000024 B stack_top
080000e4 T Start_Alarm
08000104 T Stop_Alarm
20000000 D threshold
080004e0 W Usage_Fault_Handler
08000000 T vector_arr

```

```

Alarm_Actuator_driver.o:
00000001 C alarm_actuator_state_id
0000009c T Fun_AA_alarm_turn_off
00000070 T Fun_AA_alarm_turn_on
00000000 T Fun_AA_init
00000044 T Fun_AA_waiting
00000004 C pf_alarm_actuator
          U Set_Alarm_actuator
000000c8 T Start_Alarm
000000e8 T Stop_Alarm

```

```

Alarm_Monitor.o:
00000001 C alarm_monitor_state_id
          U Delay
00000094 T detect_high_pressure
00000058 T Fun_AM_alarm_on
00000000 T Fun_AM_init
0000002c T Fun_AM_monitor
00000004 C pf_alarm_monitor
          U Start_Alarm
          U Stop_Alarm

```

```

Main_Algorithm.o:
          U detect_high_pressure
00000058 T Fun_MA_detect
00000000 T Fun_MA_init
0000002c T Fun_MA_waiting
00000001 C main_algorithm_state_id
00000004 C pf_main_algorithm
00000000 B pressure_detect
0000009c T set_pressure_val
00000000 D threshold

```

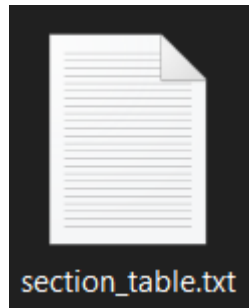
```

Pressure_Sensor_Driver.o:
00000000 T Fun_Ps_init
0000002c T Fun_Ps_reading
00000074 T Fun_Ps_waiting
          U getPressureVal
00000004 C pf_Pressure_Sensor
00000001 C Pressure_Sensor_state_id
00000004 C pressure_val
          U set_pressure_val

```

Makefile sections

```
moham@DESKTOP-B0RM31F MINGW64 /d/ES - Keroles/Unit 5 first term/first project pressure/Src
$ make section
arm-none-eabi-objdump -h *.o *.elf > section_table.txt
```



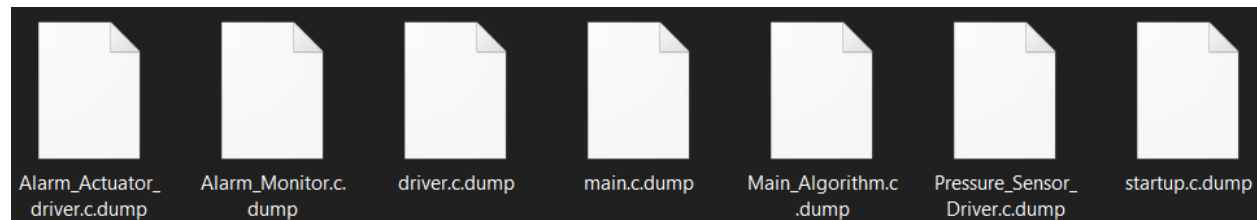
```
pressure_project.elf:      file format elf32-littlearm
```

Sections:

Idx	Name	Size	VMA	LMA	File off	Algn
0	.text	0000059c	08000000	08000000	00008000	2**2
	CONTENTS, ALLOC, LOAD, READONLY, CODE					
1	.data	00000004	20000000	0800059c	00010000	2**2
	CONTENTS, ALLOC, LOAD, DATA					
2	.bss	00000420	20000004	080005a0	00010004	2**2
	ALLOC					
3	.debug_info	00000888	00000000	00000000	00010004	2**0
	CONTENTS, READONLY, DEBUGGING					
4	.debug_abbrev	00000495	00000000	00000000	0001088c	2**0
	CONTENTS, READONLY, DEBUGGING					
5	.debug_loc	0000047c	00000000	00000000	00010d21	2**0
	CONTENTS, READONLY, DEBUGGING					
6	.debug_aranges	000000e0	00000000	00000000	0001119d	2**0
	CONTENTS, READONLY, DEBUGGING					
7	.debug_line	000003f4	00000000	00000000	0001127d	2**0
	CONTENTS, READONLY, DEBUGGING					
8	.debug_str	0000038a	00000000	00000000	00011671	2**0
	CONTENTS, READONLY, DEBUGGING					
9	.comment	00000011	00000000	00000000	000119fb	2**0
	CONTENTS, READONLY					
10	.ARM.attributes	00000033	00000000	00000000	00011a0c	2**0
	CONTENTS, READONLY					
11	.debug_frame	000002f8	00000000	00000000	00011a40	2**2
	CONTENTS, READONLY, DEBUGGING					

Makefile check misra c

```
moham@DESKTOP-B0RM31F MINGW64 /d/ES - Keroles/Unit 5 first term/first project pressure/Src
$ make misra
cppcheck --dump Alarm_Actuator_driver.c Alarm_Monitor.c driver.c main.c Main_Algorithm.c Pressure_Sensor_Driver
.c startup.c
Checking Alarm_Actuator_driver.c ...
1/7 files checked 16% done
Checking Alarm_Monitor.c ...
2/7 files checked 29% done
Checking Main_Algorithm.c ...
3/7 files checked 44% done
Checking Pressure_Sensor_Driver.c ...
4/7 files checked 58% done
Checking driver.c ...
5/7 files checked 67% done
Checking main.c ...
6/7 files checked 77% done
Checking startup.c ...
7/7 files checked 100% done
python "C:\Program Files\Cppcheck\addons\misra.py" Alarm_Actuator_driver.c.dump Alarm_Monitor.c.dump driver.c.d
ump main.c.dump Main_Algorithm.c.dump Pressure_Sensor_Driver.c.dump startup.c.dump
Checking Alarm_Actuator_driver.c.dump...
Checking Alarm_Actuator_driver.c.dump, config ...
```



MISRA rules violations found:
Undefined: 38

MISRA rules violated:

- misra-c2012-7.2 (-): 2
- misra-c2012-10.1 (-): 4
- misra-c2012-10.4 (-): 2
- misra-c2012-11.4 (-): 13
- misra-c2012-13.3 (-): 2
- misra-c2012-15.6 (-): 2
- misra-c2012-15.7 (-): 1
- misra-c2012-17.7 (-): 1
- misra-c2012-17.8 (-): 1
- misra-c2012-18.4 (-): 1
- misra-c2012-20.7 (-): 3
- misra-c2012-20.10 (-): 2
- misra-c2012-21.1 (-): 4

Map file

Allocating common symbols

Common symbol	size	file
pressure_val	0x4	Pressure_Sensor_Driver.o
pf_main_algorithm	0x4	Main_Algorithm.o
Pressure_Sensor_state_id	0x1	main.o
pf_alarm_monitor	0x4	Alarm_Monitor.o
main_algorithm_state_id	0x1	main.o
pf_Pressure_Sensor	0x4	Pressure_Sensor_Driver.o
pf_alarm_actuator	0x4	Alarm_Actuator_driver.o
alarm_actuator_state_id	0x1	Alarm_Actuator_driver.o
stack_top	0x400	startup.o
alarm_monitor_state_id	0x1	Alarm_Monitor.o

Memory Configuration

Name	Origin	Length	Attributes
Flash	0x08000000	0x00020000	xr
SRam	0x20000000	0x00005000	xrw
default	0x00000000	0xffffffff	

First_Term_Project

Pressure Controlling System

Write your OWN Linker & Startup & Makefile

write your algorithm according to:

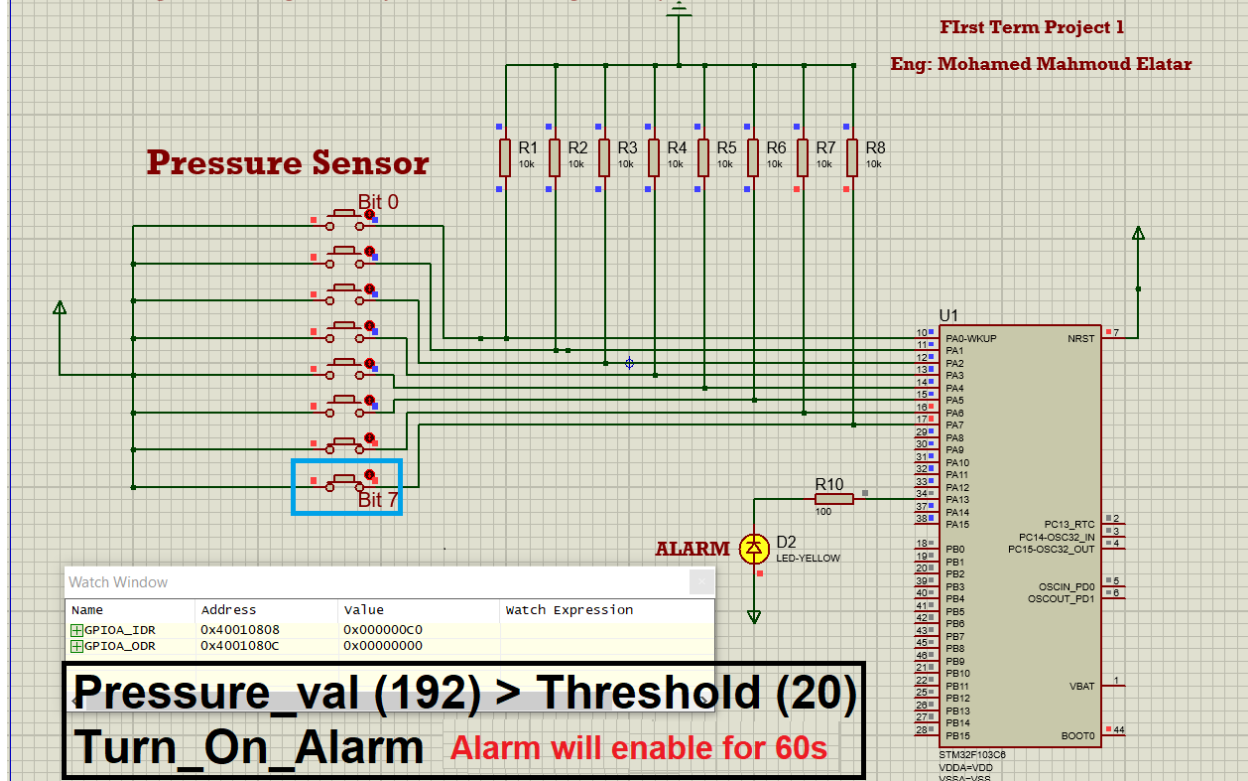
SYSML/UML Design Flows and Diagrams which you are created according to the Requirements

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First Term Project 1

Eng: Mohamed Mahmoud Elatar



First_Term_Project

Pressure Controlling System

Write your OWN Linker & Startup & Makefile

write your algorithm according to:

SYSML/UML Design Flows and Diagrams which you are created according to the Requirements

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Eng: Mohamed Mahmoud Elatar

