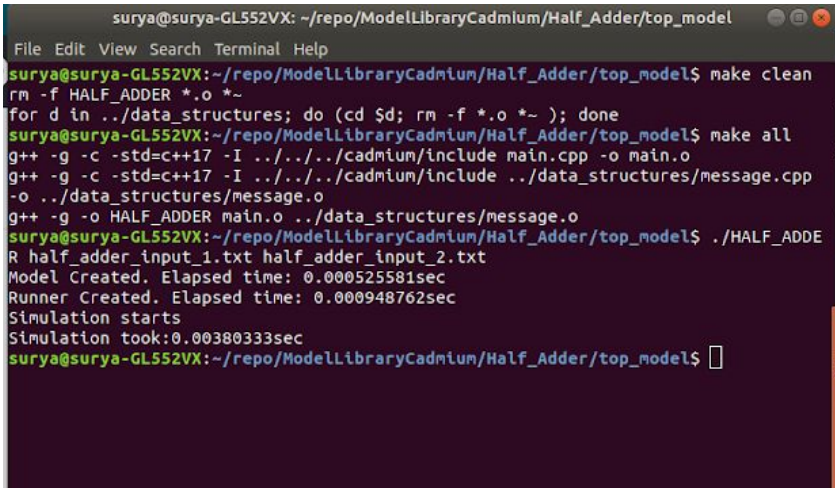
Cadmium project(HALF ADDER)
We made a sample Cadmium Half Adder project with 2 atomic models, XOR and AND that takes in 2 inputs and gives the output as the respective function. The 2 input half adder model was obtained by coupling the 2 atomic models in the top model.

PROJECT LINK: https://github.com/ksuryakrishna/arslab/tree/master/Half_Adder

Simulation of half adder model -



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ECadmium Project(MODEL HOUSE CONTROLLER)
We recreated a model house controller using ECadmium.

PROJECT LINK: https://github.com/ksuryakrishna/arslab/tree/master/TRIAL_SHIELD

Video Link - Working of Model House Controller -
https://drive.google.com/file/d/1--W-BWTmpQkzwTDH4mPcb4_1UJr1nO4h/view?usp=sharing

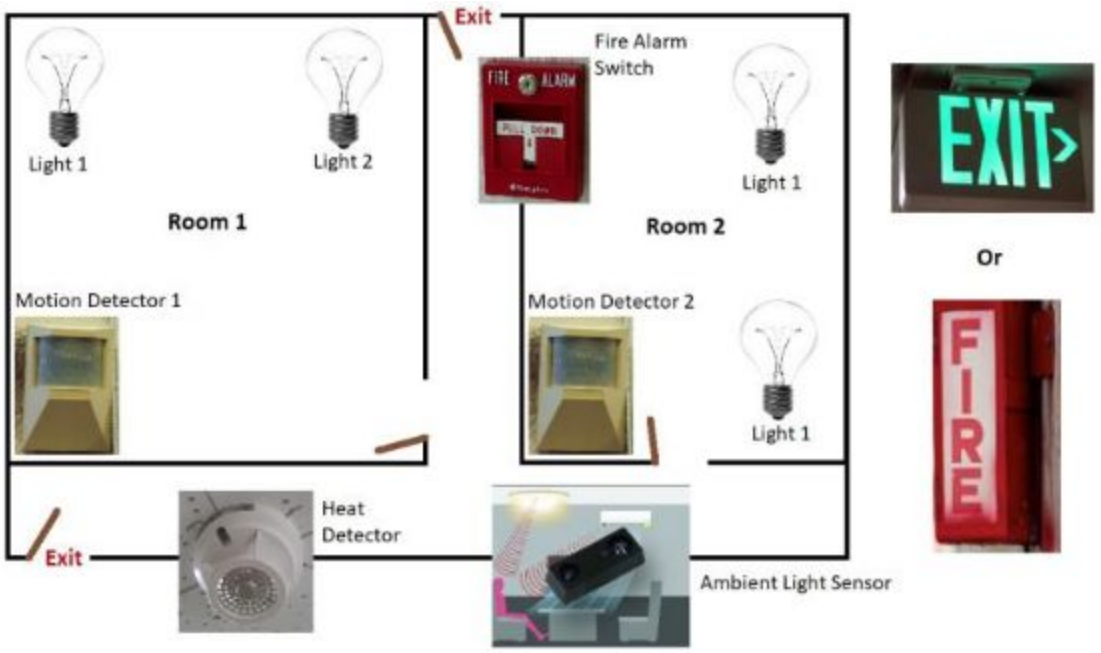
The model had the following sensors -
1. IR Sensors
2. Temperature Sensor (implemented using a potentiometer)
3. Light Sensor
4. Fire Alarm Switch

LEDs used -
4 White LEDs
2 Red LEDs

2 Green LEDs

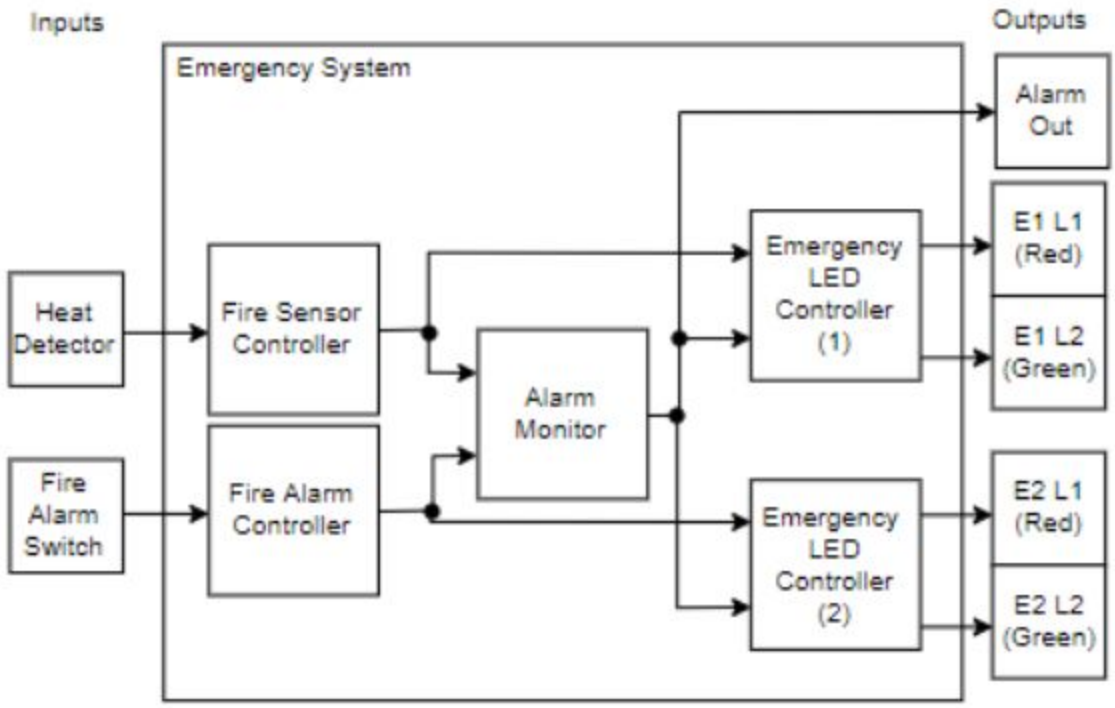
The working is as follows-

There are 2 rooms in the house as shown. There are 2 LEDS that represents the situation in each room. There are 2 pairs of Red and Green LEDs denoting whether the Fire Alarm switch is ON or OFF and Temperature inside house is high or not.



EMERGENCY SYSTEM -
Sensors Used - Fire Alarm Switch and Temperature Sensor (Input)
LEDs Controlled - 2 pairs of Red and Green , one set for each sensor (Output)

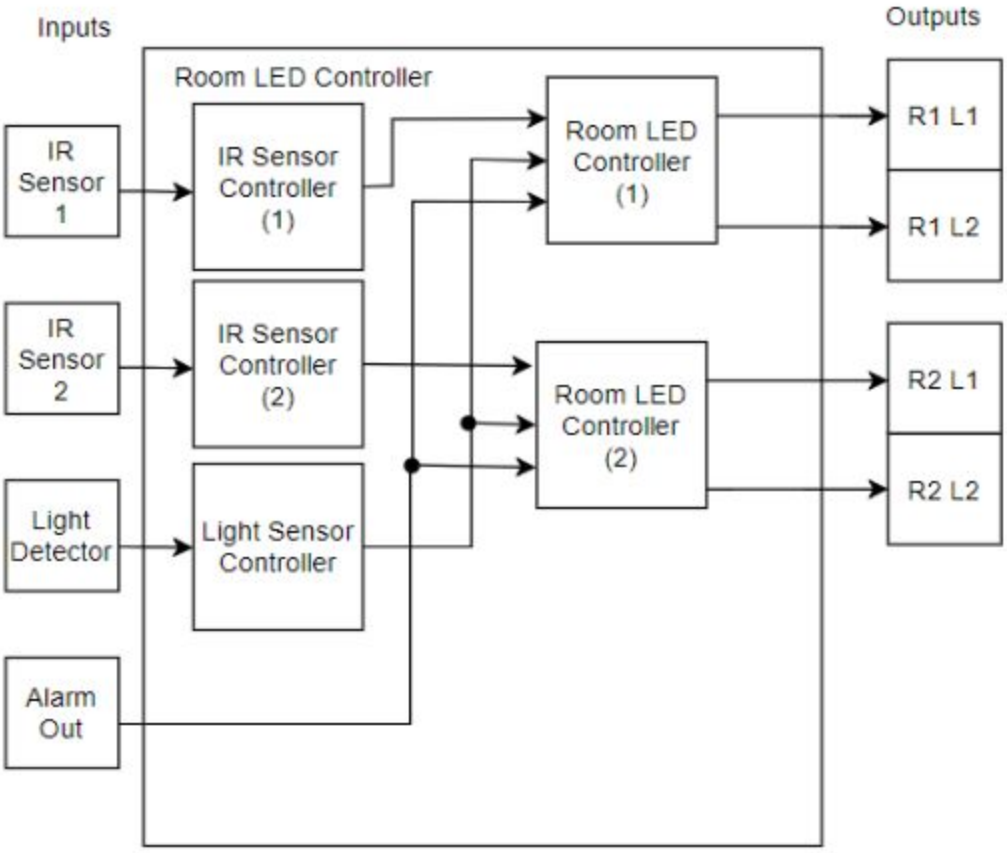
This system works based on the data received from sensors. If the Temperature sensor reads a value that's greater than a threshold and the fire alarm switch is turned OFF then the Red LED corresponding to Temperature Sensor turns ON (Green turns OFF) and the Green LED corresponding to the Fire Alarm Switch turns ON (Red turns OFF). Similarly, if the Fire Alarm Switch is turned ON and Temperature Sensor reads a safe room temperature, the Red LED corresponding to Fire Alarm Switch turns ON (Green turns OFF) and the Green LED corresponding to Temperature Sensor turns ON (Red turns OFF). In both these cases, an Alarm is sounded to denote that the people have to move out. If both the Temperature sensor and Fire Alarm Switch gives a safe reading, both pairs of Red and Green LEDs are turned OFF and alarm is not sounded.



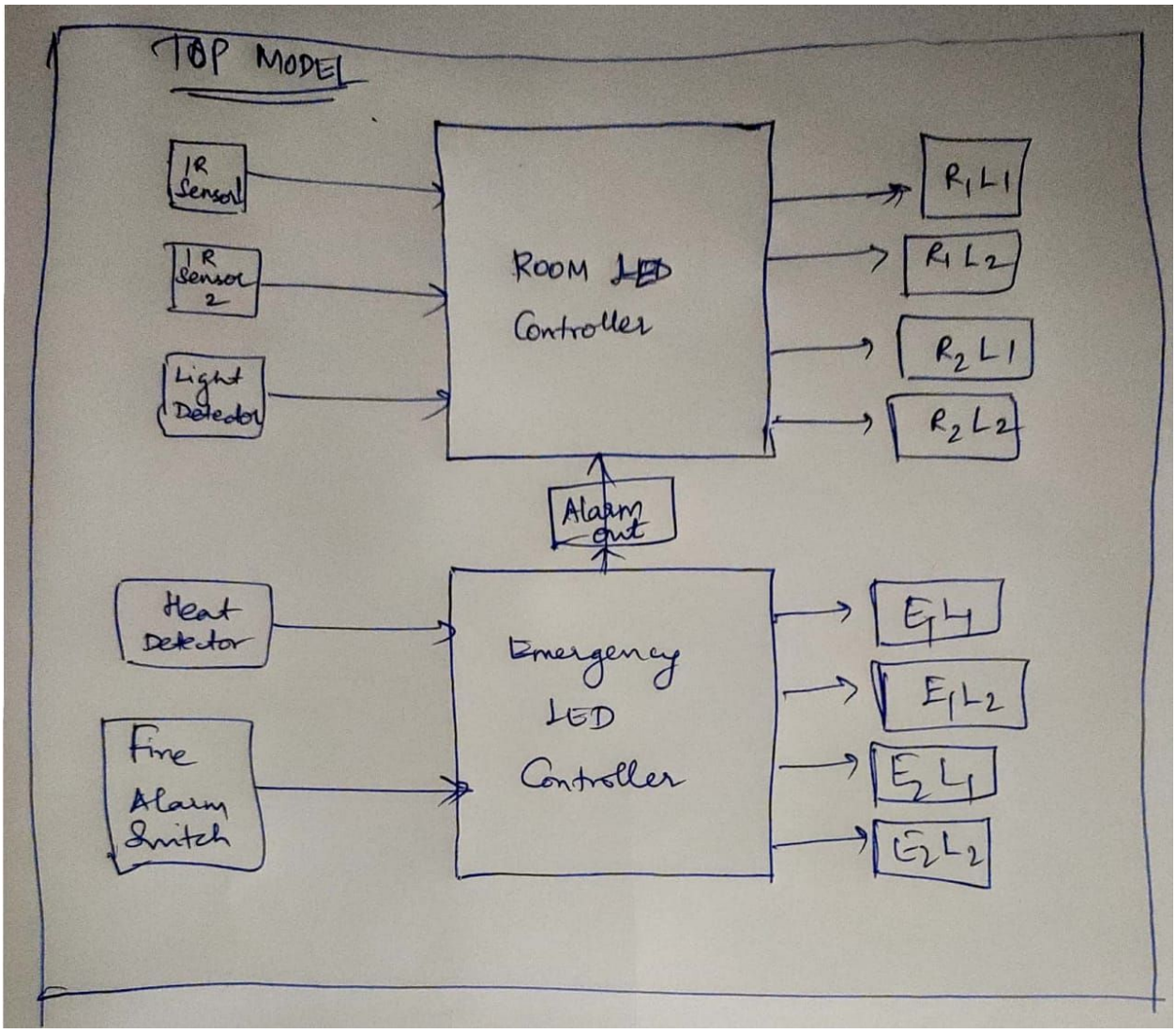
ROOM LED CONTROLLER -

Sensors uses - 2 IR sensors (one for each room), light sensor
LEDs controlled - 4 White LEDs (2 per room)

The IR sensor finds out if the room is occupied or not. The Light Sensor tells us if the light inside the house is enough or not. If a room is occupied and there is enough light inside the home, only one of the 2 LEDs corresponding to that room is turned ON. If there isn't enough light in this case both the LEDs corresponding to that room is turned ON. If the room is not occupied, both LEDs are turned OFF. All these occur if the Alarm is not sounded. If the Alarm is ON, all 4 LEDs are turned ON denoting immediate evacuation irrespective of sensor input.

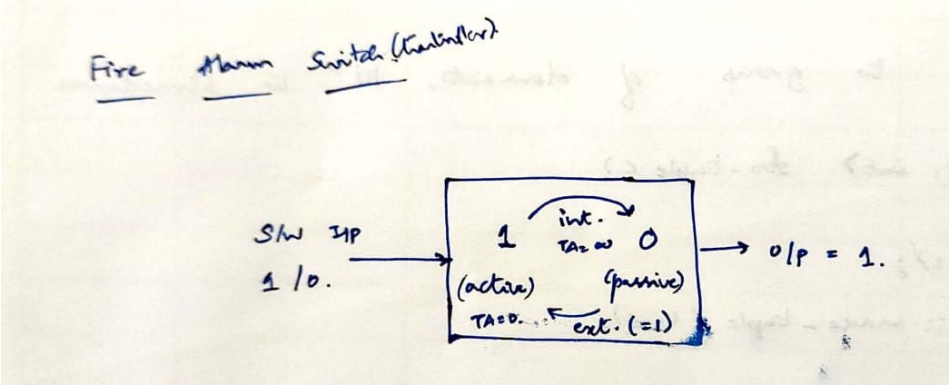

Inputs
Outputs
Room LED Controller
IR Sensor 1
IR Sensor 2
Light Detector
Alarm Out
IR Sensor Controller (1)
IR Sensor Controller (2)
Light Sensor Controller
Room LED Controller (1)
Room LED Controller (2)
R1 L1
R1 L2
R2 L1
R2 L2

Both these subsystems are combined to form the top model that represents a house.

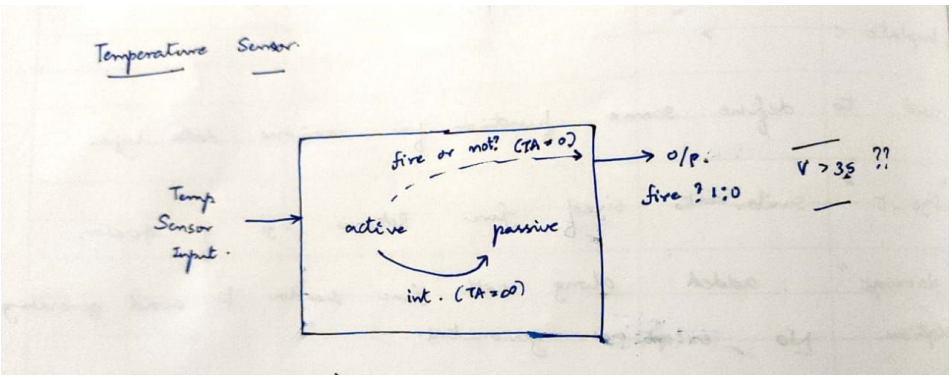


There were 7 atomic models required to build this model. Snippets of the model are provided below.

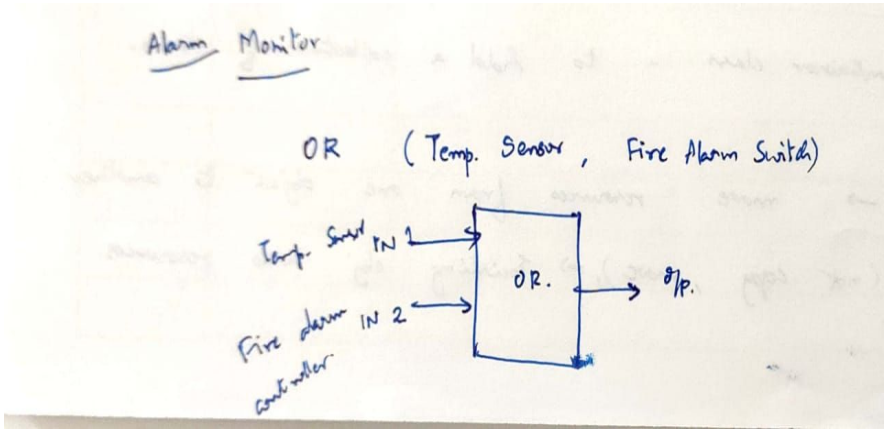
Fire Alarm Switch



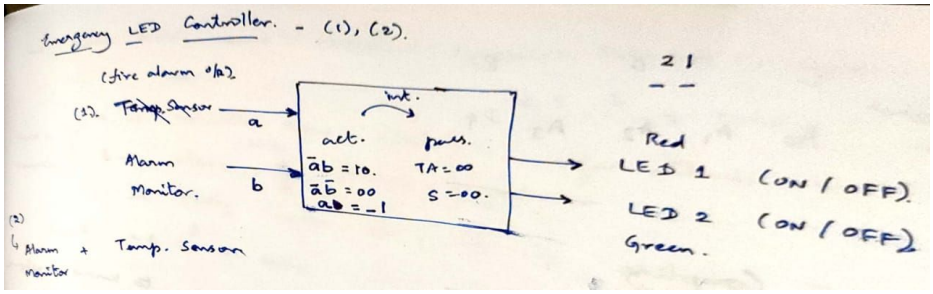
Temperature Sensor



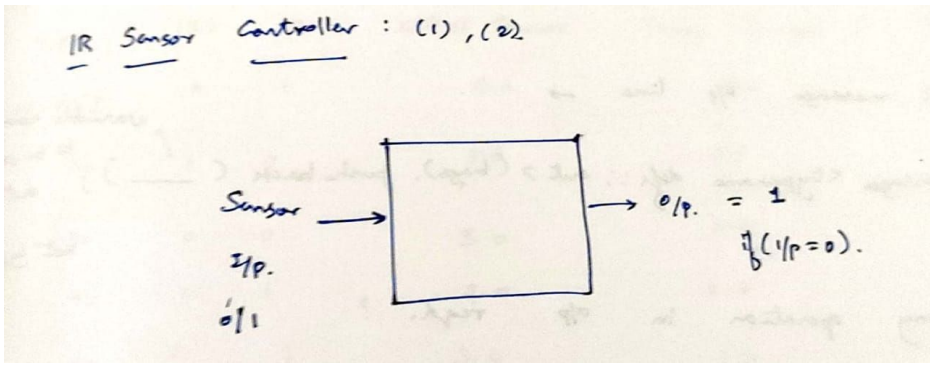
Alarm monitor



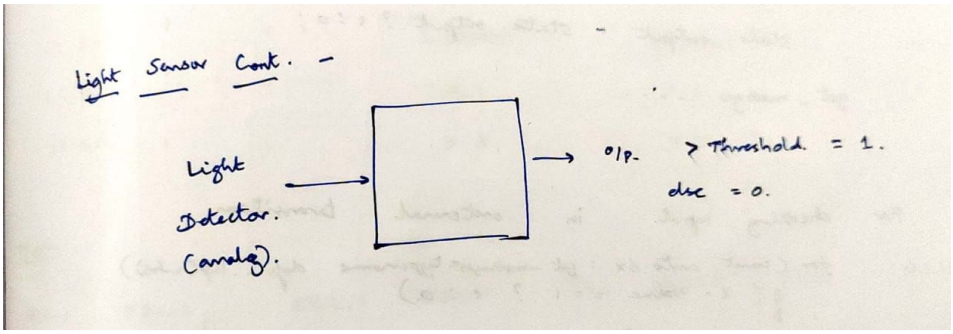
Emergency LED controller



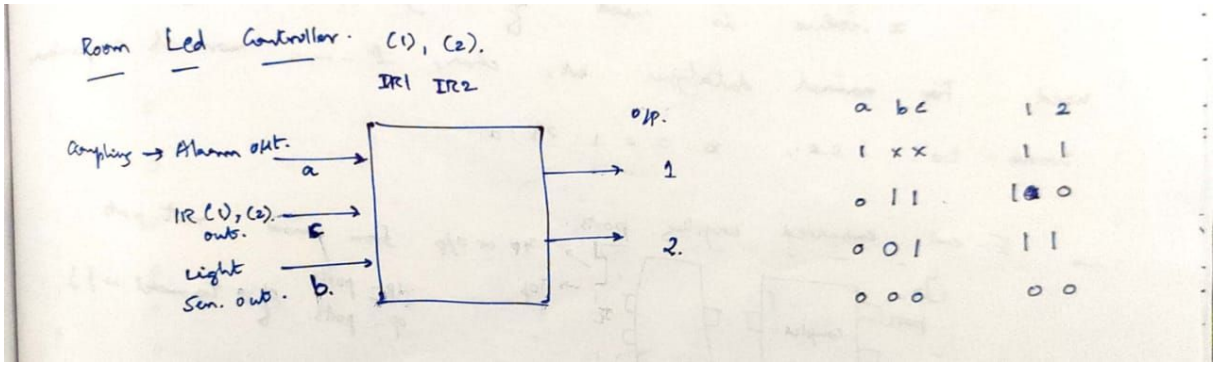
IR Sensor controller



Light Sensor

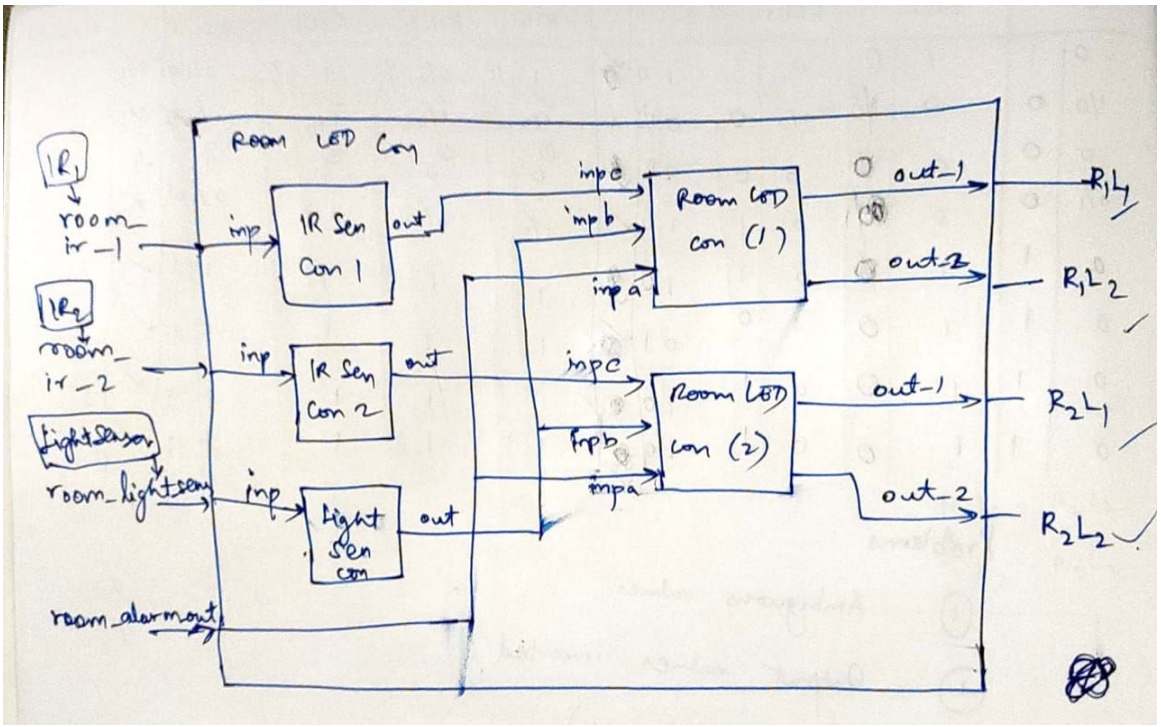


Room LED controller

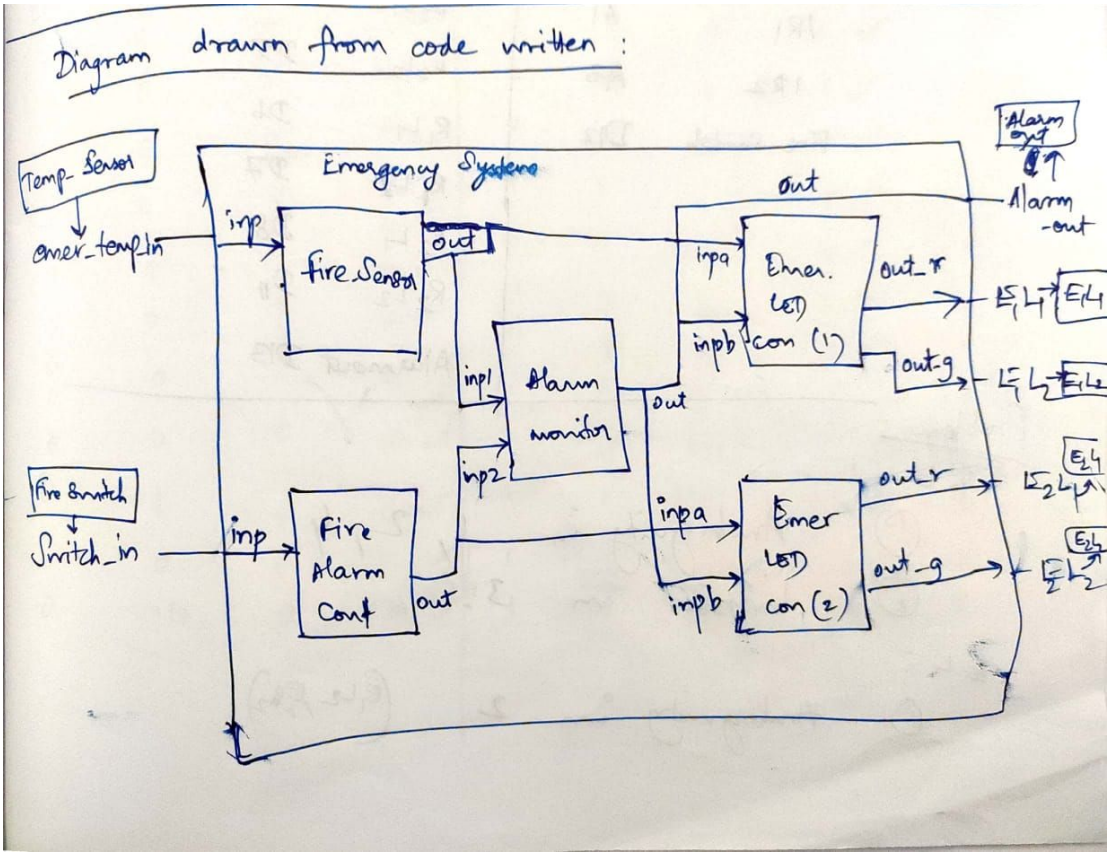


All these 7 models were coupled to form the house model.

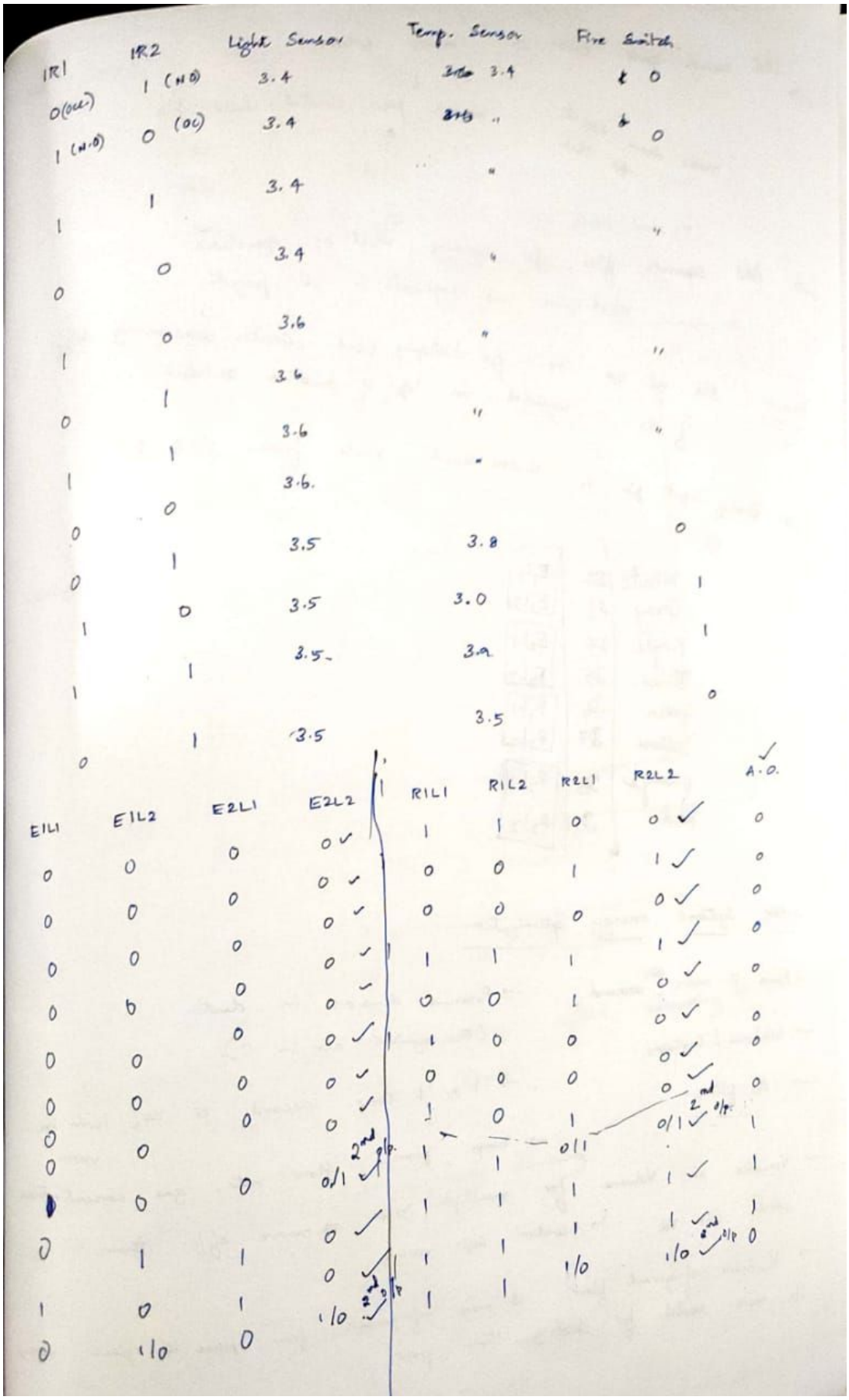
Room LED Controller with control variables used in atomic models:



Emergency System with control variables used in atomic models:

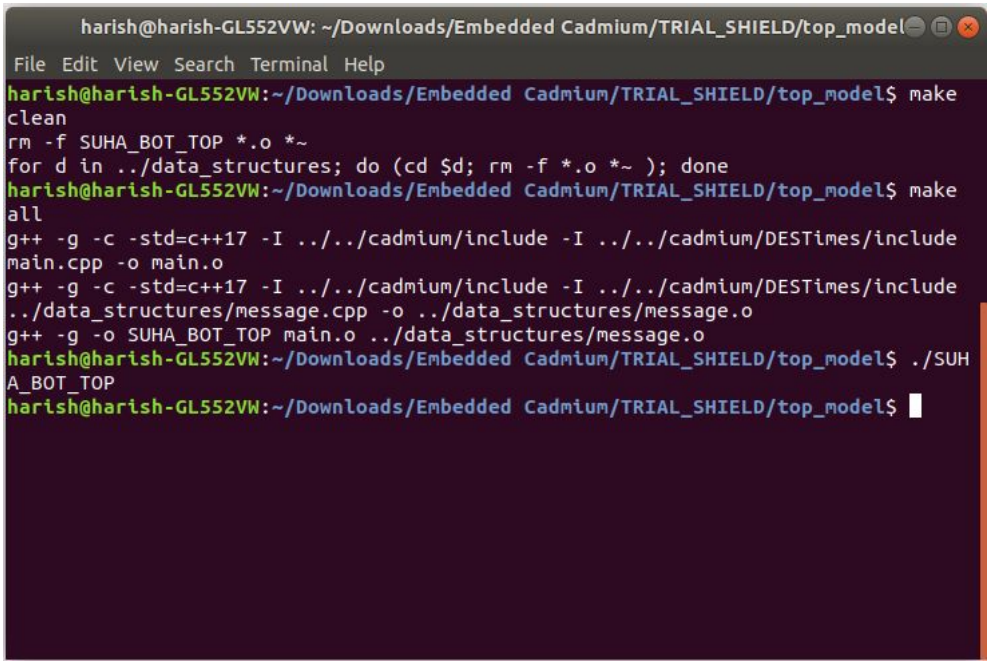


SAMPLE INPUTS AND OUTPUTS :

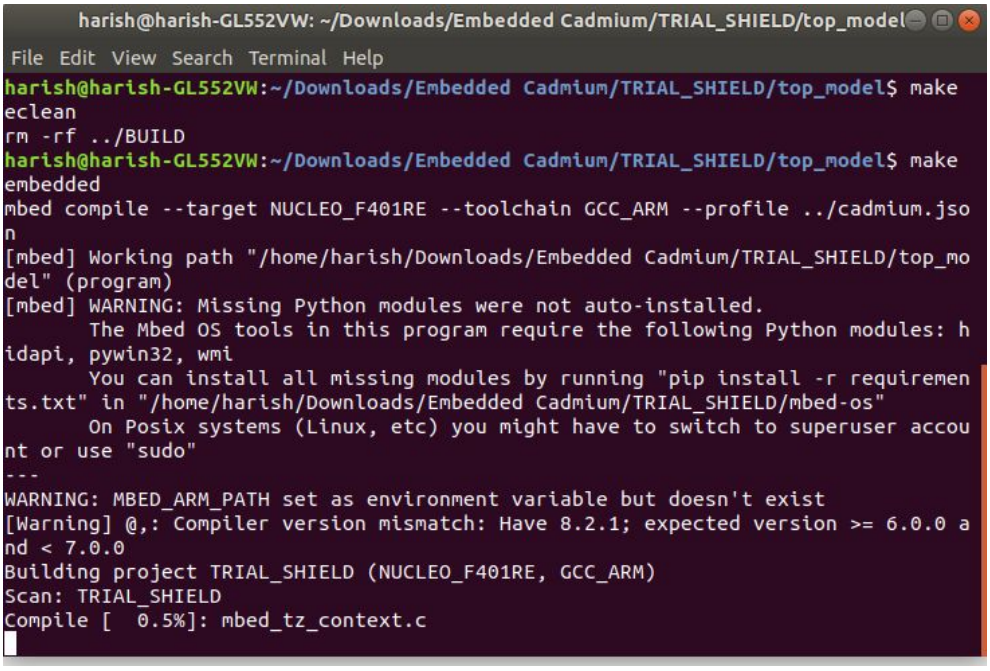


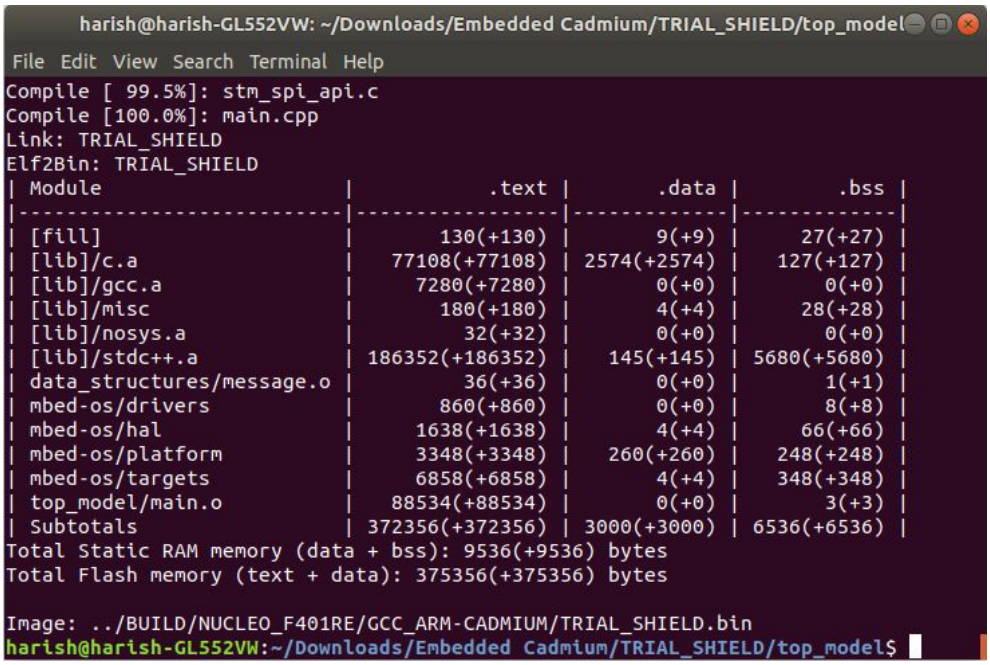
Running the Model House Controller

Simulation -



Running Real Time-




harish@harish-GL552VW: ~/Downloads/Embedded Cadmium/TRIAL_SHIELD/top_model
File Edit View Search Terminal Help
Compile [99.5%]: stm_spi_api.c
Compile [100.0%]: main.cpp
Link: TRIAL_SHIELD
Elf2Bin: TRIAL_SHIELD
Module	.text	.data	.bss
[fill]	130(+130)	9(+9)	27(+27)
[lib]/c.a	77108(+77108)	2574(+2574)	127(+127)
[lib]/gcc.a	7280(+7280)	0(+0)	0(+0)
[lib]/misc	180(+180)	4(+4)	28(+28)
[lib]/nosys.a	32(+32)	0(+0)	0(+0)
[lib]/stdc++.a	186352(+186352)	145(+145)	5680(+5680)
data_structures/message.o	36(+36)	0(+0)	1(+1)
mbed-os/drivers	860(+860)	0(+0)	8(+8)
mbed-os/hal	1638(+1638)	4(+4)	66(+66)
mbed-os/platform	3348(+3348)	260(+260)	248(+248)
mbed-os/targets	6858(+6858)	4(+4)	348(+348)
top_model/main.o	88534(+88534)	0(+0)	3(+3)
Subtotals	372356(+372356)	3000(+3000)	6536(+6536)
Total Static RAM memory (data + bss): 9536(+9536) bytes
Total Flash memory (text + data): 375356(+375356) bytes
Image: ../BUILD/NUCLEO_F401RE/GCC_ARM-CADMIUM/TRIAL_SHIELD.bin
harish@harish-GL552VW:~/Downloads/Embedded Cadmium/TRIAL_SHIELD/top_model$