# CS684: Embedded Systems
# Spring 2020
# Assignment 1 - Finite State Machine (FSM) Design

Aaron John Sabu: 170070050

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## 1 Problem Statement

Draw the FSM diagrams for the 2 cases described below:

1. Considering the building with 3 floors, draw a simple FSM diagram of the elevator (lift). Also add the functionality of safe opening and closing of the doors (in addition to the basic functionalities of lift as explained in the class).

2. Adding one more floor and another elevator to this building, draw the FSM diagram and state how these elevators coordinate together in both basic functionality and safe open/close door functionality.

## 2 Solution

Given in the subsequent pages is my approach to the problem.

## 2.1 Part 1

This FSM deals with a single lift of three floors.
RG represents a request from the Ground floor, R1 from the first and R2 from the second. O[2:0] represents the state of any door being open for the lifts.

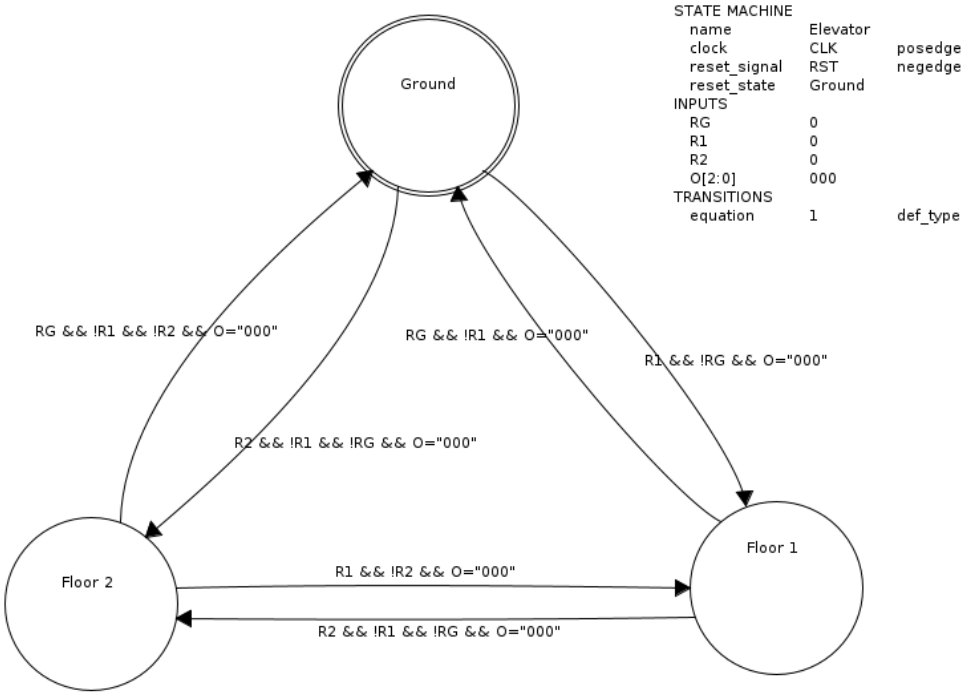


Figure 1: Problem 1 - FSM

The cycle of the lift is as expected, moving from Ground to Floor 1 or vice versa when requested to, and so on for the other two floor permutations. However, the lift is permitted to be move only when all doors are closed. This is represented by O=”000”.
Higher priority at floor 1 is given to the ground floor rather than the second floor. This is because there is always a possibility of there being more users at the ground floor than the second floor. This decision is up to the embedded system programmer based on the demand of the customer.

## 2.2 Part 2

In the following diagram, R1[2:0] represents a request from inside the first lift in the order, [Ground Floor_1 Floor_2]. A request from outside can also be considered with equal results as a request from inside for simplicity.
O1 and O2 are supposed to represent the state of being open for the two lifts. However, their implementation in the FSM has not been shown in order to prevent an extremely complex and incoherent FSM.

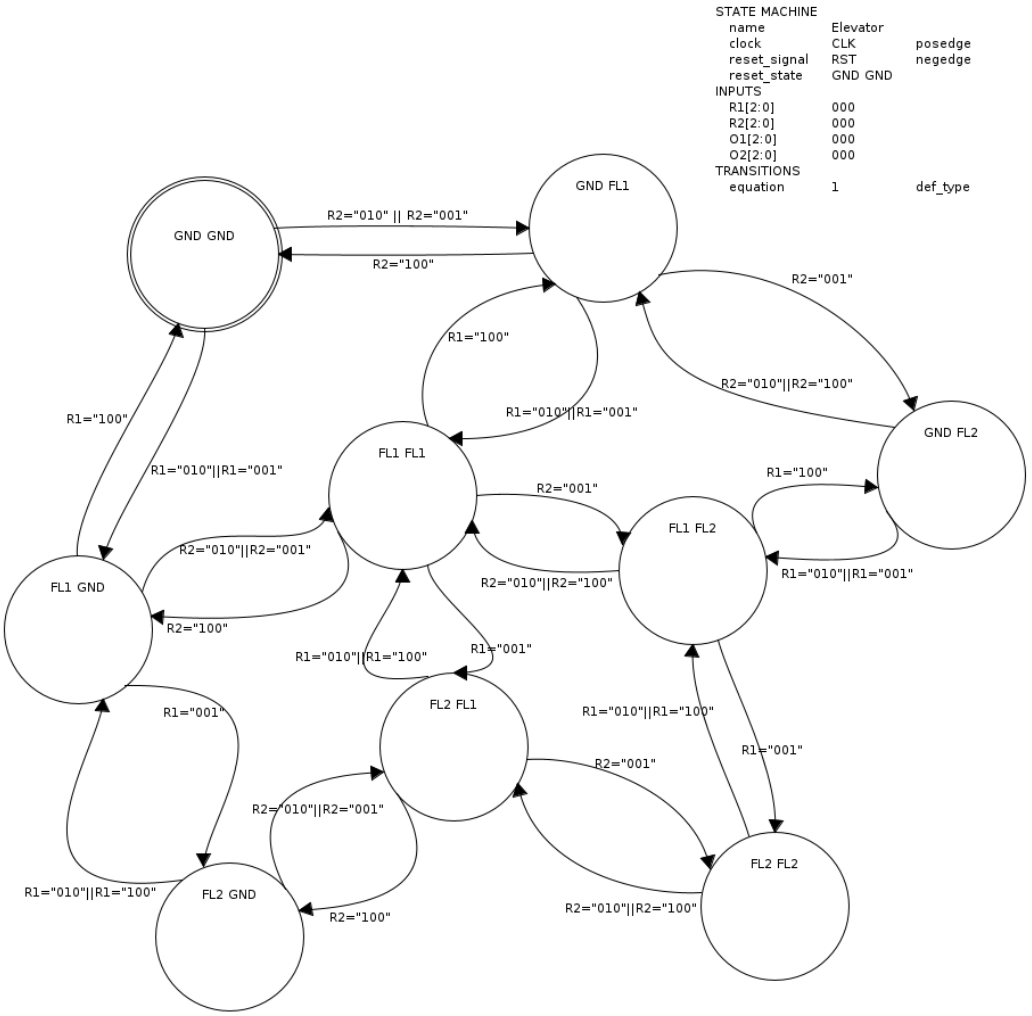


Figure 2: Problem 2 - FSM

This FSM deals with two adjacent lift of three floors; i.e. their motion is determined in tandem by the same controller. As a result, they require that the same floor should not be covered by both floors.
This condition is dependent on whether the request is from the user on the floor or the user on the lift. For the user on the floor, the condition applies. However, the user on the lift can move wherever he wishes to go.
The two types of request have been combined as one in this FSM. However, in an actual controller, they are supposed to be separated and the lift-user request is supposed to be given higher priority.

# 3 Shortcomings and Future Prospects

- I was unable to come up with an FSM for two lifts with an extra floor each since the number of states would have been 16 in that case, hence making the FSM absolutely incomprehensible.

- For the second FSM, I have not shown the implementation of the open-state inputs. This is again due to the already existing complexity of the FSM. This can be easily incorporated in the case of a statechart.