

# Elevator control

## Project 5, ESDM

### Short description

1. Create and test Simulink model with a state machine implementing the logic behind an elevator control module (only the motor control, not the full input buttons logic).
2. Write a small report on the project:
  - a. briefly describe the overall design you chose (states, transitions etc).
  - b. put screenshots from the tests, to prove the tests work



Figure 1: Elevator control module

### Requirements

1. The elevator control module has the following functionality:

1. Controls the elevator motor
  2. Open / close the door
2. The Simulink model has the following inputs and outputs:

Inputs:

- CurrentHeight: (number, 0 to 20 meters): current height of the elevator with respect to the ground
  - there are 5 floors:
    - \* floor 0: at height 0 meters
    - \* floor 1: at height 5 meters
    - \* floor 2: at height 10 meters
    - \* floor 3: at height 15 meters
    - \* floor 4: at height 20 meters
- EmergencyStop button (boolean): when TRUE, stop all movement
- TargetFloor: target floor to go to (based on the input buttons, analyzed elsewhere)
- OpenDoors button: the <|> button from the cabin. When TRUE, the doors must be opened.

Outputs:

- Motor: control the motor (simplified version)
  - 0 = Motor stopped
  - 1 = Motor moves elevator upwards
  - 2 = Motor moves elevator downwards
- Machine Status (integer):
  - 0 = IDLE
  - 1 = GOING\_UP
  - 2 = GOING\_DOWN
  - 3 = EMERGENCY
  - 4 = MOTOR\_ERROR

3. The elevator works as follows:

- The elevator is initially at the ground floor.
- The user wants to go to some floor. The input TargetFloor becomes the desired floor.
- Whenever the input TargetFloor becomes different from the current height, the machine shall command the motor to move towards the target floor, as follows:
  - wait for 1 seconds

- activate the elevator motor in the correct direction (up or down)
  - wait for the current height to reach the correct value of the target floor
  - when correct height is reached, stop the motor
  - during all this time the Status output shall be set to GOING\_UP or GOING\_DOWN
- 4. The EmergencyStop button stops the motor instantly. The output status shall be set to EMERGENCY
- 5. The EmergencyStop shall be debounced in both directions, with a duration of 0.1 seconds.
- 6. Fault control:
  - if the motor is active and the height does not change with at least 1 meter in the first 4 seconds of movement, there is a motor error. Cancel the operation and set the Status output to MOTOR\_ERROR.
- 7. Use parameters from Matlab whenever for all values you consider necessary (e.g. duration of times etc.). Our customer may want to adjust the parameters at any time.
- 8. Test your state machine (use one/multiple separate test models if necessary)