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COMP 3004 Assignment 3

Use Cases

USE CASE 1 : ELEVATOR CONTROL SYSTEM BASIC OPERATION

Context of use: The smooth operation of an elevator by the passenger which ensures safe transportation and appropriate emergency behaviour.

Scope: Subsystem – The control system and user interaction, as well as the pistons and doors connected to the control system

Level: User-goal

Primary Actor: Passenger

Stakeholders & Interests:

Passenger: Wants the elevator to get them efficiently and safely to the correct floor and respond appropriately during emergencies.

Building owner: Wants the elevator to function correctly so they do not become liable for damage to persons or good. Additionally, they will not want to have to deal with repairing the elevator.

Insurance company: Wants the elevator to function correctly so they do not have to cover damage to persons or goods.

Fire/police department: Want the elevator to safely evacuate passengers in an emergency and also don't want faulty control system leading to false alarms.

Building safety service: Want to be contacted appropriately and when necessary.

Precondition: Elevator has been installed and passed the safety inspection.

Minimal Guarantees: The elevator will return to a safe floor and let the passengers out.

Success Guarantees: The elevator will take the passengers to the correct floor and let them disembark, then responds to its next request. The elevator will respond appropriately in emergency conditions and ensure the safety of its passengers.

Trigger: Passenger presses a button on any floor to request the elevator.

Main Success Scenario:

1. Button is pressed by passenger
 - a. Button illuminates
 - b. Sends request to the MainWindow

- c. MainWindow commands the QECS to designate an elevator
- 2. QECS designates an elevator to service the request based on its position
 - a. The floorSensor associated with the elevator is activated
 - b. The elevator begins to move (if idle)
 - c. As the car moves past floors, the updates from the floor sensor are displayed on the display in the elevator
- 3. Elevator arrives at requested floor
 - a. QECS stops the sensor from sending updates, and stops the car from moving
 - b. Bell is rung
 - c. Doors open for 10 seconds
 - d. Bell rings again
 - e. Doors close
 - f. QECS tells the elevator that it can remove this destination from its list
 - g. The button light turns off
- 4. Passenger selects desired floor
 - a. Elevator adds to it's destination list
- 5. Elevator proceeds to desired floor
 - a. Sensor gets reactivated
 - b. Car starts moving
 - c. Display in the elevator updates to accurately show which floor the elevator is on as well as its direction
 - d. QECS uses signals from the sensor on each floor to monitor the position of the elevator and arrange the queue or requests in an efficient manner
- 6. Elevator arrives at desired floor
 - a. Repeat step 2a-d
 - b. Control system initiates next request in the queue based on proximity and direction

Extensions

- 1a. *(This could occur at any step, so I've placed it as an extension of step 1)* Control system receives a "Fire" alarm signal.
 - 1a1. See USE CASE 4
- 3a. Door obstacle is detected.
 - 3a1. See USE CASE 3
- 3b. Open door button inside the elevator is pressed while doors are open.
 - 3b1. Doors remain open for extra time as request of passenger.
- 3c. Close door button inside the elevator is pressed while doors are open.
 - 3c1. If light sensor is interrupted, doors remain open and ignore close door signal.
 - 3c2. If light sensor is not interrupted, doors close prematurely of the regular 10 second timer.
- 4a. Too many passengers have entered the elevator and it sends an overload signal.
 - 4a1. See USE CASE 5
- 5a. Another passenger requests the elevator while it is travelling to a desired floor.
 - 5a1. If the passenger is travelling in the same direction as the elevator and is between the

current floor and desired floor, the elevator stops at that floor and repeats step 3a-f before continuing.

5a2. If the passenger is not travelling in the same direction or is not between the current floor and desired floor, elevator queues the request until current passenger has arrived at their requested floor

5b. Control system receives a “Help” signal.

5b1. See USE CASE 2

5c. Control system receives a “Power Out” signal.

5c1. See USE CASE 6

USE CASE 2 : ELEVATOR CONTROL SYSTEM HELP ALARM

Primary Actor: Passenger

Precondition: A passenger is in the elevator.

Minimal Guarantees: The elevator will connect the user with building safety services.

Main Success Scenario:

1. Help button is pressed by passenger
 - a. Button illuminates
 - b. Sends help signal to the ECS via the elevator destination panel
2. Control system receives the Help signal
3. Control system calls building safety services
4. Building safety services responds to call
 - a. The ECS connects them to the elevator which made the request

Postcondition: The passenger and building safety services have been connected or 911 has been called if not.

Extensions:

3a. Building safety services does not respond within 5 second of being connected to passenger

3a1. 911 is called

4a. Passenger does not respond when building safety services answers the call

4a1. 911 is called

USE CASE 3: ELEVATOR CONTROL SYSTEM DOOR OBSTACLE

Primary Actor: Car Door light sensor

Precondition: Elevator car door is closing.

Minimal Guarantees: The elevator door responds appropriately when blocked.

Main Success Scenario:

1. The light sensor of a car door is interrupted while the door is closing
 - a. Sends signal to the ECS
2. Control system sends a signal back to the car and stops the doors from closing
3. Control system sends signal to the floor as well to keep the floor doors open
4. Doors reopen (if they were closing)
5. Once light sensor is no longer blocked, the elevator and floor doors close again.

Postcondition: The light sensor no longer detects a blockage and normal functioning is resumed.

Extensions:

- 4a. Once door opens, the light sensor still detects the blockage and several attempts to close the door again fail
 - 4a1. Warning sound is played, and a text message is displayed to the passengers

USE CASE 4 : ELEVATOR CONTROL SYSTEM FIRE ALARM

Primary Actor: Elevator control system

Precondition: The elevator is in operation.

Main Success Scenario:

1. Control system receives a “Fire” alarm signal
2. Control system commands all elevators to move to a designated safe floor
3. Audio is played and text message is displayed to inform passengers of the emergency
4. Elevator starts moving toward safe floor
 - a. QECS Updates its location as it’s sensors detect new floors
5. Elevator arrives at safe floor
 - a. Informs QECS of arrival
 - b. Elevator doors and floor doors open
6. Audio is played to prompt passengers to disembark

Postcondition: The elevator has arrived at a designated safe floor and passengers are let out.

USE CASE 5 : ELEVATOR CONTROL SYSTEM OVERLOAD

Primary Actor: Passengers

Precondition: Sensor detects that weight limit is surpassed.

Main Success Scenario:

1. Control system receives an “overload” signal indicating that the elevator has surpassed its weight limit

2. Control system stops elevator from leaving the floor it is on
3. Audio is played and text message is displayed to request that passengers reduce weight through disembarking or reducing cargo
4. Sensor indicates that weight is no longer above the limit
5. Elevator can now move

Postcondition: The weight of passengers + cargo is below the limit and normal functioning can resume.

Extensions:

- 4a. After message is played, sensor still indicates that elevator is above weight limit
 - 4a1. Doors will remain open and elevator will not move until this changes.

USE CASE 6 : ELEVATOR CONTROL SYSTEM POWER OUT

Primary Actor: Control system

Precondition: Power goes out.

Main Success Scenario:

1. Control system receives an “power out” signal.
2. Control system commands all elevators to move to a designated safe floor.
3. Audio is played and text message is displayed to inform passengers of the power outage.
4. Elevator starts moving toward safe floor
 - a. Updates its location as it’s sensors detect new floors
5. Elevator car arrives at the safe floor
 - a. QECS stops car
 - b. Bell rings
 - c. Elevator doors and floor doors open
6. Passengers are prompted to disembark.

Postcondition: Elevator arrives at a save floor and passengers are let out.