Scenario 1.2 Hall Call service – the elevator is moving towards the opposite direction as the passenger's destination.
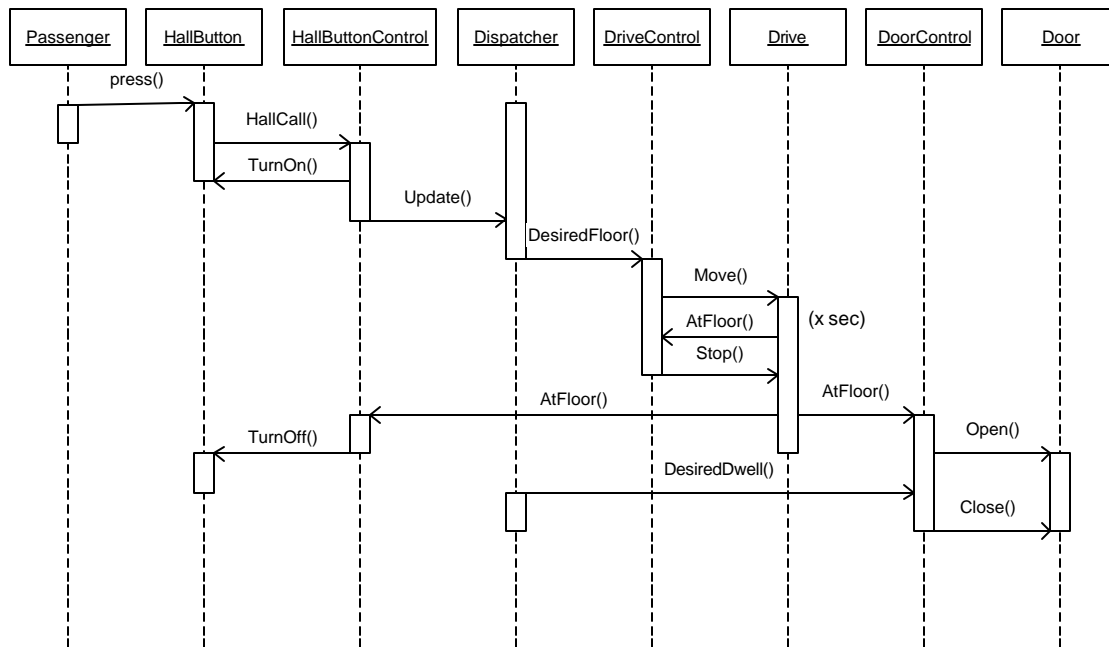

Figure 6: Scenario 1.1&1.2 - Hall Call Service

5.1.2 Use Case 2 – Process car calls

There are two scenarios for this use case: the passenger enters the car, presses a car call button. The passenger may either want to go to a upper floor or a lower one, depending on the current moving direction of the elevator, the passenger will either get to the destination floor when the elevator passes by it, or when the elevator turns around. Again, the two scenarios can share the

Scenario 2.1 Car Call service – the elevator is moving towards the same direction as the passenger's destination.

Scenario 2.2 Car Call service – the elevator is moving towards the opposite direction as the passenger's destination.
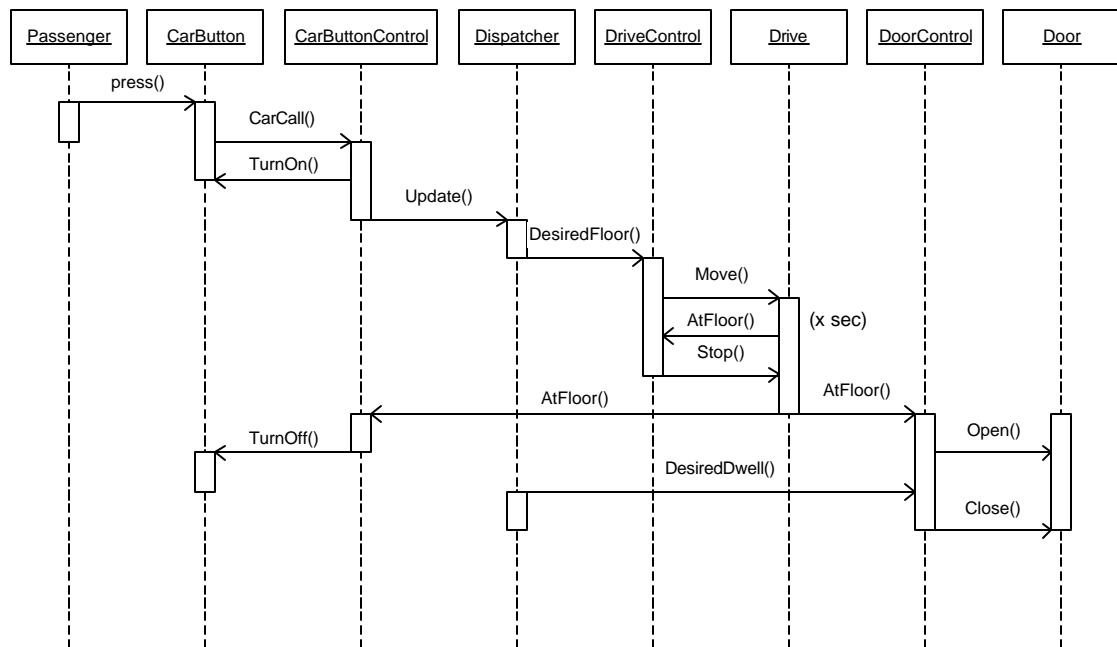
Figure 7: Scenario 2.1&2.2 - Car Call Service

5.1.3 Use Case 3 – Move/Stop the car

There are two scenarios for this use case:

Scenario 3.1&3.2 Move the car – the elevator is commanded to start moving from stop status. The moving direction and desired floor of the car are given by the Dispatcher. Within a safe scope, the car should move from slow speed to a fast speed. Scenario 3.1 is for moving Up, and Scenario 3.2 for moving Down.
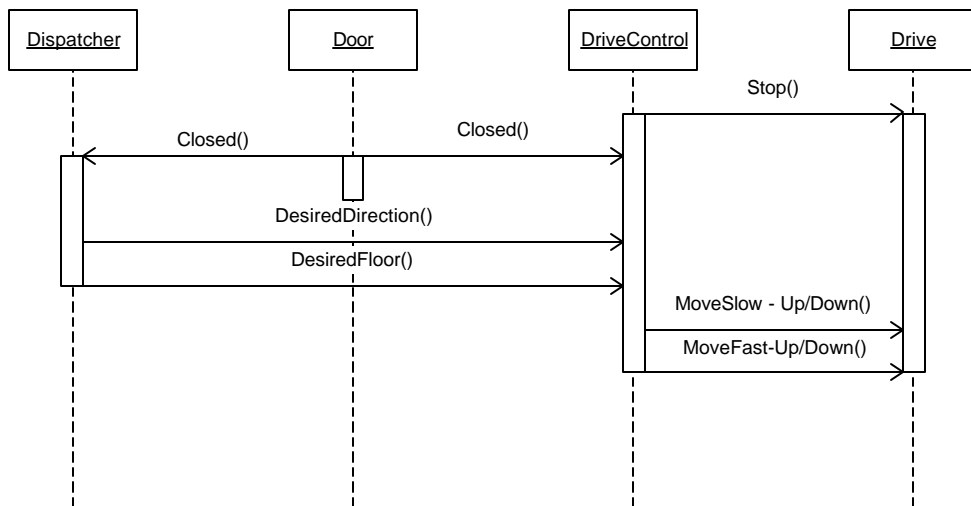
Figure 8: Scenario 3.1&3.2 - Moving the Car from Stop to Slow then to Fast

Scenario 3.3&3.4 Stop the car – when the elevator is approaching the desired floor, it should be commanded to slow down its drive speed, and at last stop at the floor.
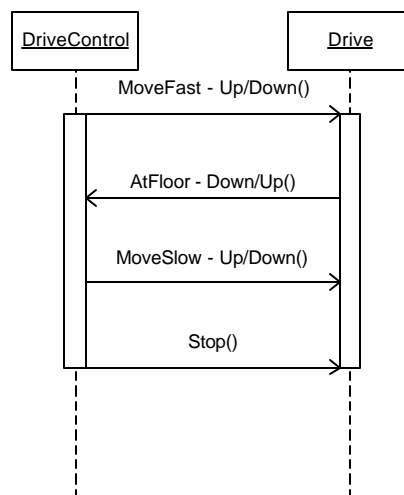
Figure 9: Scenario 3.3&3.4 - Moving the Car from Fast to Slow then to Stop

5.1.4 Use Case 4 – Indicate car position

There are two scenarios for this use case, which can share one sequence diagram:

Scenario 4.1 Indicating car position – whenever the doors of the elevator are open, the CarPositionIndicator should be commanded to illuminate to indicate the current car position.
Scenario 4.2 Finish indicating car position – when the doors are closed, the CarPositionIndicator should be commanded to indicate the desired floor.
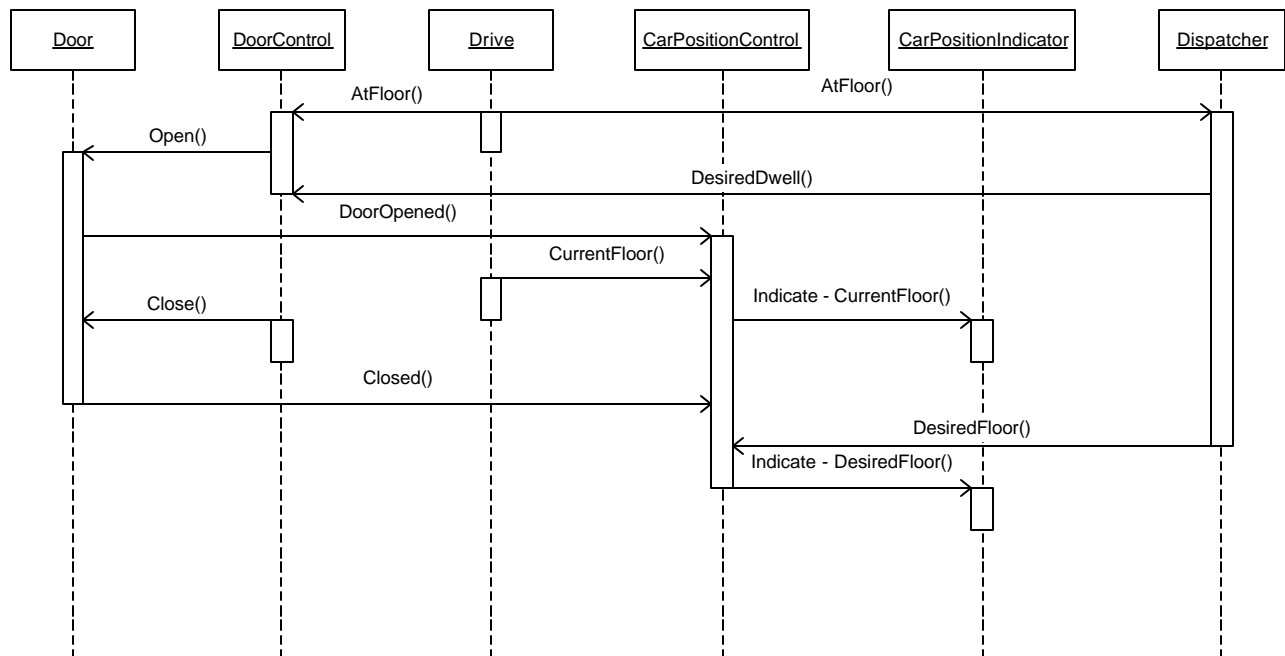

Figure 10: Scenario 4.1&4.2 - Indicating the Car Position

5.1.5 Use Case 5 – Indicate moving direction

There are two scenarios for this use case, which can share one sequence diagram:

Scenario 5.1 Indicating moving direction (up) – When the doors of the elevator are open and the desired direction of the car is UP, the UP CarLantern is illuminated. When the doors are closed, the CarLantern is turned off.

Scenario 5.2 Indicating moving direction (down) – When the doors of the elevator are open and the desired direction of the car is DOWN, the DOWN CarLantern is illuminated. When the doors are closed, the CarLantern is turned off.
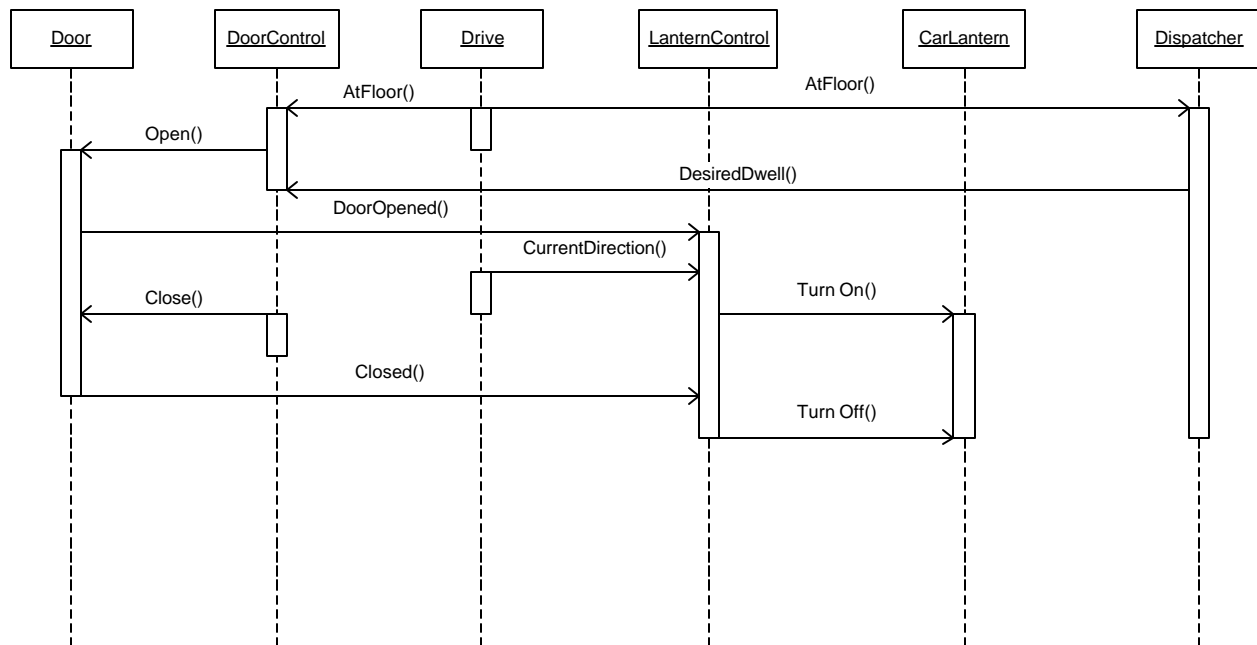
Figure 11: Scenario 5.1&5.2 - Indicating the Moving Direction

5.1.6 Use Case 6 – Open/Close the doors

There are three scenarios for this use case:

Scenario 6.1 Open the doors – When the car stops at a floor, the doors should open for a period of time (DesiredDwell), so that the passengers may get in the car.

Scenario 6.2 Close the doors – After opening for a specific period of time (Desiredperiod), the doors should close so that the car can move to the next destination.
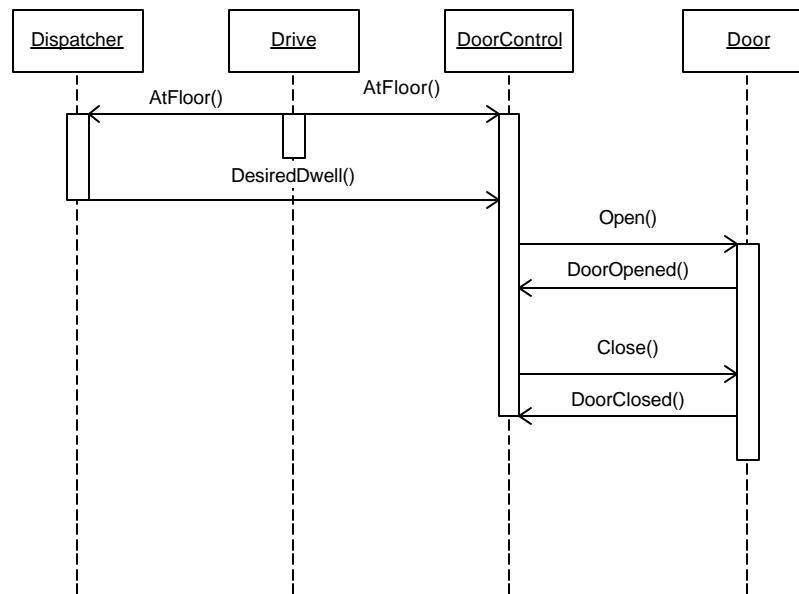
Figure 12: Scenario 6.1&6.2 - Open and Close the doors

Scenario 6.3 Door reversals – When the doors are closing but not fully closed, if there are passengers who want to get into the car, the doors should open again for another period of time, then close again.
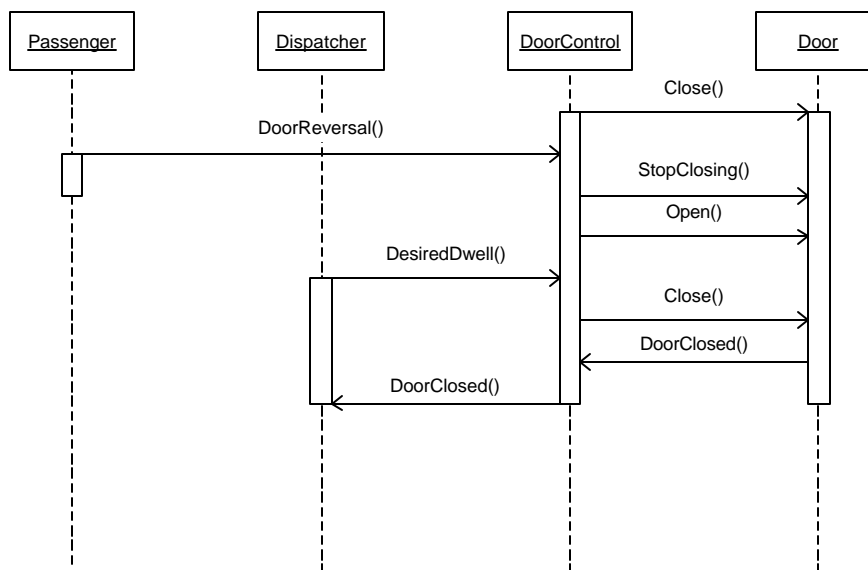
Figure 13: Scenario 6.3 - Door Reversal

5.1.7 Use Case 7 – Trigger emergency brake

There are five scenarios for this use case:

Scenario 7.1 Emergency Brake 1 – If the car is commanded to stop but it won't stop at a desired floor, the emergency brake will be triggered.
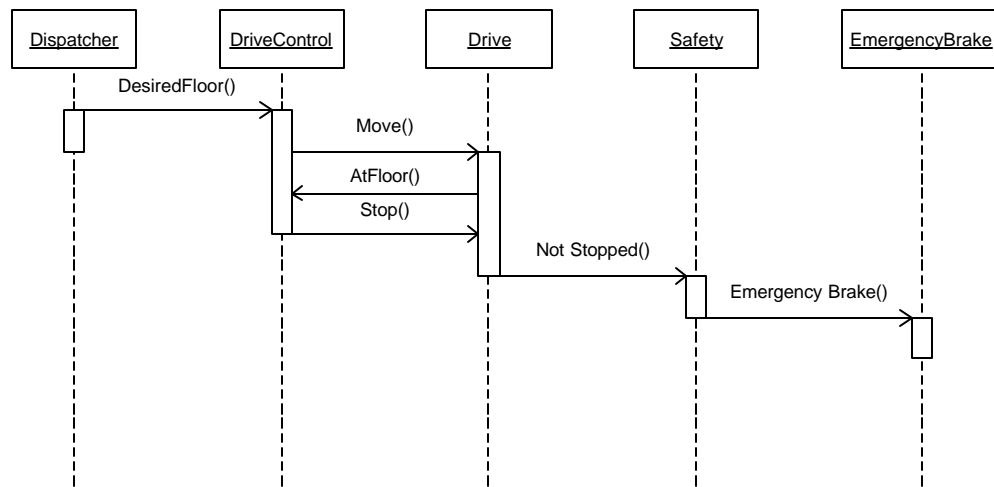
Figure 14: Scenario 7.1 - Emergency Brake - The car won't stop at desired Floor

Scenario 7.2 Emergency Brake 2 – If the car is commanded to move but it does not move, the emergency brake will be triggered.
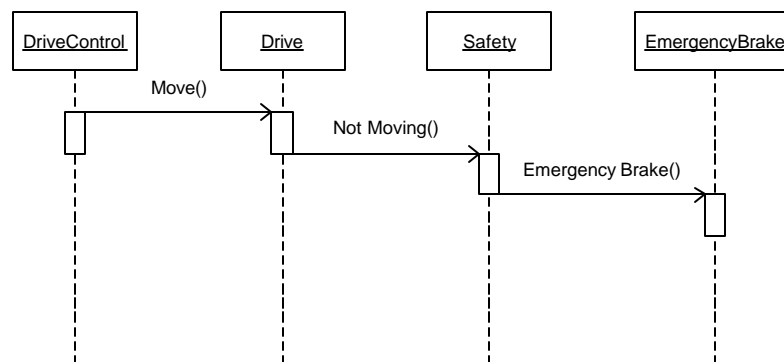
Figure 15: Scenario 7.2 - Emergency Brake - The car won't move

Scenario 7.3 Emergency Brake 3 – If the doors are commanded to open when the car stops at a floor, but the doors won't open, the emergency brake will be triggered.
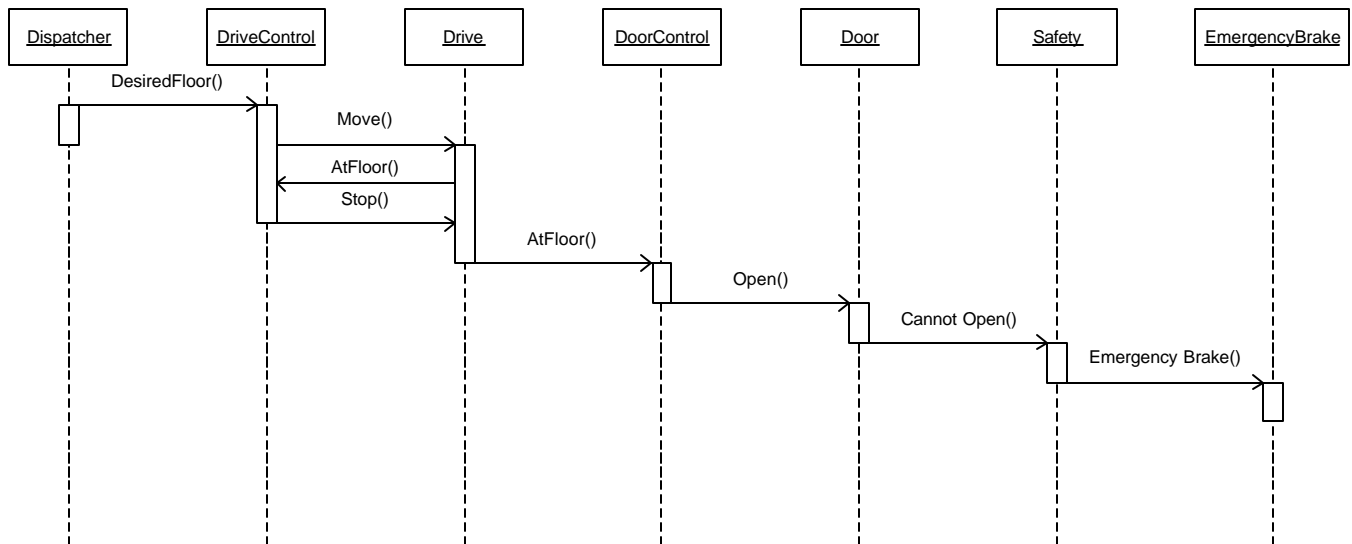
Figure 16: Scenario 7.3 - Emergency Brake - The doors won't open when the elevator stops at desired floor

Scenario 7.4 Emergency Brake 4 – If the doors open when the car is moving, the emergency brake will be triggered.
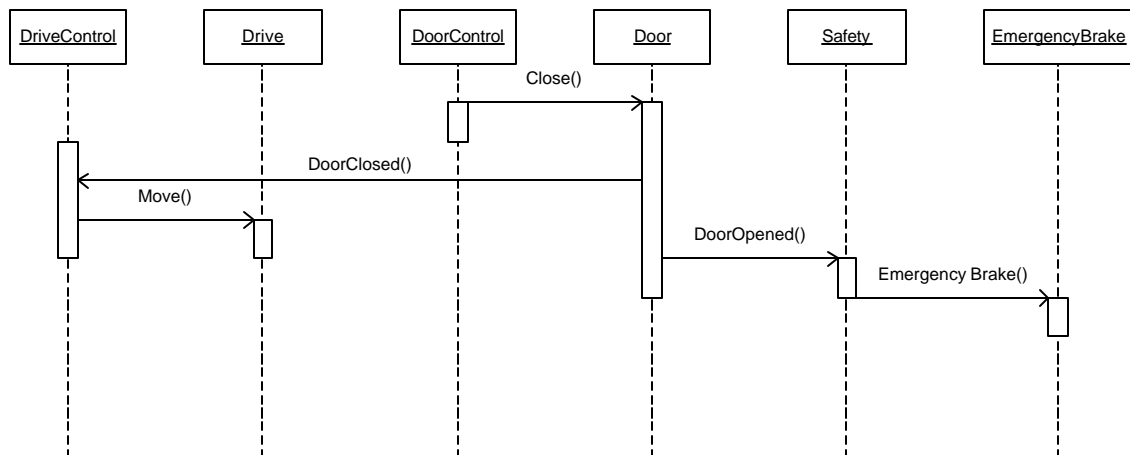
Figure 17: Scenario 7.4 - Emergency Brake - The doors open when the elevator is moving

Scenario 7.5 Emergency Brake 5 – If the car keeps going when the hoist way limit is reached, the emergency brake will be triggered.
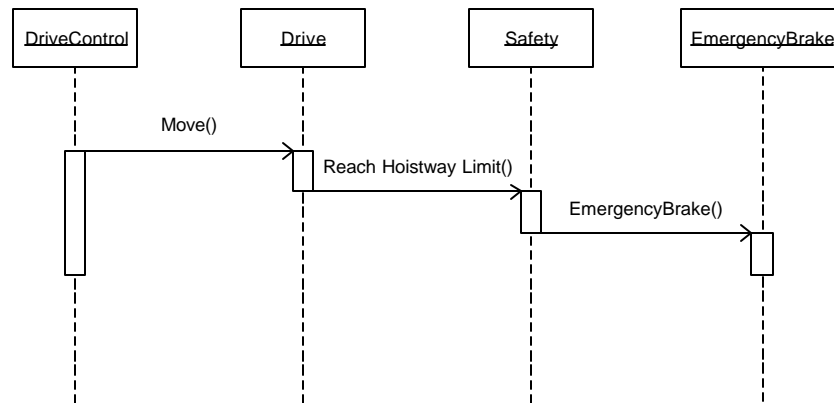

Figure 18: Scenario 7.5 - Emergency Brake - The elevator keeps going when hoistway limit is reached

5.2 State chart Diagram

A State chart diagram shows a state machine. Usually the state machine in a state chart models the behavior of a reactive object, whose behavior is best characterized by its response to events dispatched from outside its context. The object has a clear lifetime whose current behavior is affected by its past. State chart diagrams are important for constructing executable systems through forward and reverse engineering.

It is admitted that there exists a gap in the process of designing a system from requirements to state charts, not enough direction methods can be followed when drawing the state chart diagram from the requirements. In this section, some practical methods used during our designing the state charts for the elevator system are introduced. These methods may not be as serious as rules or instructions of how to draw state chart diagrams from the requirement document, but they are helpful in practice.

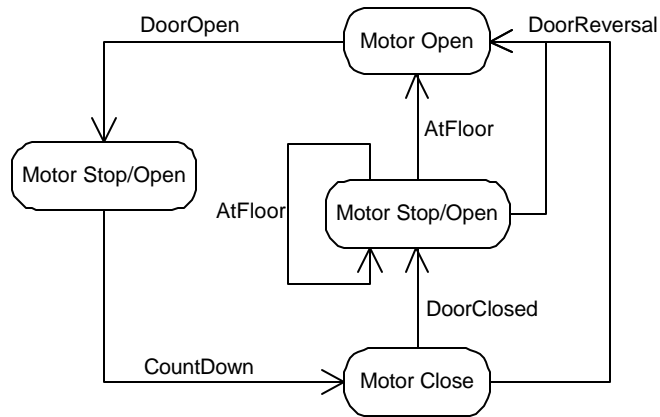### 5.2.1 State chart for DoorControl

Figure 19: Statechart for DoorControl
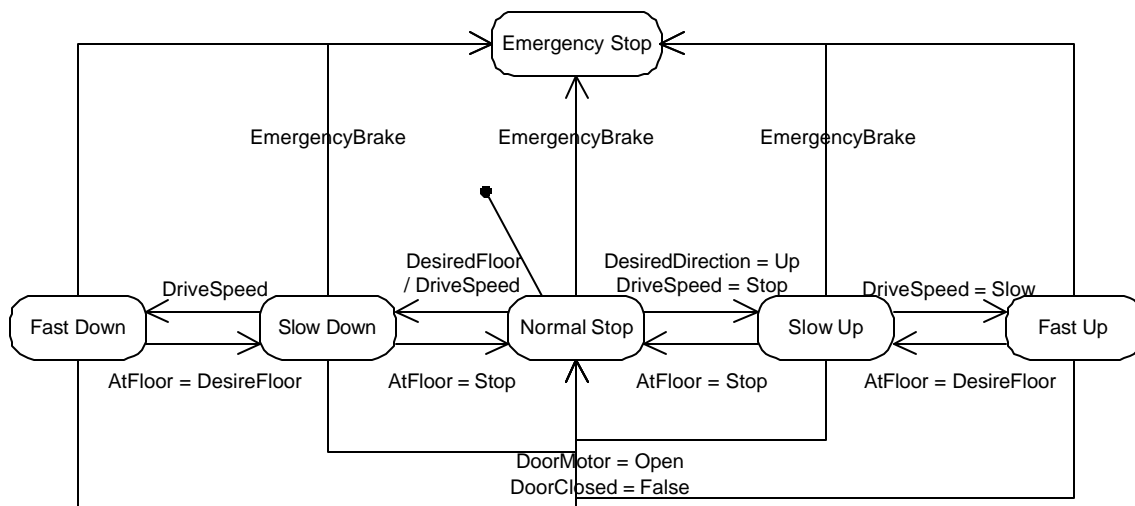
5.2.2 State chart for DriveControl

Figure 20: Statechart for DriveControl
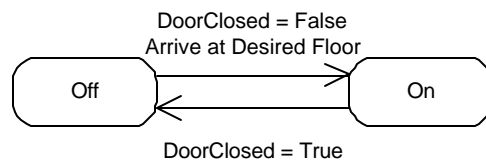
5.2.3 State chart for LanternControl

Figure 21: Statechart for LanternControl

5.2.4 State chart for HallButtonControl
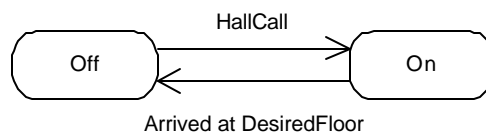

Figure 22: Statechart for HallButtonControl

5.2.5 State chart for CarButtonControl

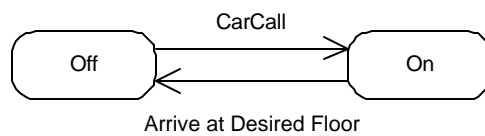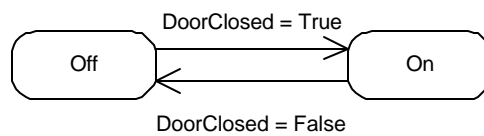Figure 23: Statechart for CarButtonControl

5.2.6 State chart for CarPositionControl

Figure 24: Statechart for CarPositionControl