

Elevator Project: Milestone 4

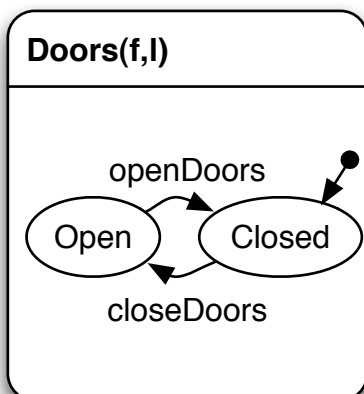
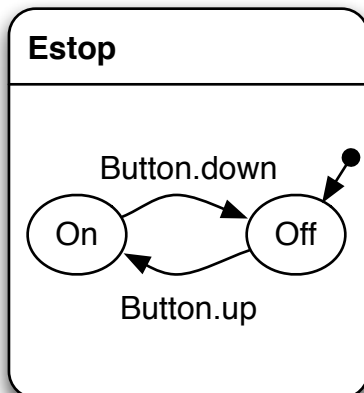
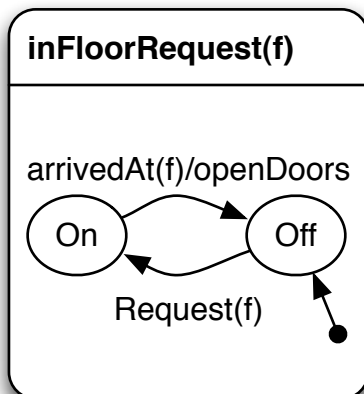
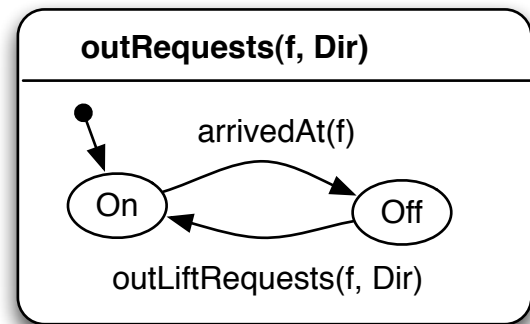
State Chart

Introduction

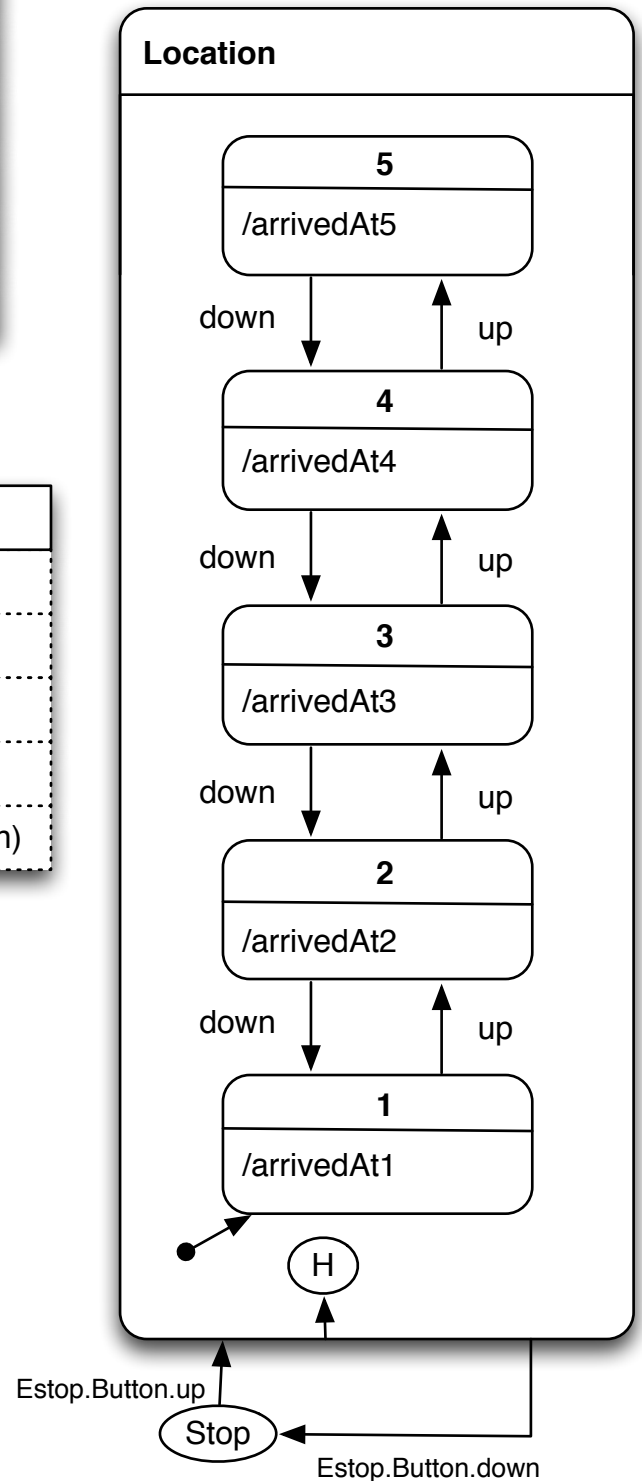
As we have progressed through the project, we have evolved our elevator simulation from a basic to advanced alloy model. We then implemented this alloy model in Java using JML to prove it. Finally we are producing a State Chart depicting the elevators and how they behave. By creating the state chart, we can actually progress through all possible positions and possibilities that could occur with the elevator system. For both convenience and readability, we have used several state aliases so that we can represent larger portions of the system in a more generic manner. We did add a hotel submachine so we can represent the whole system. From that one master state, we have several submachines that operate in an orthogonal pattern. These submachines are the lifts and the floors. We decided to create the floor machine to handle the up and down requests from buttons pressed on that floor. There are three lifts handled in our model, which effectively behave independently, each lift contains doors, and emergency stop segment. We then also have two different types of requests, those that are inside an elevator and those that are on floors.

The control algorithm is implemented with a combination of the PlannedDir, move and Doors sub charts in combination with several pieces of Alloy code. This control algorithm allows us to move lifts between floors and ensures that the doors are not moving while the elevator is moving and vice versa. All elevators will simultaneously service a floor, due to the fact we do not have data as to how an actual elevator system performs this behavior. The state charts are included below.

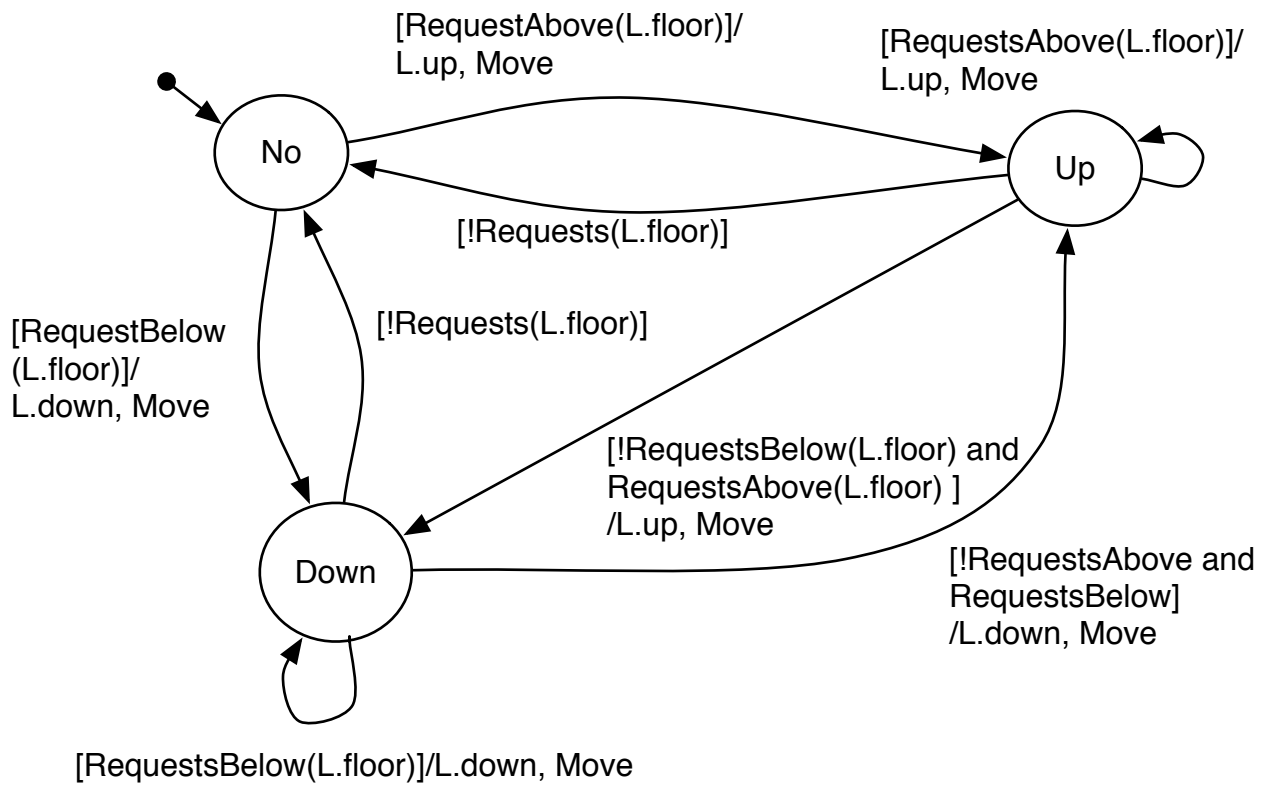
Lift(L)
inFloorRequest(5)
inFloorRequest(4)
inFloorRequest(3)
inFloorRequest(2)
inFloorRequest(1)
Doors(L)
PlannedDir(L)
EStop(L)
Location



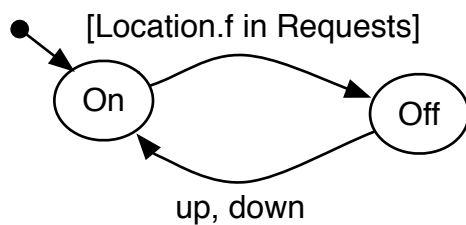
Hotel
Lift(1)
Lift(2)
Lift(3)
outRequests(1..5, Up)
outRequests(1..5, Down)



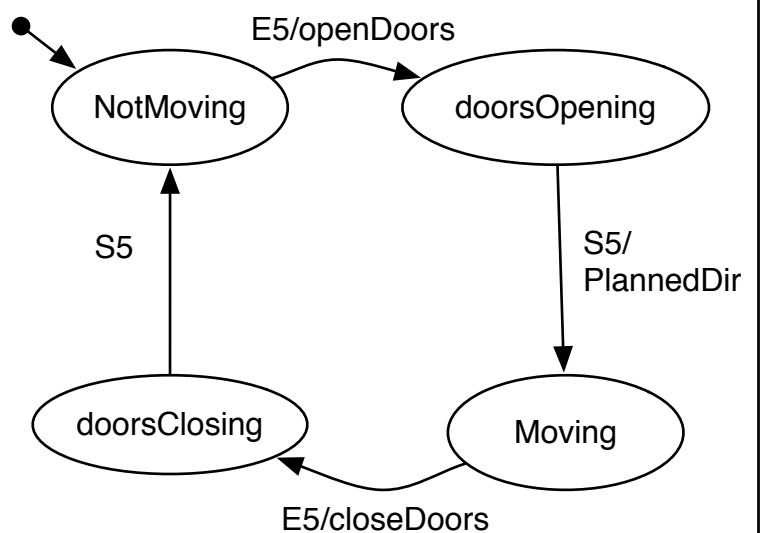
PlannedDir(L)



Doors(f)



Move



Alloy

RequestsAbove(f) = some f, f' | f' > f ++ in outLiftRequests(f', Up).ON

RequestsBelow(f) = some f, f' | f' < f ++ in outLiftRequests(f', Down).ON

outLiftRequests(f, dir) = f in outLiftRequests(f, dir).On

arrivedAt(f) = some y:{1..3} | in Lift(y).Floor(f) ++ in Lift(y).Doors.Open

requests(f) = RequestsAbove(f) ++ RequestsBelow(f)

