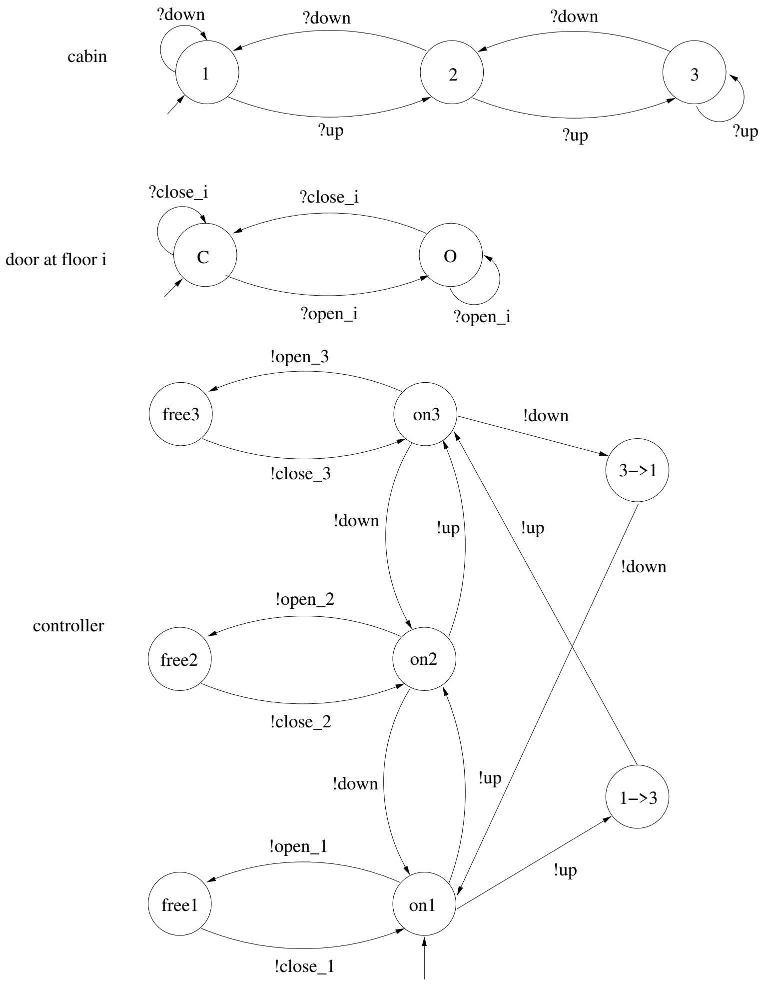
# Extra assignment for course T-79.231 Parallel and Distributed Systems

Below is given a model for an elevator system with three floors. The model comprises of parallel communicating automata. There are three different “door” automata, one for each floor. A “?” in transition signifies *input* action and a “!” *output* action. Input and output pairs are executed synchronously, that is they both happen at the same time. Note that you do not need to differentiate between input and output actions in Maria.




1. Create a Maria description of the system
2. Perform reachability analysis for the system
3. Verify the following property: “A door can be open only if the cabin is on the same floor”. Perform the verification for all three floors. Present

the LTL formula used and the results for the actual model checking run.

4. Modify the system by removing the nondeterministic choice where the cabin may move directly from floor 1 to 3, or from 3 to 1. How does the number of reachable states change? What was the reason for the change?

5. The verified property in (3) belongs to a class of properties called *safety properties*. Safety properties are properties that can be verified relying only on events that happened in the past (including the present, but not the future). An informal notion regarding safety properties is "The fewer things we do, the more chances we have that a certain safety property is fulfilled". Also, from this follows that if we reduce the behaviors of the system, all safety properties that held in the original system will also hold in the reduced system.

   Now for the question: Do you need to verify the property of (3) again for the system created by the modifications of (4)?

6. If you verify some safety properties in system created by the modifications of (4), can you be sure that the properties also hold in the original system?

Few guidelines for this assignment:

- Answers need not be long, but you should give some grounds for the answers. That is, plain yes/no answers are not enough!
- Attach the results that you got from Maria and the source code for both nets to your return. I *do* want to see them.
- If you have problems with something, ask me.