Specification of a lift

Hypothesis:

- A floor door is open or closed.
- A button is pressed or depressed.
- An indicator light is on or off.
- The cabin is present at floor i, or it is absent.

P1. Safe doors:
A floor door is never opened if the cabin is not present at the given floor.

P2. Indicator lights:
The indicator lights correctly reflect the current requests.

P3. Services:
All requests are eventually satisfied.

P4. Smart service:
The cabin only services the requested floors and does not move when there is no request.
### Specification of a lift

**P5. Diligent service:**
The cabin does not pass by a floor for which it has a request without servicing it.

**P6. Direct movements:**
The cabin always moves directly from previous to next serviced floor.

**P7. Priorities:**
The cabin services in priority requests that do not imply a change of direction (upward or downward).

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### Specification of a lift: the atomic prop.

- **Floor 0:** $C_0$ (resp. $S_0$) = $\top$ iff the button is pressed
- **Floor 1:** $C_1$ (resp. $S_1$) = $\top$ iff the button is pressed
- **Floor 2:** $C_2$ (resp. $S_2$) = $\top$ iff the button is pressed
- **Cabin:** $D_i = \top$ iff the doors at floor $i$ are opened
- **At $i$:** $at = \top$ iff the cabin is at floor $i$

### Specification of a lift

**P2. Indicator lights:**
The indicator lights correctly reflect the current requests.

- $\bigwedge_i G (C_i \Rightarrow (LC_i \lor \text{servicing}_i))$ : turned on when necessary
- with: $\text{servicing}_i = at_i \land D_i$
- $\bigwedge_i G (LC_i \Rightarrow (LC_i \land \text{W servicing}_i))$ : stay lit when necessary
- $\bigwedge_i G (\text{servicing}_i \Rightarrow (\neg LC_i \land \neg Ls_i))$ : turned off when necessary
- $\bigwedge_i G (\neg LC_i \Rightarrow (\neg LC_i \land W C_i))$ : only turned on when necessary

(And the same for $S_i$ and $SL_i$)
Specification of a lift

P3. Services:
All requests are eventually satisfied.

\[ \bigwedge_i G \left( \text{request}_i \Rightarrow \neg \text{servicing}_i \right) \]
with: \( \text{request}_i = C_i \lor S_i \)

P4. Smart service:
The cabin only services the requested floors and does not move when there is no request.

\[ \bigwedge_i G \left( \neg \text{servicing}_i \Rightarrow \left[ \neg \text{servicing}_i \land \text{W} (CL_i \lor SL_i) \right] \right) \]
\[ \bigwedge_i G \left( \text{at}_i \Rightarrow \left( \text{at}_i \lor \bigvee_{j \neq i} (CL_j \lor SL_j) \right) \right) \]

P5. Diligent service:
The cabin does not pass by a floor for which it has a request without servicing it.

\[ \bigwedge_i G \left( [ (LC_i \lor LS_i) \land \text{at}_i ] \Rightarrow (\text{at}_i \lor \text{U} \text{servicing}_i) \right) \]

P6. Direct movements:
The cabin always moves directly from previous to next serviced floor.

\[ \bigwedge_{i,j} G \left( \text{From}_{i \to j} \Rightarrow (\text{at}_i \lor \text{betw_floors}) \lor (\text{at}_{i+1} \land (\text{at}_{i+1} \lor \text{at}_{i+2} \lor \ldots \lor \text{at}_n)) \right) \]
\[ \neg \text{at}_0 \land \ldots \land \neg \text{at}_n \]

P7. Priorities:
The cabin services in priority requests that do not imply a change of direction (upward or downward).

\[ \text{Up} = \bigvee_{i=1..k} \left[ (\text{at}_i \lor \text{betw_floors}) \lor (\text{at}_{i+1} \land (\text{at}_{i+1} \lor \text{betw_floors}) \lor \text{at}_i) \right] \]
\[ \text{Down} = \bigvee_{i=0..k-1} \left[ (\text{at}_i \lor \text{betw_floors}) \lor (\text{at}_{i+1} \land (\text{at}_i \lor \text{betw_floors}) \lor \text{at}_i) \right] \]

\[ G \bigwedge_{i=0..k-1} \left[ (\text{servicing}_i \land \text{Down} \land \bigvee_{j \leq i} (CL_j \lor SL_j)) \Rightarrow \bigvee_{n \leq i} \text{From}_{i \to n} \right] \]
\[ G \bigwedge_{i=1..k} \left[ (\text{servicing}_i \land \text{Up} \land \bigvee_{j > i} (CL_j \lor SL_j)) \Rightarrow \bigvee_{n > i} \text{From}_{i \to n} \right] \]