1 Main Content

In this section, we describe the system behavior. See Appendix A for the detailed SMT formulas.

A SMT Formulas for State Transitions

Transition	SMT Formula
LC → DoorOpen	$(f = i) \wedge (l_i^u \vee l_i^d) \wedge C_i \quad (1)$
LC → $Level_i$	$\bigwedge_{i=1}^{n-1} (f = i) \wedge \Big(((DIR = (UP \vee NA)) \wedge l_i^u) \vee \big((DIR = (DOWN \vee NA)) \wedge l_i^d\big) \Big) \quad (2)$
LC → SetMotionUp	$\bigvee_{i=0}^{n-1} (f = i) \wedge \Big(\bigvee_{j=i+1}^{n-1} (l_j^u \vee l_j^d) \Big) \wedge \big(DIR = (UP \vee NA)\big) \quad (3)$
LC → SetMotionDown	$\bigvee_{i=n-1}^{1} (f = i) \wedge \Big(\bigvee_{j=0}^{i-1} (l_j^u \vee l_j^d) \Big) \wedge \big(DIR = (DOWN \vee NA)\big) \quad (4)$
DoorClose → SetMotionUp	$(DIR = (UP \vee NA)) \wedge \Big(\bigvee_{i=1}^{n-1} (f = i) \wedge \bigvee_{j=i+1}^{n-1} (c_j \vee l_j^u \vee l_j^d) \Big)$ $\vee \ (DIR = (DOWN \vee NA)) \wedge \Big(\bigvee_{i=1}^{n-1} (f = i) \wedge \neg \Big(\bigvee_{j=0}^{i-1} (c_j \vee l_j^u \vee l_j^d) \Big) \wedge \Big(\bigvee_{j=i+1}^{n-1} (c_j \vee l_j^u \vee l_j^d) \Big) \Big) \quad (5)$
DoorClose → SetMotionDown	$(DIR = (UP \vee NA)) \wedge \Big(\bigvee_{i=1}^{n-1} (f = i) \wedge \neg \Big(\bigvee_{j=i+1}^{n-1} (c_j \vee l_j^u \vee l_j^d) \Big) \wedge \Big(\bigvee_{j=0}^{i-1} (c_j \vee l_j^u \vee l_j^d) \Big) \Big)$ $\vee \ (DIR = (DOWN \vee NA)) \wedge \Big(\bigvee_{i=1}^{n-1} (f = i) \wedge \bigvee_{j=0}^{i-1} (c_j \vee l_j^u \vee l_j^d) \Big) \quad (6)$
DoorClose → Idle	$\bigvee_{i=0}^{n-1} \neg c_i \vee \bigvee_{i=0}^{n-1} (f = i) \wedge c_i \quad (7)$
Idle → $Level_i$	$(f = i) \wedge (c_i \vee l_i^u \vee l_i^d) \quad (8)$
MoveDown → $Level_i$	$(f = i) \wedge \big(l_i^d \wedge (DIR = DOWN) \vee c_i\big) \quad (9)$
MoveUp → $Level_i$	$(f = i) \wedge (l_i^u \wedge (DIR = UP) \vee c_i) \quad (10)$

Table 1: SMT Formulas for State Transitions