MODULE *elevator*

EXTENDS *Naturals*

CONSTANTS N, Up, Dn
ASSUME $N \in Nat$

VARIABLES i, dir

True when elevator is at floor f
$At(f) \triangleq i = 2 * f - 1$

$IsBetween \triangleq i\%2 = 0$

$$\begin{aligned} Init \triangleq\ & \land i = 1 \\ & \land dir \in \{Up, Dn\} \end{aligned}$$

$$\begin{aligned} UpFlr \triangleq\ & \land \exists f \in 1 \,..\, N-1 : At(f) \\ & \land i' = i + 1 \\ & \land dir' = Up \end{aligned}$$

$$\begin{aligned} UpBetween \triangleq\ & \land IsBetween \\ & \land dir = Up \\ & \land i' = i + 1 \\ & \land \text{UNCHANGED } dir \end{aligned}$$

$$\begin{aligned} DnFlr \triangleq\ & \land \exists f \in 2 \,..\, N : At(f) \\ & \land i' = i - 1 \\ & \land dir' = Dn \end{aligned}$$

$$\begin{aligned} DnBetween \triangleq\ & \land IsBetween \\ & \land dir = Dn \\ & \land i' = i - 1 \\ & \land \text{UNCHANGED } dir \end{aligned}$$

$$\begin{aligned} Next \triangleq\ & \lor UpFlr \\ & \lor UpBetween \\ & \lor DnFlr \\ & \lor DnBetween \end{aligned}$$

$v \triangleq \langle i, dir \rangle$

$$\begin{aligned} L \triangleq\ & \land \mathrm{WF}_v(UpBetween) \\ & \land \mathrm{WF}_v(DnBetween) \\ & \land \mathrm{WF}_v(UpFlr) \\ & \land \mathrm{WF}_v(DnFlr) \\ & \land \forall f \in 2 \,..\, N-1 : \\ & \quad \land \mathrm{SF}_v(UpFlr \land At(f)) \\ & \quad \land \mathrm{SF}_v(DnFlr \land At(f)) \end{aligned}$$

$$Spec \triangleq Init \wedge \Box[Next]_v \wedge L$$