MODULE *elevator*

EXTENDS *Naturals*

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

VARIABLES i, dir

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

True when elevator is between floors
$IsBetween \triangleq i\%2 = 0$

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

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

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

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

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

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

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

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

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