

EXTENDS *Naturals*

CONSTANTS  $N$ ,    number of floors  
                    $Up, Dn$     represents direction  
 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  
 $IsBetween \triangleq i \% 2 = 0$

$Init \triangleq \wedge i = 1$   
                    $\wedge dir \in \{Up, Dn\}$

move up when at a floor  
 $UpFlr \triangleq \wedge \exists f \in 1 \dots N - 1 : At(f)$   
                    $\wedge i' = i + 1$   
                    $\wedge dir' = Up$

move up when between floors  
 $UpBetween \triangleq \wedge IsBetween$   
                    $\wedge dir = Up$   
                    $\wedge i' = i + 1$   
                    $\wedge \text{UNCHANGED } dir$

move down when at a floor  
 $DnFlr \triangleq \wedge \exists f \in 2 \dots N : At(f)$   
                    $\wedge i' = i - 1$   
                    $\wedge dir' = Dn$

move down when between floors  
 $DnBetween \triangleq \wedge IsBetween$   
                    $\wedge dir = Dn$   
                    $\wedge i' = i - 1$   
                    $\wedge \text{UNCHANGED } dir$

$Next \triangleq \vee UpFlr$   
                    $\vee UpBetween$   
                    $\vee DnFlr$   
                    $\vee DnBetween$

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

$L \triangleq \wedge WF_v(UpBetween)$   
                    $\wedge WF_v(DnBetween)$

$$\begin{aligned}
& \wedge \text{WF}_v(\text{UpFlr} \wedge \text{At}(1)) \\
& \wedge \text{WF}_v(\text{DnFlr} \wedge \text{At}(N)) \\
& \wedge \forall f \in 2 \dots N-1 : \\
& \quad \wedge \text{SF}_v(\text{UpFlr} \wedge \text{At}(f)) \\
& \quad \wedge \text{SF}_v(\text{DnFlr} \wedge \text{At}(f))
\end{aligned}$$

$$Spec \stackrel{\Delta}{=} Init \wedge \Box[Next]_v \wedge L$$


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