MODULE *Alarma*

EXTENDS *Naturals*, *Sequences*
CONSTANTS *SecCode*, *Sector*, *Sensor*
ASSUME $SecCode \in Seq(0 \,..\, 9)$
VARIABLES *keyPresses*, *armed*, *bocina*

$$KeypadButton \triangleq \{n : n \in 0 \,..\, 9\} \cup Sector$$

$$\begin{aligned} TypeInv \triangleq\ & \land keyPresses \in Seq(KeypadButton) \\ & \land armed \in [Sector \to \text{BOOLEAN }] \\ & \land bocina \in \text{BOOLEAN} \end{aligned}$$

$$\begin{aligned} Init \triangleq\ & \land keyPresses = \langle\rangle \\ & \land armed = [s \in Sector \mapsto \text{FALSE}] \\ & \land bocina = \text{FALSE} \end{aligned}$$

$$\begin{aligned} ToggleAll \triangleq\ & \land armed' = [s \in Sector \mapsto \neg\exists\, x \in Sector : armed[x]] \\ & \land \text{UNCHANGED } bocina \end{aligned}$$

$$\begin{aligned} Deactivate \triangleq\ & \land bocina' = \text{FALSE} \\ & \land \text{UNCHANGED } armed \end{aligned}$$

$$\begin{aligned} SecCodeEntered \triangleq\ & \land keyPresses = SecCode \\ & \land \text{IF } bocina \text{ THEN } Deactivate \text{ ELSE } ToggleAll \end{aligned}$$

$$\begin{aligned} SectorSecCodeEntered(s) \triangleq\ & \land keyPresses = \langle s\rangle \circ SecCode \\ & \land armed' = [armed \text{ EXCEPT } ![s] = \neg@[s]] \\ & \land \text{UNCHANGED } bocina \end{aligned}$$

$$\begin{aligned} RespondToCommand(cmd) \triangleq\ & \lor \land cmd = SecCode \\ & \quad \land SecCodeEntered \\ & \lor \exists\, s \in Sector : \\ & \quad \land cmd = \langle s\rangle \circ SecCode \\ & \quad \land SectorSecCodeEntered(s) \end{aligned}$$

$$PossibleCommands \triangleq \{\langle s\rangle \circ SecCode : s \in Sector\} \cup \{SecCode\}$$

$$\begin{aligned} KeyPress(i) \triangleq\ & \text{IF } Append(keyPresses,\, i) \in PossibleCommands \\ & \text{THEN } \land keyPresses' = \langle\rangle \\ & \qquad \land RespondToCommand(Append(keyPresses,\, i)) \\ & \text{ELSE } \land keyPresses' = Append(keyPresses,\, i) \\ & \qquad \land \text{UNCHANGED } \langle armed,\, bocina\rangle \end{aligned}$$

$$\begin{aligned} Signal(m,\, s) \triangleq\ & \land bocina' = armed[s] \\ & \land \text{UNCHANGED } \langle keyPresses,\, armed\rangle \end{aligned}$$

$$\begin{aligned} Next \triangleq\ & \lor \exists\, i \in KeypadButton : KeyPress(i) \\ & \lor \exists\, m \in Sensor,\, s \in Sector : Signal(m,\, s) \end{aligned}$$

$Spec \triangleq Init \wedge \quad \Box[Next]_{\langle keyPresses,\, armed,\, bocina \rangle}$

THEOREM $Spec \Rightarrow \Box TypeInv$

* Modification History
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