

SOEN331: Introduction to Formal Methods for Software Engineering

Assignment 1 on extended finite state machines

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1 Room temperature control formal specification

The EFSM of the room temperature control is the tuple $S = (Q, \Sigma_1, \Sigma_2, q_0, V, \Lambda)$, where

$Q = \{idle, warmup, configuration\}$

$\Sigma_1 = \{shutoff, setup, interrupt, after(3min), after(2min), after\ 1\ min\ inactive, cancel, completed\}$

$\Sigma_2 = \{fan\ on, fan\ off, furnace\ on, furnace\ off, prolonged\ beep\ sound, double\ beep\ sound\}$

$q_0 : idle$

$V : \{C, T, D, Tf\}$

Λ : Transition specifications

1. $\rightarrow idle$
2. $idle \xrightarrow{\text{shut off/ (fan off ; furnace off)}} off$
3. $idle \xrightarrow{\text{after(2min)}[C \geq D]} idle$
4. $idle \xrightarrow{\text{after(2min)}[C \leq D-1] / (fan off ; furnace on)} warm\ up$
5. $idle \xrightarrow{\text{setup}} configuration$
6. $warm\ up \xrightarrow{\text{after(3min)}[T.F < D+1]} warm\ up$
7. $warm\ up \xrightarrow{\text{after(3min)}[T.F \geq D+1]} idle$
8. $warm\ up \xrightarrow{\text{interrupt/furnace off}} configuration$

9. *configuration* $\xrightarrow{\text{after 1 min inactive}}$ *idle*
10. *configuration* $\xrightarrow{\text{cancel/prolonged beep sound}}$ *idle*
11. *configuration* $\xrightarrow{\text{completed/double beep sound}}$ *idle*

The UML state diagram is shown in Figure ??.

The EFSM of the configuration is the tuple $S = (Q, \Sigma_1, \Sigma_2, q_0, V, \Lambda)$, where

$$Q = \{input, add, override, exit\}$$

$$\Sigma_1 = \{after(1min)\}$$

$$\Sigma_2 = \{\}$$

$$q_0 : input$$

$$V : triplet$$

Λ : Transition specifications

1. $\rightarrow input$
2. *input* $\xrightarrow{\text{register}[triplet \text{ does not exist}]}$ *add*
3. *input* $\xrightarrow{\text{register}[triplet \text{ exist}]}$ *override*
4. *add* $\xrightarrow{\text{repeat}}$ *input*
5. *override* $\xrightarrow{\text{repeat}}$ *input*

The UML state diagram is shown in Figure ??.

2 UML state diagrams

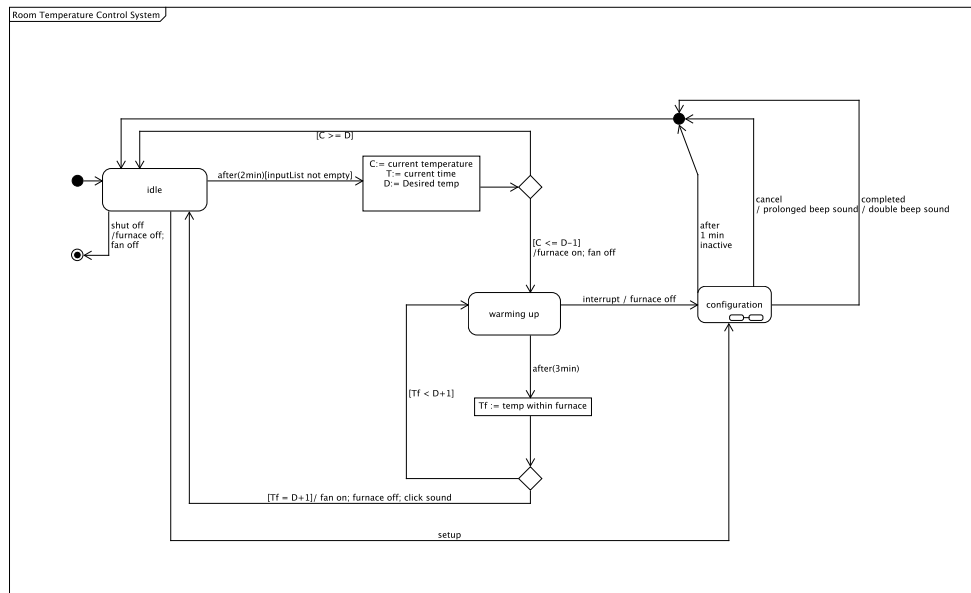


Figure 1: Room Temperature Control System UML State Diagram

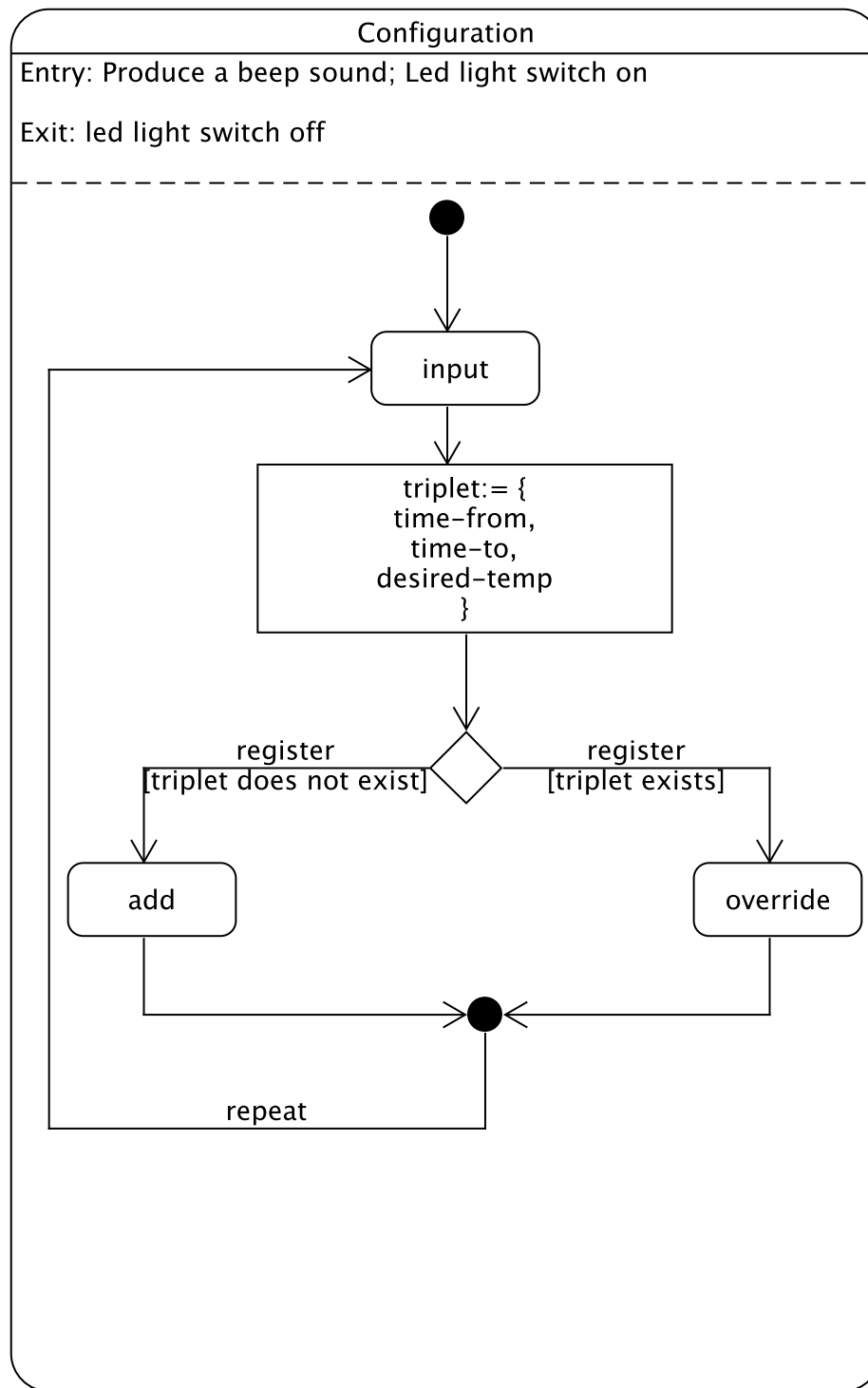


Figure 2: Configuration UML State Diagram