SOEN331: Introduction to Formal Methods for Software Engineering
Assignment 2 on Extended Finite State Machines

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1 Driver-less car system formal specification

The EFSM of the driver-less car system is the tuple $S = (Q, \Sigma_1, \Sigma_2, q_0, V, \Lambda)$, where

$Q = \{idle, parked\ mode, manual\ mode, cruise\ mode, marked\ mode, panic\ mode\}$

$\Sigma_1 = \{start, cruise\ signal, switch, arrived, unforseen, panic\ off, off\}$

$\Sigma_2 = \{lock, unlock, beep\}$

$q_0 : idle$

$V : destination = \{set, no\}$

Λ: Transition specifications

1. $\rightarrow idle$
2. $idle \xrightarrow{\text{start}} parkedmode$
3. $parked\ mode \xrightarrow{\text{off}} off?$
4. $parked\ mode \xrightarrow{\text{cruise signal [no dest]}} manual\ mode$
5. $parked\ mode \xrightarrow{\text{cruise signal [set dest] / beep}} cruise\ mode$
6. $manual\ mode \xrightarrow{\text{cruise signal [set dest]}} cruise\ mode$
7. $cruise\ mode \xrightarrow{\text{switch}} manual\ mode$
8. $cruise\ mode \xrightarrow{\text{arrived}} parked\ mode$
9. $cruise\ mode \xrightarrow{\text{unforseen}} panic\ mode$
10. $manual\ mode \xrightarrow{\text{stop}} marked\ mode$
11. $panic\ mode \xrightarrow{\text{panic off / hazard off}} manual\ mode$

The Manual mode is a composite state, it is the tuple $S = (Q, \Sigma_1, \Sigma_2, q_0, \Lambda)$, where

$Q = \{running, fast, slower, break\ mode\}$

$\Sigma_1 = \{accelerate, decelerate, break\}$

$\Sigma_2 = \{increase\ speed, decrease\ speed, 0 - speed\}$

$q_0 : running$

Λ: Transition specifications

1. $\rightarrow running$

2. $running \xrightarrow{\text{accelerate / increase speed}} faster$
3. $running \xrightarrow{\text{decelerate / decrease speed}} slower$
4. $running \xrightarrow{\text{break / 0-speed}} breakmode$
5. $breakmode \xrightarrow{\text{accelerate / increase speed}} running$
6. $faster \xrightarrow{\text{accelerate / increase speed}} faster$
7. $faster \xrightarrow{\text{decelerate / decrease speed}} slower$
8. $slower \xrightarrow{\text{decelerate / decrease speed}} slower$

The UML state diagram is shown in Figure 2.

2 UML state diagrams

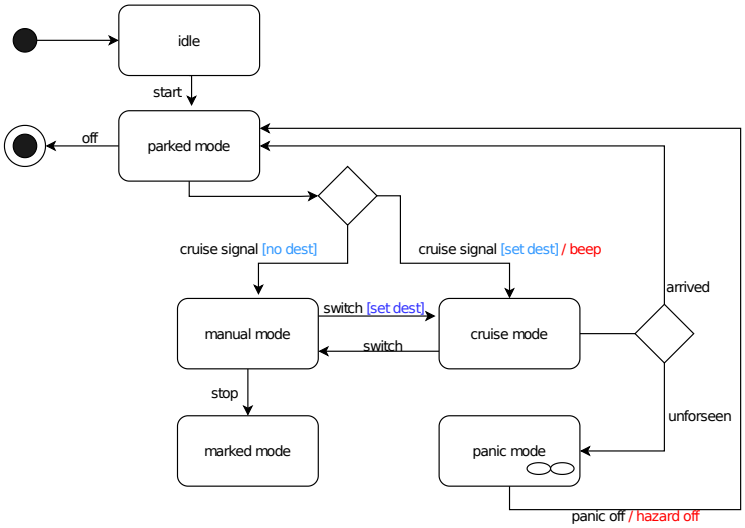

Figure 1: Main System.

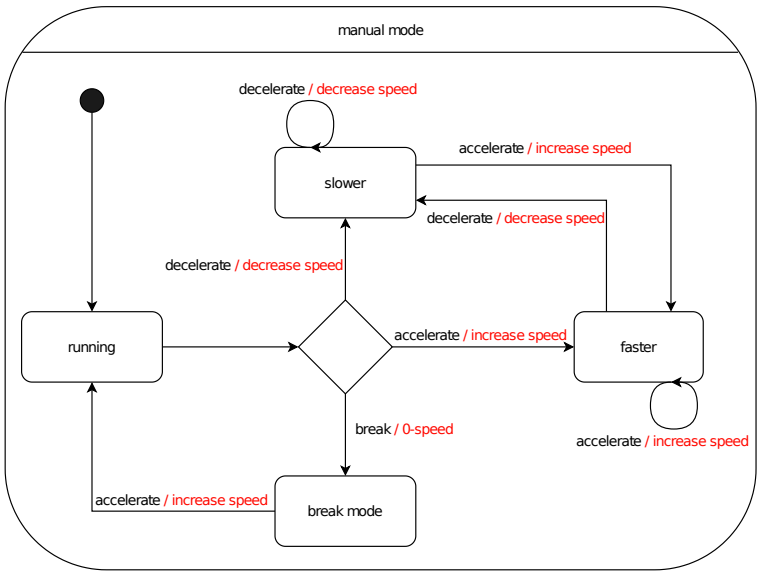

Figure 2: Manual Mode.