SOEN331: Introduction to Formal Methods for Software Engineering
Assignment 3 on extended finite state machines

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1 General information

Date posted: 14 March, 2017.
Date due: 29 March by midnight.
Weight: 10% of the overall grade.

2 Introduction

This assignment can be done individually or in pairs.

3 Assignment - Part 1

There are two exercises in this assignment, taken from the textbook [Alagar and Periyasamy "Specification of Software Systems" (2nd ed., Springer, 2011)].

Exercise 1: Home heating system

A home-heating system consists of a furnace, a thermostat, and a fan for blowing air. Temperature control is distributed, so that every room has a controller to maintain its temperature. When the temperature in a room goes below $t_r - 2$, where t_r is the desired room temperature, the furnace is turned on.

When the temperature in the furnace reaches a certain limit T, the furnace is shut off and the fan starts blowing the hot air.

The thermostat registers and monitors the room temperature. When the room temperature reaches $t_r + 2$, the furnace is shut off.

The fan runs until the furnace temperature falls to $T - 5$. Assuming that $t_r + 2 \geq T$, give an EFSM specification for the system.

Exercise 2: Arbiter

Arbiter is a mechanism for allocating resources efficiently in concurrent systems. The purpose of this exercise is to model an arbiter which allocates resources to two processes P and Q in such a way that every process eventually gets the requested resource. The following constraints apply for resource sharing between processes:

- R is a finite set of resources.
- for $r \in R$ there exists $t_r \in \mathbb{N}$, denoting the maximum utilization time.
- a process can request the arbiter for any resource in R.
- arbiter will accept all requests from P and Q.
- every resource requested by a process should be allocated to it by the arbiter.
- a process which received a resource r at time t must return it to the arbiter before time $t + t_r$.

4 What to submit

Your solution has to include both state diagrams and formal specifications. Prepare a single LaTeXdocument with the solutions for the above exercises (state diagrams and formal specifications), and produce a pdf file. Submit under **Theory Assignment 3**. In the case of joint work, only one of you would need to submit.

5 Assignment - Part 2

On model checking with UPPAAL. Will be posted on March 16

6 Late submissions

Any late submission within the first 24 hours will get a 50% penalty and it will subsequently receive a 10% penalty per day.