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Wintersemester 2014/15

Software Design, Modeling, and Analysis in UML

http://swt.informatik.uni-freiburg.de/teaching/WS2014-15/sdmauml

Exercise Sheet 7

Early submission: Monday, 2015-02-09, 12:00 Regular submission: Tuesday, 2015-02-10, 8:00

Exercise 1 (3/20 Points)

Consider the hierarchical state machine from the last exercise sheet as shown in Figure 1.

(i) There is an edge from state s_6 to s_8 coloured in blue. Is it legal? (2)

(ii) If yes, what is (roughly) it's effect? If no, do you have an intuition why not? (1)

Exercise 2 (10/20 Points)

Consider the hierarchical state machine from the last exercise sheet as shown in Figure 1.

(i) What *may* happen when dispatching E in the configuration uniquely determined by $\{s_1, s_5\}$? (4)

(ii) What if "first E then F" (from the same configuration)? (4)

(iii) Can "first E, then G" kill the executing object? (2)

Note that this task has two equally important aspects: coming up with the answers and presenting the answers. We've used a couple of different forms to note down what a state-machine does in the lecture and considered different levels of detail. With all lectures on state machines as background, which one do you find most appropriate for this task?
Further note that by the context of the lecture, you're now well after the state of "educated guess" but are able to give exact *and* complete *answers and justify their correctness. Please do so. Explain in particular why the things you claim may happen and why no other.*

Exercise 3 (10 + 5 Bonus/20 Points)

Back to the Wireless Sensor Network. The specification of the sensor behaviour has been refined as follows:

- While doing the LZ and Ack communication, the sensor should be in a state *lzactive* and otherwise in *lzidle*.
- The time indicator signal T should be used for the move from *lzidle* to *lzactive*, the move back should happen after the LZ/Ack communication is done.
- Users should always be able to do a diagnostic self test by pressing some dedicated button.

  There should be a corresponding self-test state which can even be reached during LZ and Ack, and which, by a commence step, directly returns to the configuration before.

(i) Extend your model in a well-readable way such that its behaviour corresponds to the refined specification given above. (7)

Hint: in order to obtain a "well-readable" model, make appropriate used of hierarchical states and pseudo-states like final or history states.

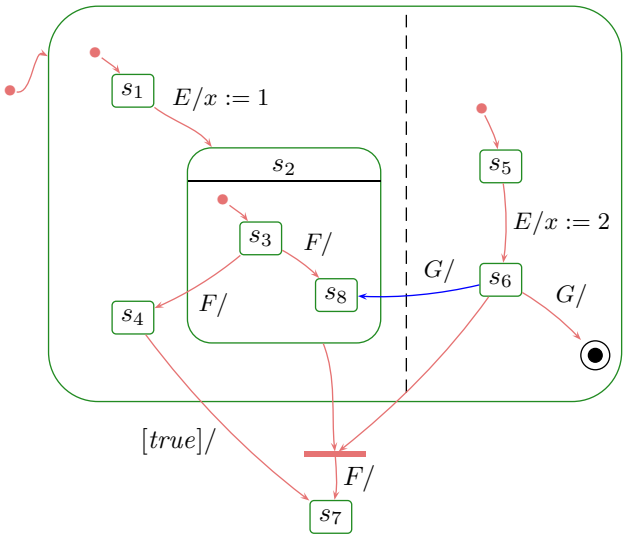

Figure 1: Hierarchical State Machine.

(ii) Convince your readers that your model's behaviour indeed corresponds to the refined specification. (3)

Hint: (recorded) sequence diagrams can support a description; they show that at least some "good" scenarios are possible in your model.

(iii) The master designer wants to make the blinking behaviour a bit more independent from the LZ/Ack cycle. She thinks about introducing an AND-state with a region for blinking and one region for the LZ/Ack cycle, which should (of course) still trigger the blinking.

Turn this rough sketch into a working model, explain your design decisions, and discuss benefits and drawbacks of your design. (5 Bonus)

Exercise 4 (10 Bonus)

This season, we for lack of time did not extensively discuss "when is a diagram a good diagram". In previous seasons we did, e.g. in Lecture 10 of the 2013/14 season. The annotated slides are still available on:

`http://swt.informatik.uni-freiburg.de/teaching/WS2013-14/sdmauml`

Consider the slides and, if you want to, the corresponding recording. For design guidelines on class diagrams, we referred to [Ambler, 2005] then, who provides guidelines in the form:

⟨ **catchy "do" or "don't"** ⟩
⟨ rationale; possible exceptions ⟩

(like the classical "Elements of Style" by Strunk & White).

Give design guidelines for UML state machines in this form.

Hint: Assume you're supervising a group of modellers and you only have the time and space that's typically worth 10 exercise points to spend. On which guidelines would you spend the precious resources?
Clear: you want to name (and appropriately cite) all sources you base your proposal on if they exceed the lecture and your own thoughts.

References

[Ambler, 2005] Ambler, S. W. (2005). *The Elements of UML 2.0 Style*. Cambridge University Press.