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**Software Design, Modeling, and Analysis in UML**

<http://swt.informatik.uni-freiburg.de/teaching/WS2012-13/sdmauml>

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Exercise Sheet 7

Early submission: Monday, 2013-02-11, 12:00    Regular submission: Tuesday, 2013-02-12, 10:00

**Exercise 1** **(5/10 Points)**

Consider the inheritance hierarchy in Figure 1(a). Assume the *late binding* approach for choosing the implementation of behavioural features and assume that in the model only  $C_0$  has a state-machine which is given by Figure 1(b). Then sending an  $E$ -event to an instance of class  $C_3$  would use the implementation of  $f()$  provided by  $C_2$ .

Describe in words how the “right” implementation is selected and formalise this selection principle assuming complete signatures including the inheritance relation “ $\triangleleft$ ” and the set-inclusion semantics, i.e.,

$$C \triangleleft C' \iff \mathcal{D}(C') \subsetneq \mathcal{D}(C).$$

**Exercise 2** **(5/10 Points)**

Consider the State Machine from Figure 1(b).

- (i) Explain how the State Machine can be seen as an instance of the UML meta-model as given in Section 15 of [OMG, 2007]. (3)
- (ii) Choose one of the constraints applying to pseudostates (cf. Section 15.3) and prove that the State Machine satisfies it (and thus, that the State Machine is well-formed regarding that condition). (2)

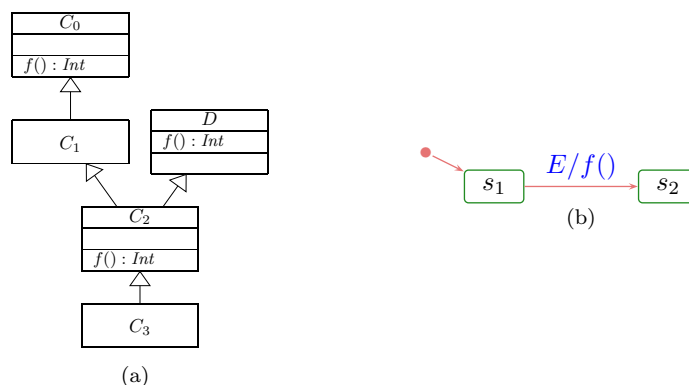


Figure 1: Inheritance Hierarchy and State Machine of  $C_3$ .

### Exercise 3

(10/20 Points)

Recall Exercise 5.3 which asked for a Rhapsody model of a level crossing system. Please mail your tutor<sup>1</sup> for the assignment of one of the submissions of your colleagues (made anonymous, of course).

Assess (the non-functional) quality and the correctness of the model you're assigned. (10)

*Hint:*

- (i) Describe briefly (in your own words) what you've obtained.  
*What is provided by the authors with what intention? Is it adequate for you to understand the model? What is good? What is unclear? Does the model build and run within Rhapsody?*
- (ii) Describe (in your own words) which requirements the authors address.  
*Discuss: are they adequate (why/why not)? Is something missing? Is something too detailed?*
- (iii) Pick at least the safety requirement from Exercise Sheet 4 and assess the model you've obtained for whether the requirement is satisfied or not.  
*If you think that it holds, than provide as many recorded sequence diagrams as needed to make plausible to the tutors why you do think that. Otherwise, provide a counterexample.*
- (iv) What do you like about the overall solution (colour, shape, presentation, architecture, modelling, ..., everything)? Why? What don't you like? Why? (A canonical "why": because it violates a modeling guideline which you can name and because it has the effect which the modeling guideline should avoid.)

*If the model is not executable, please try to fix it given the experience from your own model. In case of unclear points, act in "good-will" mode. If you really get stuck, ask your tutor for help (he will pass questions on to the original authors). If you like, you can also sketch the consequences that a "bad-will" review would have.*

### References

[OMG, 2007] OMG (2007). Unified modeling language: Superstructure, version 2.1.2. Technical Report formal/07-11-02.

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<sup>1</sup>Mail to plakue with the usual informatik.uni-freiburg.de suffix.