Bachelor/Master Thesis: Comparing ABS and B on Real World Specifications

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Context

Formal methods are established for in railway engineering for software development and system modeling. Current approaches for system modeling are realized mostly in the B-method [1] or related approaches like Alloy, which have been established for railway system since the early 90s.

Recently, system modeling approaches from software engineering, e.g. ABS or KeYmaera X, have been applied to railways and gave promising results. The **A**bstract **B**ehavior **S**pecification Language (ABS)[2] was developed to model distributed software systems, with a focus on resources analysis, usability and verifiablity, but has been applied in further domains for system modeling as computational biology, logistics and memory models.

To compare the software-based approaches to the B-method in other domains, this thesis is supposed to model case studies already finished in B in ABS. The case studies are real world safety-critical systems used to compare different modeling approaches published by the ABZ conference [1] series. The most current one is the Hybrid ETCS L3 case study which is based on real world specifications for a new mode of railway operations on a more abstract level than the current ABS railway operation model [3].

Thesis

The aim of the thesis is to evaluate ABS as a modeling language for one ABZ case study. The student is expected to learn ABS, choose and implement one of the ABZ case studies in ABS and discuss the effect of ABS design choices on the modeling process. If the topic is chosen as a Master thesis, the student either chooses a second case study or verifies safety properties of the first case study with the ABS toolkit.

Approximate Work Distribution

Analysis
Programming
Literature

References

[1] J.-R. Abrial, *The B-book: Assigning Programs to Meanings*. New York, NY, USA: Cambridge University Press, 1996.

[2] R. Hähnle, "The abstract behavioral specification language: A tutorial introduction," in *Proc. Formal Methods for Component-Based Systems (FMCO)*, 2012.

[3] E. Kamburjan and R. Hähnle, "Uniform modeling of railway operations," in *Fifth Intl. Workshop on Formal Techniques for Safety-Critical Systems (FTSCS)*, 2016.

[1] https://www.southampton.ac.uk/abz2018