

Context-aware Automatic Test Execution Management for Automated System-level Testing

Bachelor's Thesis

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Starting date: Any time



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Application:

Please apply via email to claudius.jordan@tum.de. Your email should explain your interest in the topic and contain your current transcript of records. The most promising candidates will be invited for an informal interview. Upon mutual agreement, the thesis will be performed in cooperation with TraceTronic GmbH.

Context

Despite the high degree of automated test execution in the automotive domain, the complex nature of nowadays Hardware-in-the-loop test benches (HiL) for system-level testing still poses challenges to test automation practitioners. Planning the test execution, i.e. prioritizing and dispatching tests, still involves much manual effort. In order to reduce the manual labor involved in planning an automated test execution management solution has been implemented as a prototype. The prototype is based on an open source AI constraint solver, which requires practitioners to have a thorough understanding and involves significant efforts before it can be applied to their specific projects.

Goal

The goal of this thesis is two-fold; (a) to make the existing prototype easier accessible to practitioners and (b) to investigate room for improvement. Therefore, the prototypes suitability should be evaluated for various projects at our industry partner. This should result in applying the prototype in at least two projects. At the same time, potential for test automation process improvements should be investigated. Overall, this thesis aims to enhance the capabilities of automatic test execution management at our industry partner.

Working Plan

1. Familiarize with different project settings at our industry partner
2. Familiarize with the literature on Optimal Test Scheduling (OTS) (e.g. [2]) and Test Case Prioritization (TCP) (e.g. [4, 3]), in general.
3. Familiarize with the literature on Test Automation Improvement (e.g. [1])
4. Familiarize with the existing prototype
5. Write the exposé
6. Extend the prototype to ensure easier reuse and applicability for various different projects at our industry partner.
7. Carve out the open challenges for the adoption of the prototype in the concrete real-world setting.
8. Write the thesis report

Deliverables

- Exposé (about 6 weeks after kick-off)
- Source code of the implementation.
- Technical report with comprehensive documentation of the implementation, i.e. design decision, architecture description, API description and usage instructions.
- Final thesis report written in English and in conformance with TUM guidelines
- Presentation of the work at the chair (2-3 weeks after submission)

References

- [1] Sigrid Eldh. "Test Automation Improvement Model - TAIM 2.0". In: *2020 IEEE Int. Conf. Softw. Testing, Verif. Valid. Work.* IEEE, Oct. 2020, pp. 334–337.
- [2] Morten Mossige et al. "Time-Aware Test Case Execution Scheduling for Cyber-Physical Systems". In: *Int. Conf. Princ. Pract. Constraint Program.* Cham: Springer International Publishing, 2017, pp. 387–404.
- [3] Seung Yeob Shin et al. "Test case prioritization for acceptance testing of cyber physical systems: a multi-objective search-based approach". In: *Proc. 27th ACM SIGSOFT Int. Symp. Softw. Test. Anal.* New York, NY, USA: ACM, July 2018, pp. 49–60.

- [4] Per Erik Strandberg et al. "Experience Report: Automated System Level Regression Test Prioritization Using Multiple Factors". In: *2016 IEEE 27th Int. Symp. Softw. Reliab. Eng.* Ottawa, ON, Canada: IEEE, Oct. 2016, pp. 12–23.



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