

## Master's Thesis Specification



Student: **Harmim Dominik, Bc.**

Programme: Information Technology and Artificial Intelligence

Specialization: Software Verification and Testing

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Title: **Advanced Static Analysis of Atomicity in Concurrent Programs through Facebook Infer**

Category: Software analysis and testing

Assignment:

1. Study limitations of the atomicity analyser Atomer developed in your bachelor thesis as well as the latest developments concerning the Facebook Infer framework.
2. Propose ways of significantly improving precision and/or scalability of the analysis even if for the price of the user providing more input and/or combining it with dynamic analysis.
3. Implement a new version of Atomer including the proposed improvements and supporting analysis of programs written in more programming languages than just C supported by the first version of Atomer.
4. Evaluate the new version of Atomer on suitable benchmarks, including at least real-life code in which some atomicity problems were previously detected.
5. Describe and discuss the achieved results and their further possible improvements.

Recommended literature:

1. Rival, X., Yi, K.: Introduction to Static Analysis: An Abstract Interpretation Perspective. MIT Press, 2020.
2. Blackshear, S., Gorogiannis, N., O'Hearn, P. W., Sergey, I.: RacerD: Compositional Static Race Detection. In: Proc. of OOPSLA'18, PACMPL 2(OOPSLA):144:1-144:28, 2018.
3. Gorogiannis, N., O'Hearn, P.W., Sergey, I.: A True Positives Theorem for a Static Race Detector. In: Proc. of POPL'19, PACMPL 3(POPL):57:1-57:29, 2019.
4. Dias, R.J., Ferreira, C., Fiedor, J., Lourenço, J.M., Smrčka, A., Sousa, D.G., Vojnar, T.: Verifying Concurrent Programs Using Contracts, In: Proc. of ICST'17, IEEE, 2017.
5. Harmim, D.: Static Analysis Using Facebook Infer to Find Atomicity Violations. Bachelor thesis, Brno University of Technology, 2019.
6. Marcin, V.: Static Analysis Using Facebook Infer Focused on Deadlock Detection. Bachelor thesis, Brno University of Technology, 2019.

Requirements for the semestral defence:

- Item 1 and at least some development falling under items 2 and 3 of the assignment.

Detailed formal requirements can be found at <https://www.fit.vut.cz/study/theses/>

Supervisor: **Vojnar Tomáš, prof. Ing., Ph.D.**

Head of Department: Hanáček Petr, doc. Dr. Ing.

Beginning of work: November 1, 2020

Submission deadline: May 19, 2021

Approval date: November 11, 2020