
Bachelor/Master Thesis Topic

Statistical Methods for Memory Leak Detection via Regression Testing

Motivation and Background

Memory leaks are latent defects triggering memory depletion during runtime. They are usually caused by forgetting to free allocated heap space (C/C++) or to remove all references to obsolete objects (Java). They frequently escape software testing during development and are discovered in a production scenario, creating high costs [1]. An approach to detect memory leaks early is to compare subsequent software versions under development in terms of their memory usage. This variant of regression testing indicates potential leaks by detecting anomalous memory allocation behavior of the current software version [2] compared to some previous version. The approach requires suitable statistical methods to detect anomalies as early as possible [3] under required confidence levels.

Goals

This project will evaluate and refine approaches for memory leak detection based on sequential testing and anomaly detection methods, and compare the methods on data from a real application.

Description of the Task

The specific tasks are:

- Understand the version comparison approach and relevant statistical methods
- Instrument a Java or C/C++ application for heap usage monitoring and leak injection
- Perform an evaluation and comparison of statistical methods based on experimental data.

Research Type

Theoretical Aspects:

Industrial Relevance:

Implementation

Prerequisite

The student should be enrolled in the bachelor/master of software engineering/informatics program, and has completed the required course modules to start a bachelor/master thesis.

Skills required

Programming skills in Java or C++, understanding of, or willingness to learn, the statistical methods and testing foundations needed for the project.

References

[1] Amazon AWS, "Summary of the October 22,2012 AWS Service Event in the US-East Region" (2012), <http://aws.amazon.com/message/680342/>

[2] Rivalino Matias, Artur Andrzejak, Fumio Machida, Diego Elias and Kishor Trivedi: A Systematic Approach for Low-Latency and Robust Detection of Software Aging, SRDS 2014, Nara, Japan, 2014.

[3] Amin A., Colman A., and Grunske L., Statistical Detection of QoS Violations Based on CUSUM Control Charts, ACM ICPE, 2012, pp. 97-108

Contacts

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Application

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