Master Thesis Topic
Fault Localization and Debugging with Probabilistic Slicing

Motivation and Background

Debugging, and specifically fault localization is usually a hard and tedious task in software development, because the potential causes (faults) for a failure could be in a number of code-lines. To reduce the potential lines of code, slicing (forward and backward) [1] is commonly used to reduce the potential relevant lines of code. Still after slicing the number of potential lines of code could be very high. As a result, techniques are required to guide programmers to find potential faults after slicing operation have been executed.

Goals

The goal of the research is to create a technique to provide a dynamic probabilistic slicing approach [2,3,4] and use this technique for debugging and fault localization.. This technique shall be scientifically validated with industrial data sets and tool support shall be provided to use the technique and visualize the results

Description of the Task

The task of the thesis is:
- to develop and implement a probabilistic slicing technique.
- To apply this technique to the problem of debugging and fault localization, and
- to scientifically validate the new approach with versions and fault data of existing software systems, (mined from open source software repositories)

Research Type

Theoretical Aspects:	★★★★☆
Industrial Relevance:	★★☆☆☆
Implementation	★★★★☆

Prerequisite The student should be enrolled in the master of software engineering or master of computer science program, and has completed the required course modules to start a master thesis.

Skills required The student should have or be willing to acquire the following skills: knowledge in statistical program analysis as well as debugging and fault localization techniques to select the appropriate techniques for the research in this thesis project. The student shall have also programming skill in Java:

References

[1] M. Weiser, "Program slicing," IEEE Trans. on Softw. Eng., vol. 10, no. 4, pp. 352–357, 1984.

[2] R. Santelices and M. J. Harrold, "Probabilistic slicing for predictive impact analysis," Tech. Rep. CERCS-10-10, Georgia Tech, Nov. 2010.

[3] G. Baah, A. Podgurski, and M. Harrold, "The probabilistic program dependence graph and its application to fault diagnosis," IEEE TSE, vol. 36, no. 4, pp. 528–545, 2010.

[35] R. Santelices, Y. Zhang, S. Jiang, H. Cai, and Y. jie Zhang. "Quantitative Program Slicing: Separating Statements by Relevance". In Proc. of Int'l Conf. on Softw. Eng., New Ideas and Emerging Results, pages 1269–1272, May 2013.

Contacts

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Application Please contact me during my office hours or write an email with the title: "[Thesis]-Probabilistic Slicing" to se-career@informatik.hu-berlin.de