



Software Engineering Seminar

Automated Program Synthesis

Description

Program synthesis is a foundational technique for automated program repair (APR). There are basically two types of program synthesis – *inductive* program synthesis [2] and *deductive* program synthesis [4], of which the former is more widely applied in the APR field [6]. One example of the inductive program synthesis is the oracle-guided component-based approach [3] which is utilized in the state of the art APR tool ANGELIX [5]. There also exist other program synthesis techniques such as *condition-based synthesis* [7] and *syntax-guided synthesis* [1].

The student should examine and discuss the current state-of-art automated program synthesis techniques.

References

- [1] R. Alur, R. Bodik, G. Juniwal, M. M. K. Martin, M. Raghothaman, S. A. Seshia, R. Singh, A. Solar-Lezama, E. Torlak, and A. Udupa. Syntax-guided synthesis. In *2013 Formal Methods in Computer-Aided Design*, pages 1–8, Oct 2013.
- [2] Martin Hofmann, Andreas Hirschberger, Emanuel Kitzelmannn, and Ute Schmid. Inductive synthesis of recursive functional programs. In Joachim Hertzberg, Michael Beetz, and Roman Englert, editors, *KI 2007: Advances in Artificial Intelligence*, pages 468–472, Berlin, Heidelberg, 2007. Springer Berlin Heidelberg.
- [3] Susmit Jha, Sumit Gulwani, Sanjit A. Seshia, and Ashish Tiwari. Oracle-guided component-based program synthesis. In *Proceedings of the 32Nd ACM/IEEE International Conference on Software Engineering - Volume 1*, ICSE '10, pages 215–224, New York, NY, USA, 2010. ACM.
- [4] Zohar Manna and Richard Waldinger. A deductive approach to program synthesis. *ACM Trans. Program. Lang. Syst.*, 2(1):90–121, January 1980.
- [5] Sergey Mehtaev, Jooyong Yi, and Abhik Roychoudhury. Angelix: Scalable multiline program patch synthesis via symbolic analysis. In *Proceedings of the 38th International Conference on Software Engineering*, ICSE '16, pages 691–701, New York, NY, USA, 2016. ACM.
- [6] Martin Monperrus. Automatic software repair: A bibliography. *ACM Comput. Surv.*, 51(1):17:1–17:24, January 2018.
- [7] Yingfei Xiong, Jie Wang, Runfa Yan, Jiachen Zhang, Shi Han, Gang Huang, and Lu Zhang. Precise condition synthesis for program repair. In *Proceedings of the 39th International Conference on Software Engineering*, ICSE '17, pages 416–426, Piscataway, NJ, USA, 2017. IEEE Press.

Contacts

Minxing Tang (tanminxi@informatik.hu-berlin.de)
Software Engineering Group
Institut für Informatik
Humboldt-Universität zu Berlin