

Synthesis of polymorphic digital circuits

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Abstract

The subject of my report will preview on the synthesis conventional and polymorphic circuits. For the synthesis of logic circuits are commonly used various techniques, such as different types of Binary Decision Diagram (BDD), or Boolean Expression Diagram (BED) [1]. The Directed Acyclic Graphs (DAG) structure, which can be binary trees, is used for the visualization [2].

Nowadays, there is a rapid development of polymorphic circuits, it means circuits which can change their function depending on some input conditions (a change of supply voltage, temperature, etc.). However for their synthesis, effective tools still do not exist. There are various methods used for such a synthesis (evolutionary algorithms) [3], for example Cartesian generic programming (CGP), or PolyBDD.

First, we focus on the current state and also introduce binary decision diagrams to the students, including optimization methods (Ordered BDD, Reduced Ordered BDD) and their implementation. We will also look at binary trees that represent certain digital circuit diagram. Next, we focus on polymorphic circuits, what are their advantages and why it is not possible to use standard methods for their synthesis. Then briefly outline the methods used for polymorphic circuits synthesis. In conclusion, I will focus on other options which could be implemented and the possibility of their representation.

References

- [1] *Combinational Logic-Level Verification using Boolean Expression Diagrams*, Henrik Hulgaard, et al., Technical University of Denmark
- [2] *Compact Binary Tree Representation of Logic Function with Enhanced Throughput* Padmanabhan Balasubramanian, Cemal Ardil, International Journal of Computer and Information Engineering 1:2 2007
- [3] *Biologíí inspirovaný vývin jako technika evolučního návrhu* Michal Bidlo, FIT VUT Brno, 2007