Conversion of And-Inverter-Graphs into Majority-Inverter-Graphs

TECHNISCHE UNIVERSITÄT DARMSTADT

Low Level Synthesis: Mini Tasks Round 1
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1 Basis

A set of minimized And-Inverter-Graphs (AIGs) is provided in the AIGER format. To get more examples, the tool ABC[1] can be used.

Utilities for the AIGER file format can be found on the authors web page[2]. For example the tool "aigtoaig" offers a conversion between binary and ASCII AIGER.

2 Task

Implement the method for converting AIGs to Majority-Inverter-Graphs (MIGs) described in the literature. The algorithm consists of two steps: a simple conversion, where each AND gate is mapped to a Majority gate with unused inputs. Then, the MIG is optimized using a subset of the Boolean Algebra.

The resulting program has to be able to read AIGs in the AIGER format and write MIGs in the BLIF format. The internal representation of the graphs can be chosen freely. We suggest Java as the programming language to be used.

To evaluate the implementation, an equivalence check of the AIGs and the resulting MIGs shall be performed with ABC. Furthermore, the number of nodes shall be compared between the two representations.

3 Literature

The concept of MIGs and the conversion algorithm is described in a paper by Amarú et al.[3]. A documentation of ABC can be found online[4]. The AIGER format is described on the authors web page[5].

4 Formality

A short report (4-10 pages) should be written as explained in the presentation of the mini tasks. A hand in is expected including all files, evaluation and test data, the report as well as all other relevant documents and files. Moreover, a presentation of 10 minutes should be given.

[1] executables of ABC can be found in Moodle, for the sources see: https://github.com/berkeley-abc/abc
[2] http://fmv.jku.at/aiger/
[3] https://ieeexplore.ieee.org/document/6881521
[4] https://people.eecs.berkeley.edu/~alanmi/abc/
[5] http://fmv.jku.at/aiger/FORMAT

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