

Abstract for International Competition on Graph Counting Algorithms

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1 Programs

This program consists of three main components: the first is a simple counting program (SimpleCount), the second is an XCC-based program (xcc), and the last is a TdZdd-based program (tdzdd). This program runs those components in parallel and outputs the results of the program that solved first. The details of the component are described below.

1.1 SimpleCount

Niu et al. proposed a bounding algorithm for computing two-terminal network reliability[1]. We modified their exact algorithm, which calculates network reliability, into an algorithm counting the number of paths. Additionally, we added the a path length constraint to the algorithm.

1.2 xcc

We converted s-t path counting with path length constraints to Exact Cover with Color (XCC) [3] and used xcc-solver to obtain the solution. We used aaw's cover¹ as XCC solver.

1.3 tdzdd

We used TdZdd [2]², which is a C++ library for manipulating decision diagrams. We added a path-length constraint to a sample program of s-t path counting in TdZdd.

References

- [1] Y. feng Niu and F.-M. Shao. A practical bounding algorithm for computing two-terminal reliability based on decomposition technique. *Computers and Mathematics with Applications*, 61(8):2241–2246, 2011. Advances in Nonlinear Dynamics.
- [2] H. Iwashita and S.-i. Minato. Efficient top-down zdd construction techniques using recursive specifications. *Hokkaido University Division of Computer Science TCS Technical Report TCS-TR-A-13-69*, 2013.
- [3] D. E. Knuth. *The art of computer programming, Volume 4, Fascicle 5: Mathematical Preliminaries Redux; Introduction to Backtracking; Dancing Links*. Addison-Wesley Professional, 2019.

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¹<https://github.com/aaw/cover> accessed on 2023/7/18

²<https://github.com/kunisura/TdZdd> accessed on 2023/7/18