

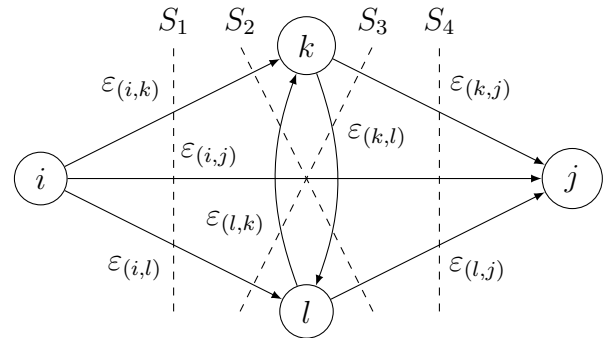
Thesis
M.Sc.

Guided
Research

A symbolic Fourier-Motzkin Solver

Motivation

We develop the Network Coding [1] implementation MOEP 802.11 [2]. For coded networks it is essential to compute the amount of transmissions each node has to make. This task reduces to a linear optimization problem, which can be represented as a system of linear inequalities. There are various different solvers that can solve such optimization problems in case they are concrete instances with actual numbers.



However, we want to solve them in the general case, i. e., in a symbolic manner. Therefore, the Fourier-Motzkin elimination seems to be a promising approach. Unfortunately, those problems have exponential complexity, and are already for a 4-node network nearly unsolvable by hand.

Your Task

- Evaluating existing open-source symbolic math frameworks, e.g. SageMath, SymPy
- Developing methods for case differentiation on symbolic terms
- Implementing a symbolic Fourier-Motzkin Solver

Prerequisites

- Good mathematical understanding
- Some open-source math framework, preferably Python-based (SageMath/SymPy)

References

- [1] Ahlswede et al. "Network information flow". IEEE Transactions on Information Theory 46.4 (July 2000)
- [2] <http://moep80211.net>
- [3] https://en.wikipedia.org/wiki/Fourier-Motzkin_elimination

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