



Master thesis No. 986

**Implementation and Evaluation of a Particle Swarm Optimization Algorithm for Multi-Layer Routing in WDM-Transport Networks**



**Methods**

Programming in Java

**Topics**

Multi-layer networks  
Artificial Intelligence

**Background**

Modern communication systems rely on optical transport networks with wavelength division multiplexing (WDM). Those networks have to transport huge amounts of data with volatile data rates. The network configuration (activated hardware and path routing) has to be reconfigured with fast algorithms to operate those networks in a cost-efficient way. The resource allocation and routing itself can be seen as a complex graph optimization problem in discrete space that can be solved with a particle swarm optimization (PSO) algorithm. A PSO algorithm is a stochastic, population-based optimization technique and belongs to the family of swarm intelligence computational techniques. At the moment we use for the network optimization simulated annealing (SA), which is a meta-heuristical approach. We expect, that with the use of PSO a speed-up in computation is possible. PSO is also well suited for parallel computation.

**Problem Description**

In this master thesis you will have to implement and evaluate a particle swarm optimization algorithm for an existing software, that is designed for the optimization of multi-layer transport networks. This work can be separated into the following steps:

- Literature research on discrete particle swarm optimization and familiarization with the existing multi-layer reconfiguration software.
- Implementation of the selected particle swarm optimization algorithm.
- Evaluation of the implemented PSO algorithm. Comparison with the already implemented simulated annealing.

**Aquired Knowledge and Capabilities**

You will learn to apply a generic algorithm on a real-life research problem. Thereby you will gain experience in programming within an large object-oriented software project. You will extend your knowledge on optical transport networks.

**Requirements**

Communication Networks II  
Programming Experience in Java

**Desirable knowledge**

Kommunikationsnetze I

**Contact**

M.Sc. Arthur Witt  
room 1.403 (ETI II), phone 685-69015, E-Mail arthur.witt@ikr.uni-stuttgart.de

M.Sc. Tobias Enderle  
room 1.402 (ETI II), phone 685-67992, E-Mail tobias.enderle@ikr.uni-stuttgart.de