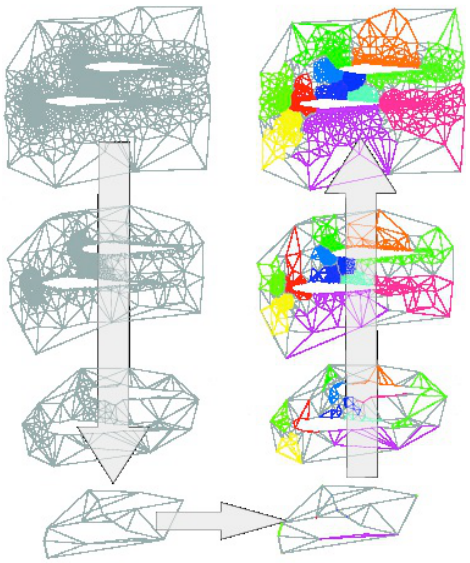
Institut für Theoretische Informatik
Forschungsgruppe Paralleles Rechnen
Juniorprof. Dr. Henning Meyerhenke

Bachelorarbeit:
Partitioning and Repartitioning using size-constrained label propagation and NetworKit

Background

During the coarsening phase of multilevel graph partitioning a hierarchy of increasingly coarse graphs is constructed on the graph to be partitioned. Typically, coarsening takes the form of merging adjacent vertices, an operation that can be performed through contracting the edge between the two vertices. Established multilevel graph partitioners such as *Metis* and *KaHIP* usually contract a matching of the graph on level *i* to generate the graph on level *i+1.* If the graphs to be partitioned are complex networks, however, the number of edges in these matchings is often very low, and the multilevel concept reaches its limits. As a remedy, a more aggressive coarsening scheme called *size-constrained label propagation* (SCLP) has been proposed. It is an adaptation of the label propagation algorithm (LPA) proposed by Ragvahan et al. for detecting communities in large social networks.



Tasks

- Extension of *NetworKit*, an open-source toolkit for high-performance network analysis developed at the research group, so as to be able to perform multilevel graph partitioning with SCLP-based coarsening, initial partitioning and refinement. This includes an overhaul of label propagation as currently implemented in *NetworKit.*
- Repartitioning with virtual vertices in *NetworKit.* An imbalanced partition is balanced through (i) redoing coarsening that respects partition, (ii) new initial partitioning using virtual vertices (a virtual vertex is connected to the vertices of the coarsest graph that belong to one old block), and (iii) usual refinement.
- Modification of the partitioner/repartitioner so that it minimizes the maximum communication volume instead of the edge cut.
- Experiments using *NetworKit* that evaluate the performance of the partitioner/repartitioner.

Requirements

Experience with algorithms and C++ .

Forschungsgruppe Paralleles Rechnen (http://parco.iti.kit.edu)
Juniorprof. Dr. Henning Meyerhenke
Kontakt: Juniorprof. Dr. Henning Meyerhenke
meyerhenke@kit.edu | Gebäude 50.34 Raum 281