Overview

Graph reordering is a powerful technique to increase the locality of the representations of graphs, which can be helpful in several applications. We want to study how the technique can be used to improve compression of graphs and inverted indexes. Recently, Dhulipala et. al proposed an algorithm that is based on recursive bisection paired with simple local search. It is an extension of the recent theoretical model of Chierichetti et al. (KDD 2009) for graph compression, and shows how it can be employed for compression-friendly reordering of social networks and web graphs and for assigning document identifiers in inverted indexes.

There is an important motivation for such studies: Web properties require high-speed indexes for serving adjacencies in the social network: thus, a typical query seeks the neighbors of a node (member) of a social network. Maintaining these indexes in memory demands that the underlying graph be stored in a compressed form that facilitates efficient adjacency queries.

The most simple graph compression approach is based on $\Delta$-Encoding which only stores the set differences in the neighborhoods of two consecutive node (given an ordering of the nodes). The more sophisticated approach by Dhulipala et. al is based on recursive graph bisection combined with local search that directly optimized an objective function relevant for the problem.

The main task of the thesis is to improve this approach by using more localized local search techniques or even $\pi$-level techniques. More localized local search techniques are known to compute solutions with much better objective functions. In turn, this will directly yield better orderings for compression.

Requirements

- Interest in algorithms and data structures
- Excellent programming skills in C++
- Ability to think for yourself

INFO: More topics available such as algorithm configuration.

Application deadline 31st October 2016