ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Institute of
Theoretical Computer Science

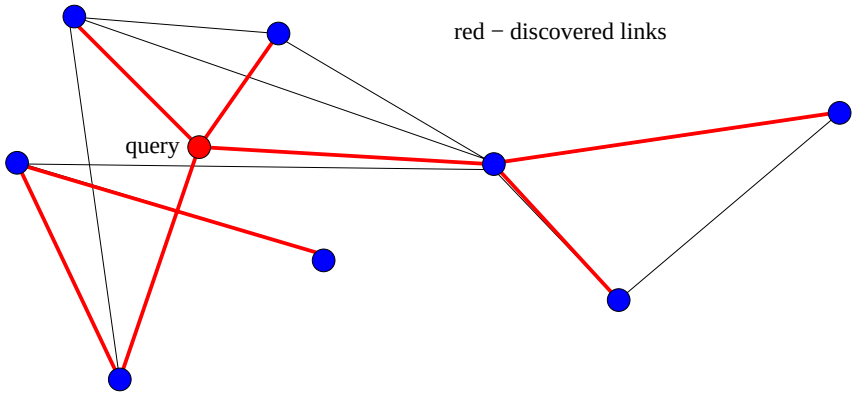
Semesterarbeit

Mapping the Internet

A fundamental problem in the study of complex large-scale networks is how to obtain accurate information about the topology of a network using a limited number of measurements or observations. Obtaining an accurate map is not trivial due to the network's dynamic growth process and limitations in accessing the network.

There are several attempts to capture the map of the Internet. A common approach is to inspect routing tables and paths stored in each router (passive measurement) or to directly investigate the network with a traffic-sending probe (active measurement). Many of the ongoing projects that attempt to map the Internet use this approach in heuristics to obtain (approximate) maps, basically by simply overlaying found paths.

The map is usually modeled as an undirected (connected) graph $G = (V, E)$. The nodes V represent the communication entities (such as Autonomous Systems in the Internet) and the edges represent direct (physical) communication links. A query at node v returns a local information of the network (such as a routing table that is stored at v or the paths returned by performing `traceroute` commands from v). *Network discovery* is a combinatorial optimization problem that captures the process of network mapping: find a minimum number of queries such that all links are discovered.



The goal in this semester project is to consider the Network Discovery problem on real-world data, design new heuristics, perform several experiments that evaluate the existing approaches, and compare their behaviour on real and artificial data sets (such as random graphs).

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