Network Simulator and Analyzer

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Dedication: This project is made for the course CSP301 at IIT Delhi and submitted to Prof. Subodh Kumar.

Contents

1 Introduction and Motivation

This project aims at simulation and analysis of a social network. There are two aspects of this project: Simulator and Analyser.

1.1 Network Simulator

We simulate an academic network. At the beginning of simulation, universities and faculties are generated. Then every year a fixed number of students are added to the network. Whenever a new person is added to the network, he is assigned a set of interest, hostel/home and department randomly.
Finally the friending activities of people are simulated on the following mathematical model:

- **Number of friend requests** sent follow an exponential distribution. That is to say that probability density function

  $$pdf(x) = r \cdot e^{-r \cdot x}$$

  Where r denotes average request per minute (input parameter of the simulation), and x denotes the time interval between two consecutive friend requests.

- **Target:** A friend request is sent to random person with a probability *out_probablity* and the rest probability is equally divided into interest groups, home locality, courses and department. This is a reasonable model as observed in practice.

After the simulation, the final network is stored as a *graphml* file which can be viewed in various graph visualisation tools such as *Gephi*.

1.2 Network Analyser

The second part of the project focuses on running queries on the network. All the standard aspects of the graph can be extracted namely:

1. Clique Size
2. Shortest distance and path between two persons
3. Diameter of the graph/network
4. *Importance:* Betweenness centrality of a vertex/person
5. Relative importance

2 System Requirements

To compile this code, you need:

- C++11
- perl
- python.

To run the executable provided, you need to be on a linux system. To compile this code, issue the following command:

```
make
```

To build, you need to be on a unix based system. If you want to run on windows, you need to have cygwin installed on your system.

3 User Manual

3.1 Network Simulator

To run NetworkGen, the network simulator, use following command:

```
./run1.sh arg1 arg2 arg3
```

where:
arg1 is input file to set environment
arg2 is the units of time to simulate from beginning
arg3 is the time
For example:

```
./run1.sh SocialNetworkEnv.inp -y 5
```

This runs the simulation for 5 years

```
./run1.sh SocialNetworkEnv.inp -d 100
```

This runs the simulation for 100 days
Possible choices for argument 2 are:

- -d (days)
- -y (years)
- -h (hours)
- -m (minutes)
- -s (seconds)
- -w (weeks)

3.2 Analyser

To run the Gyani, simply use the command:

```
./run2.sh
```

The Gyani, our analyser, will take input queries in simple english language, make best possible guess and print the output accordingly.