

Positional and Participation Dynamicity of Longitudinal Social Networks

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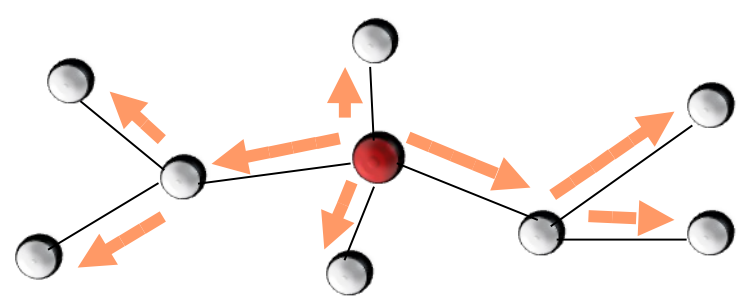
MOTIVATION

Longitudinal study of a social network involves studying different snapshots of the network at several discrete time points. Each snapshot is known as a **Short Interval Network**. Changes over different short intervals have strong dependency upon the participation and positional changes of each actor. Quantifying these dynamic changes has become a major challenge in recent years.

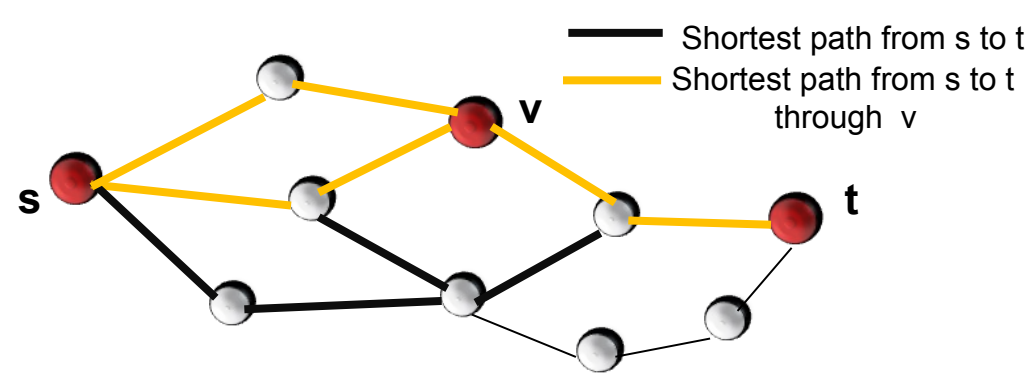
OBJECTIVE

❖ To quantify positional dynamicity of each actor in a longitudinal social network using different positional measures - closeness centrality and betweenness centrality. Quantifying with different measures give different results.

Closeness centrality- The measure of how long it will take for information to spread from a given vertex to all others in the network.



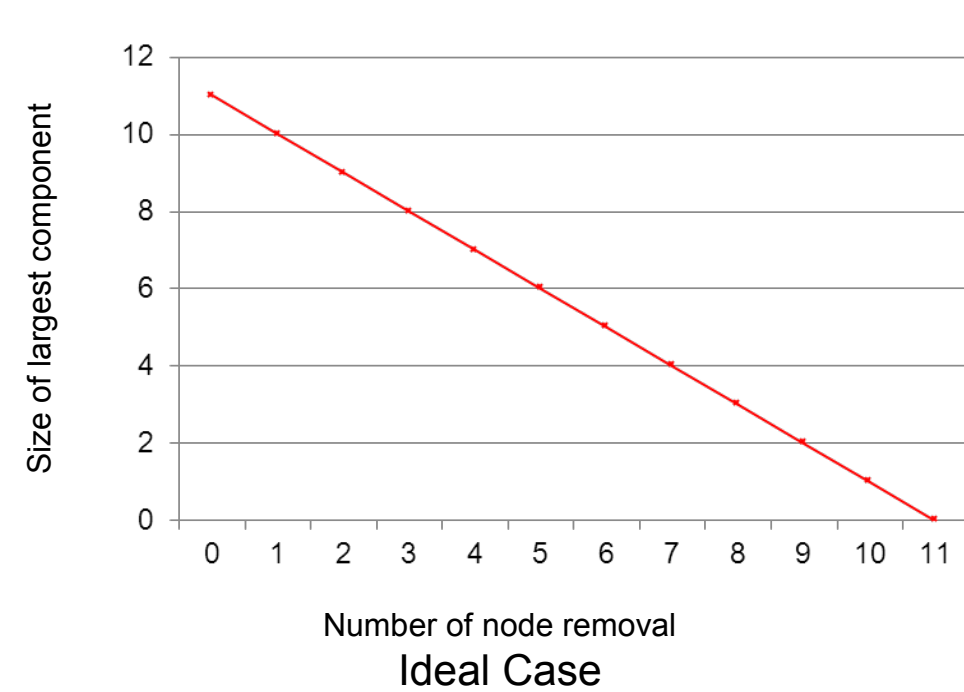
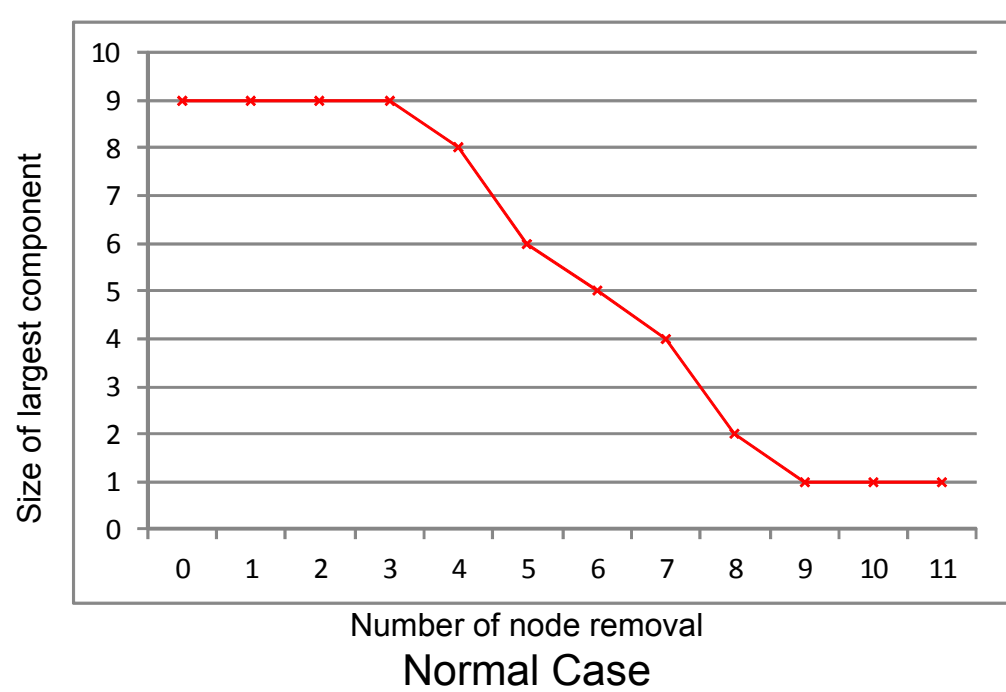
Betweenness centrality- It measures the fraction of shortest paths that pass through a given node, averaged over all pairs of nodes in a network.



- ❖ To observe the differences in results graphically.
- ❖ To analyze the participation dynamicity of each actor in the network over time.
- ❖ To study the impact of the dynamicity of the actors upon the robustness of the network.

Robustness: The robustness coefficient, R is the ratio of the area under the curve in normal case, A_N and that in ideal case, A_I .

$$R = A_N / A_I$$



❖ To find out methods to disintegrate a network effectively.

METHODOLOGY

1. Making a program to measure the closeness centrality and betweenness centrality of each actor in the short-interval networks and in the aggregated network.
2. Measuring the positional and participation dynamicity of the actors in each short-interval network and also in the aggregated network using the results found in step-1. Here length of a day is considered as a short-interval.

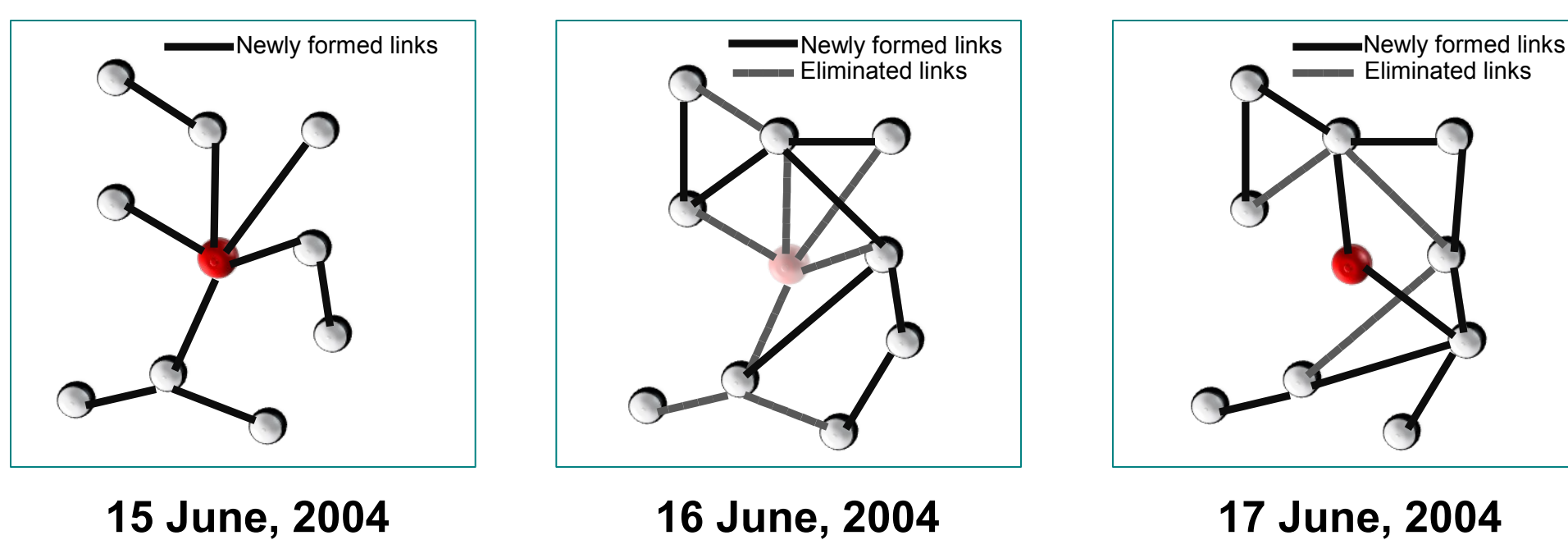


Figure:- The change of position and participation of a node in different short-interval networks.

3. Measuring the participation dynamicity of the actors taking into consideration their presence or absence in the network.
4. Summing up the dynamicities to get complete dynamicity of each actor in each SIN (Short Interval Network) and in the LSN (Longitudinal Social Network).
5. Simultaneously plotting the results found by the two different measures in a graph and comparing them.

OUTCOME

❖ Datasets involved in the analyses:

- Facebook data of activity of about 1900 persons from March to October, 2004.
- Van de Bunt, Friendship networks among people in a classroom through time.

❖ The activity of a node or actor in a network is measured examining through message passing.

- The positional dynamicity of an actor is determined considering the closeness centrality and betweenness centrality separately for the sake of comparison.
- The possibility whether an actor is present or absent in consecutive two short-intervals is determined using the Markov chain model.

❖ The complete dynamicity of the longitudinal social network with the positional dynamicity considering betweenness centrality is 0.109440 and that considering closeness centrality is 0.093163. Its range is in between ≥ 0 and $< 200\%$.

❖ The graph comparing the results of measuring the positional dynamicity using closeness centrality and betweenness centrality :

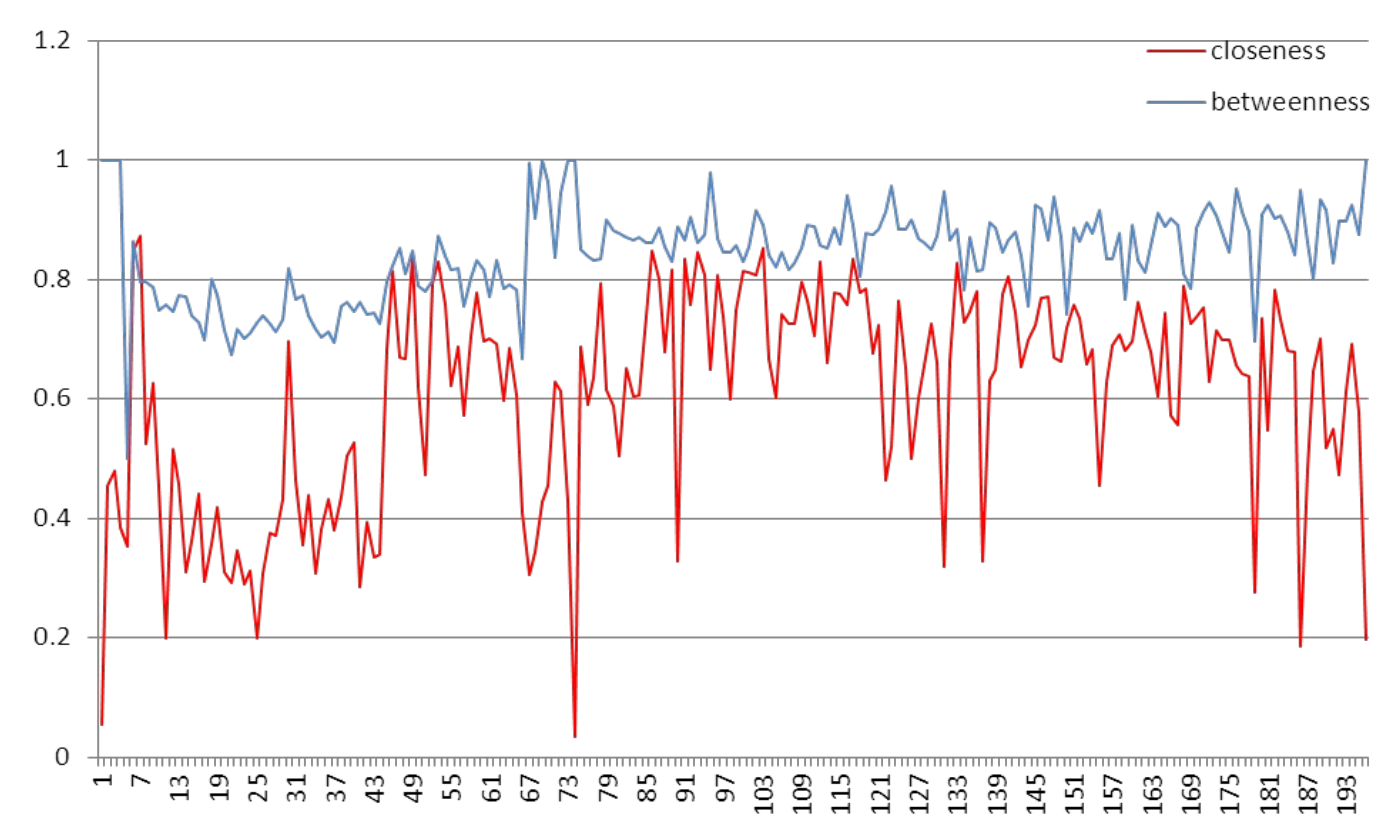


Figure:- The positional dynamicity of the actors in short-interval networks considering closeness and betweenness centrality.

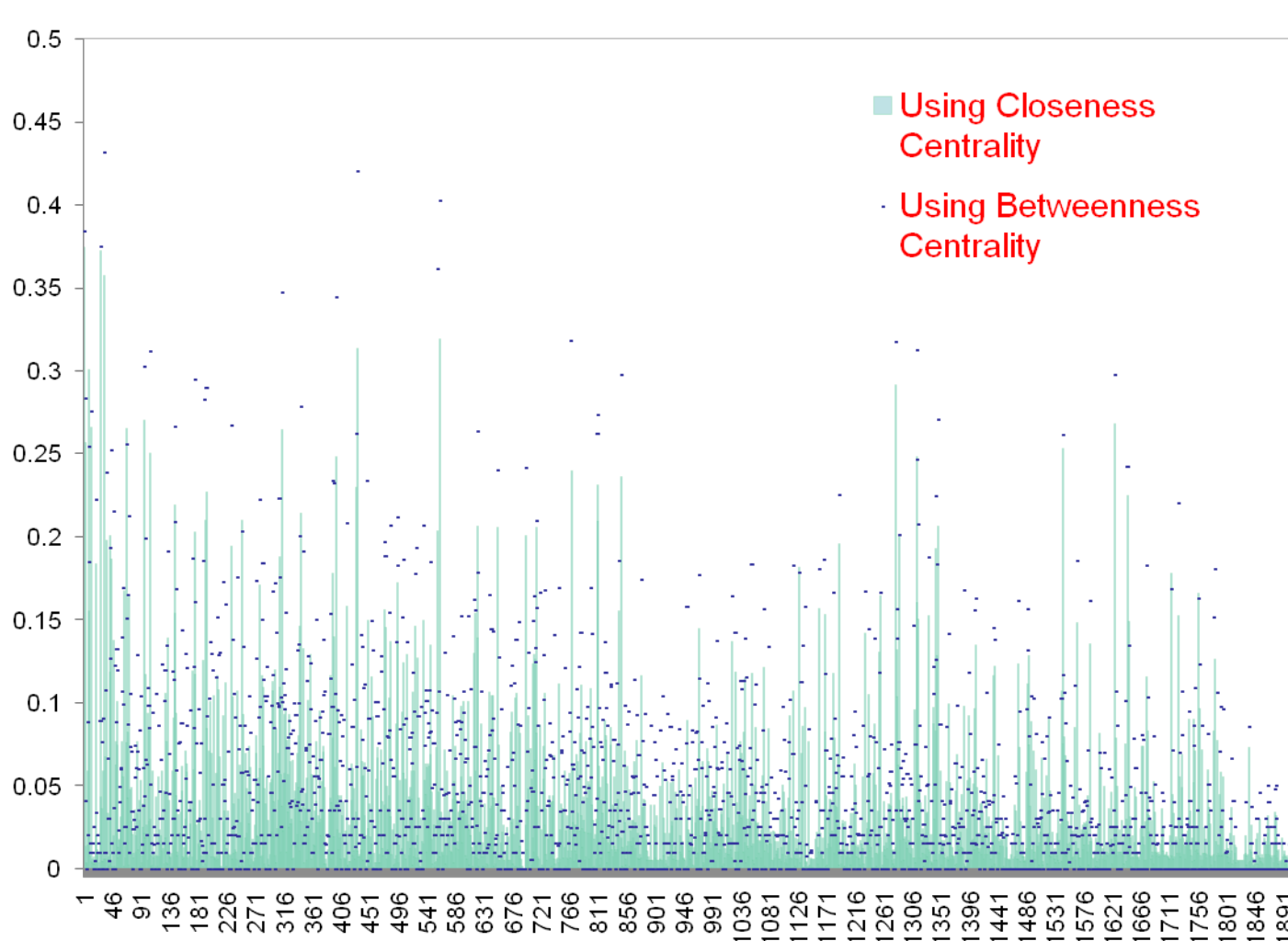


Figure:- Positional dynamicity of each actor in the LSN with closeness centrality and betweenness centrality as positional measures.

REFERENCES

- 1) http://toreopsahl.com/datasets/#online_social_network
- 2) Van de Bunt, G.G., M.A.J. van Duijn, and T.A.B. Snijders. 1999.
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- 5) Bimal Viswanath, Alan Mislove, Meeyoung Cha, Krishna P. Gummadi, On the Evolution of User Interaction in Facebook.