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Propagation Model for Information Dissemination among Novel Social Networks

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Assortative mixing, high clustering, short average path lengths, broad degree distributions and the existence of community structure have become the main role of currently researches. Application in the domain of information propagation has been developed here, based on some existing social network models, which satisfies all the above characteristics. In addition, this model facilitates interaction between various communities. It gives very high clustering coefficient by retaining the asymptotically scale-free degree distribution. The community structure is raised from a mixture of random attachment and implicit preferential attachment. It supports the occurrence of a contact between two initial contacts if the new vertex chooses more than one initial contacts. The result shows a faster application to propagate information over social networks based on degree centrality.

Keywords : Information Propagation, Random Initial Contact, Social Networks, Tertiary Contact, Neighbor of Neighbor Initial Contact.

1. INTRODUCTION

Collaboration between professional, academic, research and Business groups are becoming domain dependent. Here we develop a application for propagating information based on degree centrality. The node with the highest degree become very easy to propagate the information to other node in the social networks. Social networks are made of nodes that are tied by one or more specific types of relationships. The vertex represents individuals or organizations, edge represents relationship between individuals or organizations.

Social networks have been intensively studied by Social scientists [1-3], for several decades in order to understand local phenomena such as local formation and their dynamics, as well as network wide process, like transmission of information, spreading disease, spreading rumor, sharing ideas etc. Various types of social networks, such as those related to professional collaboration [4-6], Internet dating [7], and opinion formation among people have been studied. Social networks involve Financial, Cultural, Educational, Families, Relations and so on. Social networks create relationship between vertices; Social networks include Sociology, basic Mathematics and graph theory.

The basic mathematics structure for a social network is a graph. The main social network properties includes hierarchical community structure [8], small world property [9], power law distribution of nodes degree [10] and the most basic is Barabasi Albert model of scale free networks [11].

The more online social network gains popularity, the more scientific community is attracted by the research opportunities that these new fields give. Most popular online social networks is Facebook, where user can add friends, send them messages and update their personal profiles to notify friends about themselves. Essential characteristics for social networks are believed to include assortative mixing [12,13], high clustering, short average path lengths, broad degree distributions[14,15] and the existence of community structure. Growing community can be roughly speaking set of ver-

This has very large clustering coefficient compared to the earlier work where it was $c(k)$ $1/k$.

3.2. Centrality Measures

Centrality measure is one of the most studied concepts in social network analysis. Numerous results have been measured including degree centrality, closeness centrality, betweenness centrality [18]. We assume that all networks on which we might compute centrality measures consist of undirected graphs $G(V, E)$, in which V is a set of nodes (also called vertices, points or actors) and E is a set of edges (also called ties or lines) that connect them [19,20]. The following graph shows the centrality distribution on 100 nodes. As we can see big size vertices has maximum centrality. i.e., any information given to that node will spread faster in the network, as compared to other nodes. Centrality measures: Centrality measures includes point centrality which node has maximum possible degree and also point centrality appear any social network graph which node has point a center of a star or hub of wheel.

3.3. Degree Centrality Measure

Measures degree or number of adjacencies for a point v_i

$$C_{Deg}(v_i) = \sum_{n}^{X_i=1} a(v_i; v_k) \tag{5}$$

Where $a(v_i; v_k) = 1$ if v_i and v_k are connected a line otherwise 0. Normalized degree measures

$$C'_{Deg}(v_k) = \frac{Deg(v_k)}{(n-1)} \tag{6}$$

4. RESULTS

Simulation results have been projected for a network of 100 vertices where edge to vertex ratio and triangle to vertex ratio for 100 vertices has been projected. Hence one can see an increase in number of contacts due to the introduction of secondary and neighbor of neighbor contacts, The results are given in Table 1. Here one can see an enormous increase in secondary contacts. In addition tertiary contacts also have been added in our model, which leads to a faster and complex growth of network.

Table 1
Simulation Results

Our model	IC	SC	NNIC
Vertices	0.33	0.45	0.20
Triangles	0.001	0.07	0.06

4.1. Simulation Result

The below results have been represented graphically by calculating the degree (number of contacts) of a node. This also shows an enormous growth in degree of nodes. Comparison results of network community: initial contacts, secondary contact, secondary contact and degree of each vertices.

5. CONCLUSIONS

In this paper, an application which reproduces very efficient networks compared to real social networks has been developed. This application of information propagation, based on degree centrality, which mean the higher the degree of the node the faster the node to propagate the information in the network. This is very useful in the case of Professional, Research and Business groups, which helps in faster spreading information for network community. Thus here an eficient but complex application of social network has been developed which gives an enormous growth in probability distribution and clustering coeficient and edge to vertex ratio by retaining the community structure. This application can be used to develop a new kind of social networking among various professional, academic, research and business groups which helps in faster propagation of information which is essential for faster development in the real world. We have used C language, UciNet, NetDraw and Excel for creating graph and simulation.

REFERENCES

1. S Milgram. Psychology Today, (2): pages 60-67, 1976.

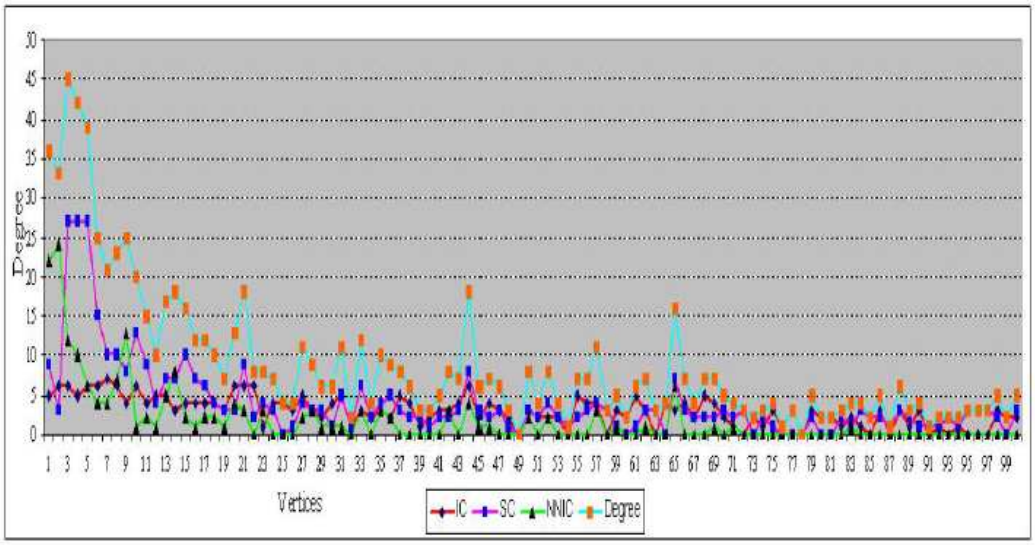

Figure 4. Comparison Results of Network Community

2. M Granovetter. The Strength of Weak Ties, *in Journal of Social,* (78):1360-1380, 1973.
3. S Wasserman and K Faust. Social Network Analysis, *Cambridge University Press,* Cambridge, 1994.
4. Duncan JvWatts and Steven H Strogatz. Collective Dynamics of 'Small-World' Networks, *NATURE*, pages 393-440, 1998.
5. M Newman. The Structure of Scientific Collaboration Networks, *PNAS*, (98): pages 404- 409, January 2001.
6. M Newman. Coauthorship Networks and Patterns of Scientific Collaboration, *PNAS*, (101): pages 5200-5205, April, 2004.
7. P Holme, C R Edling, Fredrik Liljeros. Structure and Time-Evolution of an Internet Dating Community, *Social Networks,* (26): pages 155-174, 2004.
8. M Girvan and M E J Newman. Community Structure in Social and Biological Networks, *in Proceeding of National Academic Science*, USA (99): 7821-7826, 2002.
9. M E J Newman. The Structure and Function of Complex Networks, *SIAM Review*, (45):167-256, 2003.
10. P L Krapivsky and S Redner. Organization of Growing Random Networks, *Physics Review*, 2001.
11. A L Barabsi and R Albert. Emergence of Scaling in Random Networks, *Science,* (286):509-512, 1999.
12. M E J Newman. Assortative Mixing in Networks, *Physics Review Letter*, (89), 2002.
13. M E J Newman, Juyong Park. Why Social Networks are Different from other types of Networks, *Physics Review,* vol. 68, 2003.
14. 1 L A N Amaral, A Scala, M Barth and H E Stanley. Classes of Small-world Networks, PNAS, (97): pages 11149-11152, 2010.
15. Marian Boguna, Romualdo Pastor Satorras, Albert D'az-Guilera, Alex Arenas. Models of Social Networks based on Social Distance Attachment, *Physics Reviw,* vol. 70, 2004.
16. Riitta Toivonen, Jukka-Pekka Onnela, Jari Saramaki, Jorkki Hyvonen, Kimmo Kaski. A Model for Social Networks, *Physica,* (371): pages 851-860, 2006.
17. Sreedhar Bhukya. A Novel Model for Social Networks, *BCFIC IEEE*, pages 21-24, February, 2011.
18. S Wasserman, K Faust. Social Network Analysis: Methods and applications, *New York: Cambridge University, Press*, 1994.
19. Stephen P Borgatti, Martin G Everett. A Graph-Theoretic Perspective on Centrality, *Published by Elsevier,* (499): pages 1-19. 2001.
20. Piotr Brodka, Katarzyna Musial and Przemyslaw Kazienko. A Performance of Centrality Calculation in Social Networks, *CA-SoN,* 2009.