Patterns and A Generator of Social Networks: From the Perspective of Non-giant Connected Components

Jianwei Niu*, Jing Peng*, Chao Tong*

*School of Computer Science and Engineering, Beihang University, China

niujianwei@buaa.edu.cn, pj.hades@gmail.com, tongchao@buaa.edu.cn

Abstract—What patterns do non-giant connected components in a graph or network have? How do the non-giant connected components behave during their evolution over time? How can we model the time-evolving patterns of non-giant connected components? These questions are important for understanding the evolution of social networks, but they were seldom studied in previous work, which focused mainly on the giant connected component. In this paper, we study three real-world networks, and analyze some patterns of non-giant connected components. The main contributions of our work include the following aspects. First, we find that many non-giant connected components cannot stay in the networks for a long time. Most of them merge with one another or with the giant connected component. Second, we find that when those non-giant connected components die, the distribution of their node number follows a power law. Third, we design a graph generator to reproduce the observed patterns.

Keyword—Graph generator, network analysis, network evolution, non-giant connected components, social networks

Jianwei Niu received his Ph.D. degrees in 2002 in computer science from Beijing University of Aeronautics and Astronautics (BUAA). He was a visiting scholar at School of Computer Science, Carnegie Mellon University, USA from Jan. 2010 to Feb. 2011. He is a professor in the School of Computer Science and Engineering, BUAA. He has published more than 80 referred papers on such as TECS, JPDC, Neurocomputing, and filed more than 20 patents in mobile and pervasive computing. He served as the Program Chair of IEEE SEC 2008, TPC members of ICC, WCNC, Globecom, IWCMC, and etc. He has served as editors of Journal of Network and Computer Applications (Elsevier), Transactions on Emerging Telecommunications Technologies (Wiley).

Peng Jing is currently a graduate student in the School of Computer Science and Engineering of Beihang University. His research interest is social network analysis. Contact him at pj.hades@gmail.com.

Chao Tong received his Ph.D. degrees in 2009 in computer science from Beihang University (BUAA). He is an assistant professor in the School of Computer Science and Engineering, BUAA. He is an ACM member and has published more than 20 referred papers and filed more than 10 patents. His current research interests include mobile computing and social networks analysis.