EVOLUTION OF THE SMS NETWORK

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Abstract. With the rapid development on the technology of cellular phones, short messages (SM) have become one of the most important ways in communication. By making use of real data, we constructed an evolving Short Messaging Services (SMS) network. We found that the SMS network is a scale-free network. By investigating the mean connectivity and the mean path length of the SMS network, we found that there are two descriptions based on different time measures—the number of nodes or the number of edges—representing different stages of the SMS network's evolution.

Keywords. Complex network, Short Messaging Service, random graph,scale-free network, evoluting network.

1   Introduction

Starting with the influential work of Erdos and Renyi in 1959 [1], random network theory has developed into one of the important branches in modern mathematics. Generally, a random network is defined as a collection of nodes where the probability of two nodes connected by one edge is a constant. Among the prominent properties of random networks [2], the degree distribution following Poisson distribution was thought to be a generic one. However, recent breakthroughs in complex networks have found that the degree distribution $P(k)$ in many real and artifact networks significantly deviates from Poisson distribution [3, 4, 5, 6, 7, 8]. Especially, a power law distribution of the degree, $P(k) \sim k^{-r}$, has been found in many networks such as the Internet, world wide web, and so on [9, 10, 11]. The origin of the power-law distribution is first addressed by Barabasi and Albert [3]. By using two generic mechanisms– linear growth and preferential attachment, Barabasi and Albert reproduced the power-law distribution of degrees and found the corresponding network as a scale-free one. Since then, numbers of studies on modeling real networks has confirmed the validity of the BA model [12, 13, 14, 15]. Nevertheless, rigorous justifications of the BA model are still to be clarified due to the fact that the assumptions on the linear growth and preferential attachment are short of evidences.

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