

COMPUTING THE CLUSTERING COEFFICIENT OF A RANDOM MODEL OF GRAPHS

Xianmin Geng¹ and Hongwei Zhou^{1,2}

¹College of Science
Nanjing University of Aeronautics & Astronautics
Nanjing, 210016, P. R. China

²College of Education and Science
Nanjing Xiao Zhuang College, Nanjing, 210038, P. R. China

Emails: xm_geng@163.com; hwzhou122@yahoo.com.cn

Abstract. In order to further explore the mechanism responsible for complex networks, we extend the binomial random graph model to get a more general model on which the connected probability between each pair of vertices follows a geometric-like distribution. With the theory of stochastic analysis, we analyze the geometric properties of this model and derive analytical expressions for its degree distribution and the clustering coefficient.

Keywords. ER model, Random graph, Geometric-like distribution, Degree distribution, Clustering coefficient.

AMS (MOS) Subject classification: 05C25, 05C85, 68W99

1. Introduction

Complex networks describe a wide range of systems in nature and artifacts, whose vertices are elements of the system and edges represent the interactions among them. For example, social networks [1], the Internet [2], citation networks and collaboration network [3], etc. At present, the great challenge is accurate and complete descriptions of various complex networks. Many researchers are interested in unravelling the structures and dynamics of such complex networks [4].

The degree of a vertex in a network is typically defined to be the number of its edges. The probability $P(k)$ that a vertex in the network is connected to k other nodes ($k=0,1,\dots$) is called the degree distribution function. The degree distribution is a very important characteristic of a complex network. Empirical results indicate that there exist a large number of networks whose distribution function $P(k)$ follows a power law. Another important characteristic of a complex network is its clustering coefficient. To quantify the clustering, Watts and Strogatz introduced the clustering coefficient C , as the degree of the clustering. C is defined as $C \equiv \langle C_i \rangle$ with the average $\langle \cdot \rangle$ over all vertexes in the network. The local clustering coefficient C_i for vertex i is defined as $C_i \equiv e_i / \binom{k_i}{2}$, where we suppose that the vertex i