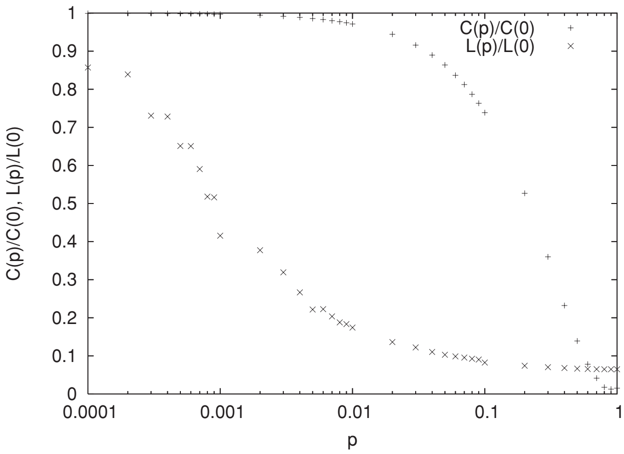

Fig. 1. $L(p)$ and $C(p)$ against p. The data are averages over 20 random realizations of rewiring and normalized by the values $L(0)$ and $C(0)$.

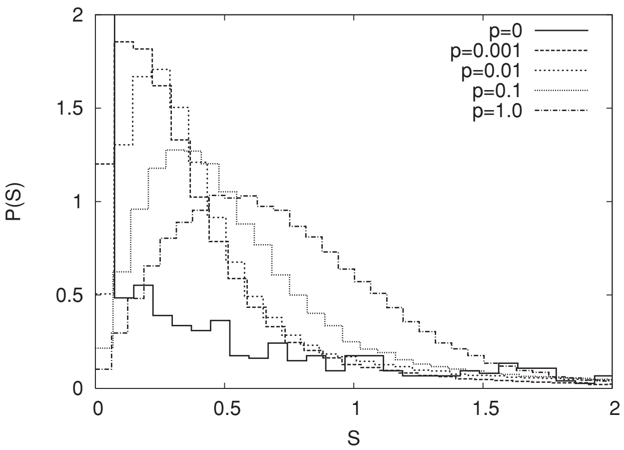

Fig. 4. The bulk part of $P(S)$. This figure is the magnified one of Fig. 3 at $0 \leq S \leq 2$ with normal-scale plot.

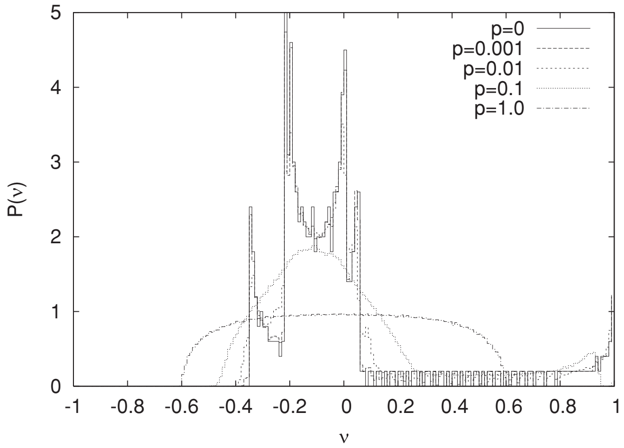

Fig. 2. $P(\nu)$ against ν for $p = 0, 0.001, 0.01, 0.1, 1$.

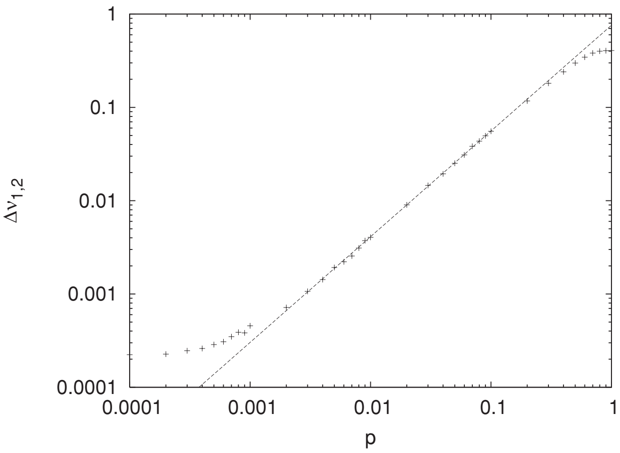

Fig. 5. $\Delta\nu_{1,2}$ against p. The dashed line represents $0.76 \times p^{1.13}$.

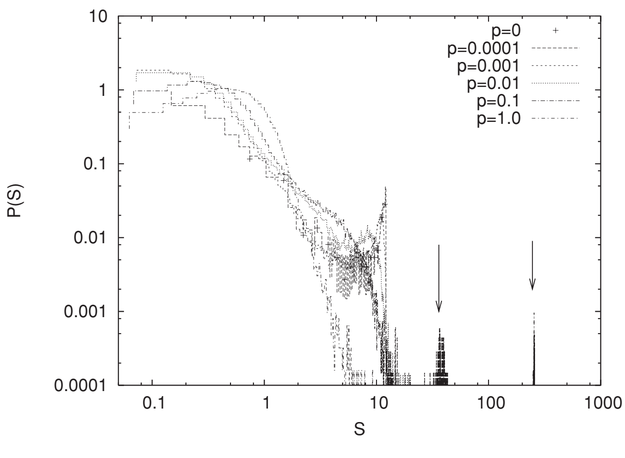

Fig. 3. $P(S)$ against S for $p = 0, 0.001, 0.01, 0.1, 1$. The arrows point the isolated peaks of the distributions.

many variations of this model (Newman *et al*., 2000), we use this original process. We fix N and k hereafter, so that the control parameter of this model is the rewiring probability p only. And in a certain range of p, the network presents the so-called small-world property in which the network has a large number of nodes but an effectively short characteristic path length and is locally clustered. In terms of structural quantities, we characterize it with a small value of the average shortest path length L and a large value of the clustering coefficient C. L is the average of the shortest path length per all node pairs. C is the average of C_i, the clustering coefficient of each node. C_i is the fraction of pairs of neighbors of a node which are also neighbors to each other. Clearly, a network with the small-world property is highly clustered and has also shortcuts for a short average path length. In fact, real social networks have this small-world property; actors who play together, social networking services, collective writing of papers (Newman, 2000). The WS model depicts our daily feeling, "It's a small world."

In this paper we will make clear how the small-world property is reflected in the spectra statistics of the transition matrices using the WS model as a concrete model. The construction of the WS model contains random rewiring processes, so that the transition matrices can be regarded as random matrices with specific constraints. We investigate the distribution of eigenvalues and NNES's, which are key statistics in random matrix analyses (Metha, 1991; Dorogovstev *et al*., 2003).