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Average Edge Betweenness of a Graph

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Abstract: Vulnerability is an important concept in network analysis. When a failure occurs in some of the components of the network, vulnerability measures the ability of the network to disruption in order to avoid the external or internal effects. Graph theory is an important concept in network vulnerability analysis. If a network is modeled as an undirected and unweighted graph composed of processing vertices and communication links, there have been several proposals for measuring graph vulnerability under link or vertex failures. In this paper, we consider the concept of average edge betweenness of a graph in order to measure the network stability. The average edge betweenness is related to the edge betweenness of an edge. The edge betweenness of a given edge is the fraction of shortest paths, counted over all pairs of vertices that pass through that edge. The average edge betweenness considers both the local and the global structure of the graph. In this paper, we obtain exact values for average edge betweenness and normalized average edge betweenness for some special graphs and E_p^t graph.

Keywords: *network vulnerability; network design and communication; stability; average edge betweenness.*

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1 Introduction

Many complex systems in the real world can be conceptually described as networks, where vertices represent the system constituents and edges depict the interaction between them, such as social networks (collaboration network), technological networks (communication networks, the Internet), information networks (the World Wide Web), biological networks (protein-protein interaction networks, neural networks) and etc. [10, 11] . A central issue in the analysis of complex networks is the assessment of their stability and vulnerability. Vulnerability is an important concept in network analysis related with the ability of

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