



Quantitative Analysis of the Importance and Correlation of Urban Bridges and Roads in the Study of Road Network Vulnerability

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Abstract

The city development is closely related to the performance of the transportation network system. Bridges and roads are important parts of the transportation system, and are also inseparable components of the transportation network. However, the effect of the correlation between bridges and roads on the network system has not been studies thoroughly in the literature. Therefore, it is necessary to analyze the vulnerability of the road network when both bridges and roads are involved. In this paper, the urban road network is modeled into the form of network connection and node, based on the analysis of the related research results of road network vulnerability in the literature. Taking the urban roads at all levels as the connection and the transportation hubs (including bridges) as the nodes, the paper puts forward the corresponding measurement indexes and calculation methods, and establishes the importance and correlation analysis model of roads and bridges in the urban road network.

Keywords: urban road network; transportation system; vulnerability analysis; importance and correlation between bridge and road.

1 Introduction

Road traffic network vulnerability usually refers to the sensitivity of road network capacity reduction caused by emergencies, which is manifested as the cascading failure of related road sections caused by the loss of capacity of some road sections, resulting in large-scale traffic network congestion [1]. With the enrichment of modern means of transportation and modes of transportation, the vulnerability analysis of road network has become an important work of urban road planning.

Scholars have done a lot of research on road network vulnerability. Berdica [2] defines vulnerability by considering the probability and consequence of events that affect the road transportation system, that is, vulnerability in the road transportation system is the susceptibility of events, which can greatly reduce the maintainability of the road network. Jenelius [3] pointed out that the purpose of road network vulnerability analysis is to assess the possibility of emergencies and their economic and social