DEVELOPING A GIS-BASED MODEL FOR ROAD BLOCKAGE ASSESSMENT

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ABSTRACT

Road plays a significant role in evacuation in post-earthquake emergency. This study looks at the function of road networks in post-earthquake scenarios. A methodology is developed to estimate the possibility of road blockage after earthquakes. Factors of building damage, characteristics of the building, and relative distance between the building and the road are taken into the estimation. This research brings upon two novel approaches in modeling the road blockage. Firstly, the debris caused by damage to buildings are treated separately according to different building typology (including structural type, height, age…) and the associated proximity to the roads considering each building footprint widths. And secondly, the potential blockage share of each building is estimated by the relative debris heap and the road width.

The methodology is implemented with the actual data of the road network in District 17 of Municipality of Tehran. At first, the geospatial information for buildings and road inventories were compiled and processed as to generate a geodatabase. In the next phase, ground shaking maps are produced for scenario or actual earthquakes considered for the case studies. The third phase emphasizes on the vulnerability modeling of the building stock. In the final phase, the estimate of the building damage is calculated for these two earthquake scenarios. Residential building loss and the road blockage are calculated for two important earthquake scenarios produced by North Tehran Fault (NTF) and Rey Fault (RF) for Tehran as case study. Based on the result of implementation, up to 10 percent of the roads with width more than 15 meter will be blocked.

INTRODUCTION

Immediately after disastrous earthquake events, the knowledge regarding the status and the potential performance of the road network is essential in managing related emergency activities such as search and rescue and evacuation of injured and dead people. In most urban settings of Iran, especially in old fabrics, buildings are densely packed within their neighborhood while surrounded by relatively narrow or congested roads. A large number of constructions are severely vulnerable and potentially subject to collapse resulting in the spread of large amount of debris around them after severe ground shaking. Although the collapse of some network elements such as bridges, overpasses, tunnels, etc…, are very important; but, the debris spread can