Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11797, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11797
EGU General Assembly 2008

Automatic Determination of Earthquake Destruction of Buildings, Using High Resolution Satellite Imagery

F. Samadzadegan (1) **H. Rastiveisi** (2)

(1,2) Dep. of Surveying and Geomatics Eng. University of Tehran (Tel: +98 21 88008841 Fax: +98 21 88008837 e-mail: (1) samadz@ut.ac.ir (2) hrasti@ut.ac.ir)

Receiving rapid, accurate and comprehensive knowledge about the conditions of damaged buildings after earthquake strike and other natural hazards is the basis of many related activities such as rescue, relief and reconstruction. Minimal fieldwork, continuous coverage of wide area and rapid access of remote sensing data make this technology as a useful and powerful resource for post-earthquake damage assessment. Recently, commercial high-resolution satellite imagery such as IKONOS and QuickBird, are becoming more powerful data resource for disaster management. Various automatic methods have been used in order to detect damaged buildings after an earthquake using satellite imagery. These methods can be categorized in "map to image" and "image to image" strategies. In the first strategy, "map to image", after geo-referencing map and post-event image, location of all buildings on image is specified. Then, by extracting and considering of spectral, textural and structural features for each candidate building, situation of the building is realized. The next strategy, "image to image", is based on comparison between pre-event and post-event images. In these methods, after registration of both images, buildings are extracted and compared with each other. In this research, a method for automatic damage map generation with integration of vector map and high resolution satellite imageries is proposed. In the proposed method, input data are vector map and both before and after earthquake images of damaged area. First, in the preprocessing step using image enhancement algorithms such as histogram equalization and histogram matching, images will be enhanced. Then, geo-referencing of both pre-event and post-event images will be done. Since images and vector map are geo-referenced, buildings position are ex-

tracted from vector map and all buildings are located on both images. For all buildings, textural features for any candidate buildings, one by one, are extracted. Before extracting the features, optimum feature selection is done by genetic algorithm (GA). After selecting optimum textural features, buildings situation regarding to their destruction is evaluated using these features. According to existences of ambiguity and vague in determination of buildings destruction, a fuzzy inference system is used. In the proposed Fuzzy Inference System, difference between features, extracted from pre-event and post-event images for candidate building, are considered as input linguistic variables and building labels ("undamaged to negligible damaged", "moderate damaged", "heavily damaged" and "destructed") are assigned as output linguistic variables. The proposed method in this study is evaluated using before and after December 26th 2003 earthquake QuickBird multi-spectral images of Bam, Iran. From available images, a 1900*2500 pixels area was selected as test area, which involved 1137 buildings. For this area, 4 buildings were removed from 1137 list of buildings according to their negligible size. Other 1133 buildings were classified into: 128 buildings in "undamaged to negligible damaged" class, 276 buildings in "moderate damaged" class, 349 buildings in "heavily damaged" class and 380 buildings in "destructed" class. After calculation of Confusion matrix, overall accuracy 74.4% and kappa coefficient 0.63 were acquired for our classification. Results of the proposed method, indicates the capability of this method for automatic determination of damaged buildings from high resolution satellite imageries.