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Rapid Damage mapping for post-earthquake building damage assessment

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Earthquake is one of the inevitable natural hazards that cause lots of damages and problems to the economy, environment and the whole life of people. Therefore, it is necessary to use all available knowledge and technologies for saving people and their assets through an efficient disaster management. Recent improvements in spatial resolution of commercial satellite imagery make it possible to apply very high-resolution satellite data for assessing structural damage in the aftermath of humanitarian crises.

However, in practice most of the processes for damage assessment are manual operations like on-screen change detection that are time consuming and expert dependent. To model the human capabilities in object perception and recognition for damage assessment, it seems that in a comprehensive solution: (a) All available descriptive information components of an object (such as structural information, textural information and spectral responses) must be simultaneously used; (b) A Neural Network formulation for the object definition should be devised; (c) Learning capabilities to modify the defects accompanied by the objects definition needs to be considered. This will enhance the recognition potentials when encountering new and undefined objects.

In this paper a system that integrates all above features in a total and comprehensive automatic geospatial database change detection solution is developed. The change detection process is divided in 1- object identification, 2- object extraction, 3- object recognition and 4- change detection and damage assessment phases. The approach presented here takes advantage of hybrid fusion of descriptive and logical informa-

tion. That is, descriptive fusion to exploit the multi-level characteristics of the objects and logic fusion for enhancing the learning abilities of the object recognition in change detection process.

The potential of the proposed methodology evaluated by using the buildings layers of pre-event 1:2000 scale digital map of the city of Bam in Iran and a pan-sharpen QuickBird post-event satellite image of the Bam, acquired 8 days after December 26th 2003 earthquake. Visual inspection of the obtained results established the high capability of proposed automatic change detection of these 3D objects which was constructed based on hybrid information fusion.