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Damage detection using ALOS-PALSAR images and ancillary information for the 2007 Peru earthquake

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This work is devoted to the exploitation of the information contained in remotely sensed images and ancillary data for damage detection in urban areas stricken by an earthquake. The importance of remote sensing in the analysis of the damages caused by natural disasters is increasing, and recent literature shows a number of works related to this topic, involving the use of both optical and radar data. In the use of radar data, which is the goal of this paper, two different approaches has been considered: damage assessment using coherence [1], and using SAR intensity data [2]. A fusion of the two approaches has been presented in [3], where the originality of the methodology presented consists in the fusion of the classification result – still far from being satisfying if considered alone- with ancillary data, either already available or easily extracted by manual interpretation of maps and/or optical images. The fused map obtained here has the vantage of being more precise than the per-pixel classification, and also immediately usable even by a non-experienced user.

The same procedure is applied here to the test case of Peru, which central coast has been stricken by a 7.9 magnitude earthquake on August 15, 2007. Among the affected cities, the city of Pisco has been considered because it appears in two Fine Beam Double Polarisation (HH/ HV) Precision images, 12.5 meters resolution, acquired before – on August, 12, 2007 – and after – on August 27, 2007 – the earthquake. A GIS depicting the borders of the parcels in the urban area has been obtained by manual digitalisation of a SPOT pre – event image, while information related to damaged areas obtained by in situ measurements have been provided by visual interpretation. In the final paper, if available at that time, in situ measurements by INDECI, the National

Institute of Civil Defense of Peru, will be also provided. Since the data have been provided as precision images, no phase information has been considered. From the available images some intensity features have been extracted, in particular the intensity correlation r and the backscattering coefficient d, in a sliding window W made of N pixels around the current position, according to the suggestions in [2-4] and taking into account the spatial resolution of the ALSO PALSAR scene.

Other considered features are the pre- and post-event intensities, from the original data pre-filtered with a 9×9 Gamma filter. The methodology applied involves a spectral step of classification, performed by using a neuro-fuzzy classifier, and a spatial one, in which a Markov Random Field model is considered. Then, the classification results have been fused with the GIS layer by assigning each defined sub-area of the GIS to the class to which the majority of mapped pixels belonged.

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