Supervised and unsupervised characterisation of urban exposure data using remotely sensed images for catastrophe loss modelling

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Capturing the characteristics of the buildings exposure is one of the major challenges for loss estimation from natural disasters. Building area (footprints), height, structure type, age and use type are some of the key characteristics of buildings that are required for loss estimation. Conventional methodologies to capture this type of information involve the use of secondary datasets such as housing census data and tax data, where available, though the quality and level of aggregation differs from area to area. In the recent years, various new direct data collection methodologies have been proposed. Such methodologies include the use of remotely sensed data.

We propose use of high-resolution satellite images (spatial resolution less than 1 m) to characterise the buildings in a given urban area as a combination of clusters, each representing an approximately homogenous set of "building types". The clustering of urban areas is achieved by using image segmentation techniques, more specifically Gabor filters, on the high-resolution optical images. The morphology of the urban area which is affected by characteristics such as the size of the buildings and the space between them, road layout and widths, i.e. patterns, is categorised according to their similarity. Using a grid on the image, each portion of the image is analysed in terms of their response to the filter by grid cell. The grid cell responses are then clustered using unsupervised or supervised clustering using a measure of similarity/distance (e.g. chi square) to assess the similarity between the responses.

Currently, in collaboration with the European funded FP7 project NERA, existing field data collected for previous academic research in Europe are being collected, which will allow further investigation into the relationship between the grid cell size and the homogeneity of the building types that exist on the ground in the grid cells by different geographical territories. The latest results from the investigations will be presented