Extraction of Rural Building Damage due to Earthquake using Remote Sensing Imagery

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In all kinds of natural disasters, earthquake is regarded as one of the greatest natural disaster in the world, and it seriously threatens human’s lives and properties. In the actual scene of earthquake disasters, the types of pre-earthquake satellite images available in the affected area are various, and they are from different sensors. However, the current researches on multi-source satellite image building recognition are not sufficient. In addition, when extracting building damage information, we can only determine whether the building is collapsed using the post-earthquake satellite images. Even the images have the sub-meter resolution, the identification of lightly damaged buildings is still a challenge. In order to solve the above problems, in this paper, we will use the post-earthquake UAV images and the pre-earthquake satellite images to extract the building damage information in rural areas of Sichuan, China. In particular, the main research contents of this paper are as follows:

- (1) According to the color feature of UAV images and the shape feature from point cloud data, we divide the building damage into four types: intact buildings, slightly damaged buildings, partially collapsed buildings and completely collapsed buildings, and give the rules of damage grades. In particular, the Chinese restaurant franchise model, which simultaneously fuses the color and shape features, is proposed to detect the earthquake-triggered roof-holes. Based on the roof-holes, the type of slightly damaged buildings is identified.
- (2) At present, the model of building extraction from remote sensing images is suitable for an image, that is, for different images, the model needs to learn its model parameters again. In this paper, based on the generalized Chinese restaurant franchise (gCRF) model, we introduce the morphological profiles to propose the gCRF_MBI model. In the residential regions, the buildings are extracted by fusing the spatial information and the morphological profiles in the gCRF_MBI model.
- (3) The visual attention model selects the regions of interest from the complex scenes by simulating the visual attention mechanism of biological objects, which is similar to the
extraction of residential regions from remote sensing images. In this paper, based on the basic principle of the spectral residual approach, we utilize the approach to extract the latent residential regions from remote sensing images, and we analyze the effects of different band combinations and different threshold methods on the extraction of residential regions.