Damaged building detection based on a machine-learning approach for the 2016 Kumamoto earthquake, Japan

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When a large-scale natural disaster occurs, rapid and accurate damage information such as building damage can help to effectively support the implementation of the emergency rescue and can reduce disaster losses and casualties. Identification of disaster areas captured by aircraft and satellites is often visually interpreted by eye-based manual process, and it takes a huge amount of time and human effort. Therefore, for on-site relief measures, it is desired to build a framework and rapid assessing process of the afflicted area.

The ultimate goal of this study is to produce the proxy damage maps as the risk information to support emergency efforts in a disaster affected area by locating damaged buildings right after the 2016 Kumamoto earthquake disaster. The first event was designated as the “foreshock” and the second one as the “mainshock”. The epicenters of the both events were located in Mashiki town. The “mainshock” struct at 01:25 JST on April 16 (16:25 UTC on April 15), a Mw7.0 earthquake, under Higashi Ward of Kumamoto City in the Kyushu Region in southwest Japan.
For emergency purposes, the proposed detection approach of damaged building was designed to use a post-earthquake high-resolution satellite (single) image, eliminating the use of complicated algorithms and auxiliary data. Focusing on prioritizing the practicality of using the space-based sensors, the application of object-based image analysis (OBIA) showed that a two-step hierarchical region segmentation was superior to a pixel-based image analysis (PBIA) to identify damaged buildings by using the feature quantity such as texture information and hierarchical information obtained from each object.

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