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DETECTION OF THE COLLAPSED BUILDINGS IN TURKEY FROM MULTI-SENSOR VERY HIGH RESOLUTION SATELLITE IMAGES.

Abstract

On February 6th, 2023, a magnitude 7.8 earthquake struck Kahramanmaras province in Turky, which is approximately 23 kilometers east of Gaziantep province near Syria, followed by a magnitude 7.5 aftershock nine hours later. These devastating earthquakes killed tens of thousands of people and millions of people were estimated to have been left homeless in Turky and Syria. Prompt detection of the affected areas is necessary to rescue victims from these disasters. Recently, earth observation satellites are used for that task because they can capture a wide range of areas remotely. In this study, we estimated the detection performance of the collapsed buildings from very high-resolution satellite images. First, we collected open source data xView, which contains thousands of labeled very high resolution RGB satellite images from WorldView by Maxar corporation. The label classes include intact buildings and demolished buildings. Then, we made mask images from the label data and trained a semantic segmentation model with U-Net architecture. We defined three classes: intact buildings, demolished buildings, and others. Finally, we acquired satellite images from WorldView in Turkish cities which were highly damaged by the earthquakes, publicly provided by Maxar corporation, and inferred them by the trained model. As a result, we confirmed the model could imply the collapsed buildings qualitatively. In addition, we also acquired very high resolution satellite images from a different sensor, Pleiades by Airbus corporation. Pleiades has a bit lower resolution than WorldView but still could predict well to some extent. we also tried the adversarial domain adaptation method which we established in the past study to improve the segmentation accuracy of the test data. This results implied the model had robustness and enabled frequent time series monitoring by combining multi-sensor satellite images. In conclusion, to detect the collapsed area promptly, we built a semantic segmentation model trained with very high resolution satellite images, and inferred test images in Turky impacted by the earthquakes. We confirmed our method would be applicable to the detection of collapse with multiple sensor images. Our future study is to add other sensor images and increase segmentation accuracy on them.