AUTOMATED PRE-DISASTER BUILDING IMAGES EXTRACTION FROM STREET VIEW IMAGERY

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After a disaster, teams of structural engineers collect vast numbers of images from buildings which provide valuable evidence to understand the impact on our structures. However, sometimes buildings are severely damaged, or there is a lack of sufficient spatial context in the post-disaster images. In these cases, incorporating pre-disaster images of such buildings is helpful to evaluate possible circumstances related to a building's failure accurately. One of the best resources to observe the pre-disaster condition of the buildings are Street View services which provide a sequence of 360 degrees panorama images captured along streets to enable all-around views at each location on the street. According to the number of the targeted buildings for a post-disaster survey, searching for the pre-disaster images manually of the buildings is time-consuming. In this study, we develop an automated technique to extract past building images from 360 degrees panorama images serviced by Google Street View. Users only need to provide a geo-tagged image, collected near the target building, and the rest of the process is fully automated. High-quality and undistorted building images from multiple views are extracted from past panoramas. Overall, the developed technique is divided into four main steps: In Step 1, we build an object detector using a large volume of ground-truth building images to extract the buildings on images. Step 2 is to download the panoramas near the target building from Google Street View. In Step 3, the building's location in the GPS coordinate is computed using the geometric relationship between the building and the panoramas. Finally, in Step 4, the trained object detector is applied to detect and localize the building in each of the 2D images. To demonstrate, verify and validate the technique developed, an area located in Rockport, Texas, United States, is selected which has significantly damaged during Hurricane Harvey in 2017.

Keywords: Post-disaster assessment, 360° panorama image, Google street view, Region-based convolutional neural network, Multiview geometry.