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AUTOMATIC GEOREFERENCING OF REMOTE SENSING IMAGES WITHOUT METADATA USING DEEP CONVOLUTIONAL NEURAL NETWORKS

Abstract

Georeferencing remote sensing images is an essential prerequisite for any further image analysis task as it provides a geometric mapping of the local image coordinates to a location on the Earth's surface. Scanned historical remote sensing images and images with corrupted or incomplete metadata usually lack this information and thus limits their utility. The common solution is to register them with existing georeferenced satellite images for automatic georeferencing. However, identifying correspondences is much more challenging when working with historical images, because of the drastic change in imaging modes, acquisition times, viewpoints, and resolutions of the query and reference images. To this end, this paper proposes a practical framework to co-register uncalibrated historical images with georeferenced satellite images based on deep convolutional neural networks, to generate precise, fully-automatic spatial information. Firstly, it detects the geographical location of remote sensing images by using a deep convolutional neural network to search the closest image patch from known reference satellite data. Then, a convolutional neural network-based feature matching is proposed to align the historical image with the reference image patch for georeferencing. An experimental evaluation is conducted on a set of historical and reference satellite images and confirms the outstanding performance of the proposed method in automatic image georeferencing.