

An Integrated Way to Monitor the Health Condition of Building Facades by Analyzing Thermal Infrared Images

Keng-Tsang Hsu¹, Qianying Yang², Yishuo Huang²

¹Civil and Construction Engineering, Chaoyang University of Technology, Chinese Taipei, ¹Construction Engineering, Chaoyang University of Technology, Chinese Taipei

Monitoring building health conditions is an essential issue for building sustainability. Thermal infrared images recording the surface temperatures can be used as a clue to identify defects illustrated on building facades. Recently, image processing techniques can be applied to the recorded thermal infrared images. Image segmentation can group those pixels with similar pixel values into limited groups. A complex scene can be simplified into a few groups according to the surface temperatures. This paper proposed an integrated approach to analyze the collected thermal infrared images. Firstly, robust principal component analysis (RPCA) is applied to a series of thermal infrared images to have a template image in a low-dimension space. The template extracted from the low-dimension space inherits the significant properties of the given data. Then, the template is segmented by employing image segmentation. The image segmentation is implemented by introducing two-level set functions in an iterative scheme. The initial level set functions will continuously change their locations and positions till a convergence can be reached. With the segmented results, the health conditions can be monitored by comparing the thermal infrared images recorded in 2019 and 2023. The processed results demonstrate that the proposed approach can efficiently identify defects illustrated in the building facades.