Super Resolution Of Wind Pressure Field Of Buildings Using Deep Learning

Xiao CHEN, Gang HU, Chao LI, Yiqing XIAO

Evaluating wind pressures on buildings accurately is crucial to ensure safety of main structures and cladding. To obtain a high-resolution field of wind pressure, a large number of pressure taps are required in wind tunnel pressure tests. However, the amount of the pressure taps is often limited due to its high cost and space limitation on accommodating taps and tubes. This study used deep learning techniques including Residual Networks (ResNet) and Generative Adversarial Networks (GANs) to generate a high-resolution wind pressure field from pressure data acquired using finite pressure taps. It was found that the GANs model is superior to the ResNet model in reconstructing the high-resolution wind pressure field. In addition, the GANs model has been proven capable of reconstructing a wind pressure field with a high accuracy using only 40% of pressure taps. It is anticipated that this GANs model could be used to generate a higher-resolution wind pressure field on the basis of a pressure field acquired in the wind tunnel, and hence facilitate a more accurate evaluation of wind effects on buildings. Consequently, the GANs model could resolve the contradiction between high cost of pressure scanners and high-resolution wind pressure fields.