Construction of Refined 3D Real Scene Models of Buildings based on Air-ground Integration Method

Fenghua LYU, Penghui Ding and Baohua Liu (China, PR)

Key words: Photogrammetry; UAV oblique photogrammetry; SLR camera photogrammetry; texture and structure modification; historical buildings

SUMMARY

With the advancement of the construction of 3D Real Scene China, 3D real scene model data has become a new, unified and authoritative spatial digital twin base for the city. However, 3D Real Scene model is constructed from images taken from the air. Because of limitation of the occlusion between urban buildings, the near-ground parts of the buildings lack image information, resulting the problem of texture distortion and structural deformation in the construction of the 3D real scene model of the near-ground part of a building. In order to solve the above problems, this paper proposes an air-ground integrated refined 3D real scene modeling method, in which method a UAV with an oblique camera is firstly used to obtain ground oblique images, and then a SLR camera on the ground is used to take surrounding supplementary shots of each building. During the shooting process of the SLR camera at each site, images of the building from 5 angles are obtained. For facade information, the UAV oblique images and ground SLR images will be collected to perform aerial triangulation adjustment to obtain dense matching points, and finally a refined 3D real scene model of the building is constructed. Taking the Qingdao Bookstore, a historical building in Qingdao, as an example, a DJI UAV is firstly used to obtain oblique image information of the building from the air, and then a Sony SLR camera is used to capture the building facade images on the ground at a certain distance, and then aerial triangulation adjustment is performed. Finally, a 3D real scene model of the building is constructed. Compared with the 3D real scene model of Qingdao Bookstore by using UAV oblique images, the air-ground integration method proposed in this paper obtains 3D real scene model with more clear texture near the ground and under the eaves, with a reasonable structure, consistent with the real situation of the building. The results show that the method proposed in this paper effectively solves the problem of texture embroidery and structural deformation issues. At the same time, the proposed method is simple and easy to implement, with less manual intervention and a higher degree of automation in the entire construction process.