**Indoor mapping based on RGB-D and DSLR cameras**

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**ABSTRACT:** RGB-D cameras, which capture both RGB images and per-pixel depth information, recently became a popular indoor mapping tool in the field of computer vision. One of the mainstream solutions for indoor mapping and modeling is to create 3D point cloud from multiple images. However, the major drawback of image based on approaches is the lack of points extracted in featureless areas. The integration of RGB-D based sensors and cameras may fill up these voids in featureless areas and create a uniformly distributed point cloud of indoor environments. In this research, a hardware consisting of Kinects and digital single-lens reflex (DSLR) cameras is assembled and the data processing procedure for integrating these two kinds of devices to generate 3D point cloud is established. There is interference between Kinects, hence the field of view of the Kinects cannot overlap with one another. Thus, DSLRs are used to bridge the Kinects and provide a more accurate ray intersection condition, which takes advantage of the higher resolution and image quality of the DSLR cameras. Bundle adjustment is used to resolve the exterior orientation (EO) of all RGB images acquired by Kinect and DSLR. The EO of Kinect at each frame is used as an initial value to combine these point clouds at each frame into the same coordinate system. Iterative closest point (ICP) algorithm is used to refine the initial EO and resolves the scale factor for the created 3D point cloud. The quality of the combined point cloud is evaluated by comparing the width and height of the corridor and length of objects in the model against in situ measurements. The result shows that the design of the hardware and the data processing procedure can generate dense and fully colored point clouds of indoor environments effectively and accurately even in featureless areas.

Topic of paper: New Generation Sensors and Applications - Application of New Sensors

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