Using mobile laser scanning and UAV for 3D city models

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3D city model has been paid high attention for recent ten years, especially when many new applications e.g. location-based services, navigation, tourism, urban planning, require advanced visualization from the real scene. According to CityGML standard, the levels of detail (LoD) of the models are grouped to five categories. The detail definitions can be found from www. citygml.org. However, usually we also refer to two groups according to the distance and height from the target objects: models for fly-through views and models for walk-through views. Models for fly-through view can be regarded as an overview of the scene, the distance between the view point and the target is usually further than 100 m and the height is beyond the height of the objects. As regards with walk-through view, the distance can vary usually from half meter to one hundred meters. Models for walk-through view offer a sense that you were walking in the real scene. Therefore model reconstruction for walk-through view requires higher visual quality than for fly-through view since small errors or distortions or the rough surfaces can be clearly presented in front of you. The level of detail for walk-through view models can be referred to LoD 4 and LoD 5 according to CityGML standard.

As the sensor technology development, the increasing availability in multiple data sources acquired by different sensor platforms has provided the great advantages for detailed model achievement. This paper proposes the use of both MLS data and UAV images for 3D model reconstruction. Mobile laser scanning (MLS) has been commercialized for almost ten years. Since then due to the disadvantage in one-side (without backside information) data collection, it results in the limitation of applications. However the rise of the unmanned aerial vehicle (UAV) offers an alternative complementary for the disadvantages of MLS. As we know that 3D city models are reconstructed, the information from both building facades and roofs is needed. MLS can provide high resolution point clouds in building facades, whereas UAV images can offer detailed information in building roofs. The data fusion of MLS and UAV images can generate a complete high resolution 3D model for walk-through views. Methods are performed by four steps: i) Building facades are extracted from MLS data; ii) UAV images are referenced to MLS and extract building roof information from UAV images; iii) Data fusion of building facades building roofs; iv) Complete building model generation. By the above four steps, the desired models are achieved and the results are analyzed.