**Improvement of Virtual Tour Depiction Potential Utilizing Active and Passive Sensing Data Fusion**

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***ABSTRACT***

The generation of geospatial information about objects has become a well-established field of study, facilitated by the advent of diverse techniques and technologies. Furthermore, the demand for more realistic and detailed three-dimensional models and precise digital twins has led to a surge in interest in three-dimensional modeling. The integration of high-quality three-dimensional models and high-resolution textures in virtual reality has constituted a well-established field of study within this context. The unmanned aerial vehicle is a highly sought-after technology due to its ability to facilitate high-resolution aerial photo acquisition in a relatively short period of time, at a relatively low cost, and with minimal labor. In addition, TLS is a widely utilized technology due to its competence in delivering high accuracy and precise three-dimensional point clouds. Nevertheless, both technologies are subject to inherent limitations in three-dimensional reconstruction. The unmanned aerial vehicle technique is based on the passive remote sensing principle, which presents certain challenges when attempting to view objects in areas that are partially or fully occluded, including the forest understory and roofed structures. Furthermore, the TLS technique, which is based on active remote sensing, encounters challenges in capturing the upper parts of objects, limited mobility, and high operational costs. In this study, a virtual tour of the Gebze Technical University campus was created through the integration of an unmanned aerial vehicle and a terrestrial laser scanning data set. Subsequently, virtual tour depiction potential was improved through active and passive sensing data fusion, and three-dimensional models generated from unmanned aerial vehicle data were evaluated in comparison with three-dimensional models produced through data fusion. In conclusion, the limitations of the applied techniques in enhancing the potential of the virtual tour to represent objects were examined in terms of their advantages and the impact of object geometry on their effectiveness.

**Keywords:** digital twin, terrestrial laser scanning, three-dimensional modeling, unmanned aerial vehicle, virtual reality