**Building Change Detection Based on Roof Feature Analysis   
Using Single Satellite Imagery and Building Database**

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***ABSTRACT***

Understanding the distribution and development of buildings is crucial for urban management and planning. High-resolution satellite imagery enables rapid building change detection. Traditional building change detection methods have commonly used time-series satellite images. However, these methods have limitations due to the accumulation of errors from uncorrected relief displacement and building detection inaccuracies. In this study, we propose a building change detection methodology using single satellite imagery to overcome these limitations, utilizing a building database to accurately determine changes. We extract roof areas within an image by reprojecting building vertexes obtained from a building database. We classify roof images based on their features and detect building change candidates using deep learning model predictions. The study area was a residential complex in Seoul, South Korea. The data used included Compact Advanced Satellite 500 imagery and a publicly available building database. First, we generated a true-ortho image by removing the relief displacement of buildings and accurately reprojecting the building database onto the image. We extracted and analyzed various features of the roofs and performed clustering. The roof layers and clustering results were used as training data for a CNN model. The trained model was then used to classify validation satellite images and identify building changes. Classification accuracy was compared with actual building changes. Experimental results show that the roof features of buildings were meaningfully extracted, allowing for the clustering of similar buildings. The trained deep learning model produced highly accurate classification results in the validation data, grouping buildings with similar roof features together. Additionally, unique buildings in small groups and roofs that changes had occurred were classified together. The classification results identified candidates for building database updates, demonstrating the potential of the proposed methodology.

**Keywords:** Satellite image, Building change detection, True ortho-image