**Enhancing Tiepoint Extraction Performance in Multispectral UAV Images Using LightGlue algorithm**Sunghyeon Kim, Sung-Joo Yoon, Taejung Kim.

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***ABSTRACT***

As Unmanned Aerial Vehicle (UAV) technology advances, it has become possible to monitor crops in agricultural fields in near real-time, enabling efficient crop management. When acquiring UAV images, visible bands along show limitations in understanding the state of crops and soil. Therefore, acquiring crop information using UAV with multiple bands provides more diverse and accurate information. In a multispectral camera, there are inherent offsets in physical distances between each band. To address this issue and effectively utilize multispectral images, it is essential to extract tiepoints between multispectral bands. These points are then used to compute transformation coefficients, which align bands accurately. The traditional tiepoints extraction algorithms, Speeded Up Robust Features (SURF) and Oriented FAST and Rotated BRIEF (ORB), exhibit superior performance in matching feature points between common bands. However, when extracting tiepoints between different bands with varying brightness characteristics, it becomes challenging to identify tiepoints. Therefore, we aim to enhance matching performance across different bands by applying a machine learning-based algorithm to extract matching points, rather than relying on traditional algorithms that are sensitive to changes in brightness characteristics. The experiment was conducted by comparing the number of tie points extracted by SURF, ORB, and LightGlue on the dataset, and analyzing matching performance based on the success rate. LightGlue has strengths in both speed and performance compared to other machine learning-based matching point extraction methods. The experiment used 200 images of an agricultural area with 5 bands, captured by Phantom4 MultiSpectral. It was observed that LightGlue extracted approximately three times more tie points between different bands compared to the ORB and SURF algorithms. Consequently, the success rate of band alignment also increased by 20%. Based on this experiment, it is expected that applying LightGlue to areas where tiepoint extraction is challenging due to brightness value characteristics, such as forests or agricultural lands, could also yield improved results.

**Keywords:** UAV, Tiepoint, Band alignment, Machine learning