ABSTRAK

PERBANDINGAN AKURASI VERTIKAL DTM DARI FOTO UDARA PPK DAN LIDAR PPK

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Digital Terrain Model (DTM) merupakan representasi digital permukaan tanah yang berperan penting dalam berbagai aplikasi geospasial seperti perencanaan wilayah, analisis topografi, dan mitigasi bencana. Perkembangan teknologi penginderaan jauh memungkinkan pembentukan DTM menggunakan metode fotogrametri berbasis foto udara maupun teknologi *Light Detection and Ranging* (LiDAR). Penerapan metode *Post-Processed Kinematic* (PPK) digunakan untuk meningkatkan ketelitian posisi hasil akuisisi. Perbedaan karakteristik sensor foto udara dan LiDAR berpotensi menghasilkan tingkat ketelitian vertikal DTM yang berbeda, khususnya pada wilayah dengan penggunaan lahan beragam.

Penelitian ini bertujuan membandingkan ketelitian vertikal DTM hasil foto udara PPK dan LiDAR PPK menggunakan titik uji *Independent Check Point* (ICP) hasil pengamatan GNSS metode *rapid static*. Akuisisi data dilakukan menggunakan sensor CHCNAV Alpha Air 450 Advanced pada wahana DJI Matrice 300 RTK. Pengolahan *trajectory* PPK dilakukan menggunakan CoPre2, pengolahan foto udara dilakukan di Agisoft Metashape hingga pembentukan *dense cloud*, sedangkan proses *filtering* dan klasifikasi *ground* kedua data dilakukan di Global Mapper menggunakan parameter yang sama agar perbandingan lebih objektif. Evaluasi ketelitian vertikal dilakukan menggunakan perhitungan RMSEz dan LE90 berdasarkan elevasi ICP sebagai data referensi.

Hasil penelitian menunjukkan bahwa DTM LiDAR memiliki ketelitian vertikal lebih baik dibandingkan DTM foto udara. DTM foto udara memperoleh nilai LE90 sebesar 0,536 m sehingga memenuhi kelas ketelitian 2 untuk skala peta 1:2.500, sedangkan DTM LiDAR memperoleh nilai LE90 sebesar 0,329 m dan memenuhi kelas ketelitian 1 untuk skala peta 1:2.500 berdasarkan Peraturan Badan Informasi Geospasial Nomor 6 Tahun 2018. Ketelitian vertikal DTM LiDAR yang lebih tinggi dipengaruhi oleh kepadatan *point cloud* dan kemampuan sensor LiDAR dalam merekam *multiple returns* sehingga identifikasi titik *ground* dapat dilakukan lebih optimal.

Kata kunci: DTM, foto udara, LiDAR, LE90, PPK

ABSTRACT

COMPARISON OF DTM VERTICAL ACCURACY FROM PPK AERIAL PHOTOGRAPHS AND PPK LIDAR

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Digital Terrain Model (DTM) is a digital representation of the ground surface that plays an important role in various geospatial applications such as regional planning, topographic analysis, and disaster mitigation. The development of remote sensing technology enables DTM generation using aerial photogrammetry and Light Detection and Ranging (LiDAR) technology. The application of the Post-Processed Kinematic (PPK) method is used to improve the positional accuracy of acquired data. Differences in the characteristics of aerial photography and LiDAR sensors may produce different levels of vertical accuracy, particularly in areas with diverse land use conditions.

This study aims to compare the vertical accuracy of DTM generated from PPK aerial photography and PPK LiDAR using Independent Check Point (ICP) data obtained from GNSS rapid static observations. Data acquisition was carried out using the CHCNAV Alpha Air 450 Advanced sensor mounted on a DJI Matrice 300 RTK platform. PPK trajectory processing was performed using CoPre2, aerial photogrammetry processing was conducted in Agisoft Metashape up to dense cloud generation, while filtering and ground classification for both datasets were carried out in Global Mapper using the same parameters to ensure a more objective comparison. Vertical accuracy evaluation was conducted using RMSEz and LE90 calculations based on ICP elevation data as reference values.

The results show that the LiDAR-based DTM has better vertical accuracy than the aerial photogrammetry-based DTM. The aerial photogrammetry DTM obtained an LE90 value of 0,536 m, meeting Class 2 accuracy requirements for a 1:2.500 map scale, while the LiDAR DTM obtained an LE90 value of 0,329 m, meeting Class 1 accuracy requirements for a 1:2.500 map scale based on the Regulation of the Geospatial Information Agency Number 6 of 2018. The higher vertical accuracy of the LiDAR DTM is influenced by the higher point cloud density and the LiDAR sensor's capability to record multiple returns, enabling more optimal ground point identification.

Keywords: digital terrain model, aerial photo, LiDAR, vertical accuracy, LE90