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Topographic Mapping of Farmland by Integration of Multiple Sensors on Board Low-Altitude Unmanned Aerial System

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Abstract : This paper introduced a topographic mapping system with time-saving and simplicity advantages based on integration of Light Detection and Ranging (LiDAR) data and Post Processing Kinematic Global Positioning System (PPK GPS) data. This topographic mapping system used a low-altitude Unmanned Aerial Vehicle (UAV) as a platform to conduct land survey in a low-cost, efficient, and totally autonomous manner. An experiment in a small-scale sugarcane farmland was conducted in Queensland, Australia. Subsequently, we synchronized LiDAR distance measurements that were corrected by using attitude information from gyroscope with PPK GPS coordinates for generation of precision topographic maps, which could be further utilized for such applications like precise land leveling and drainage management. The results indicated that LiDAR distance measurements and PPK GPS altitude reached good accuracy of less than 0.015 m.

Keywords : land survey, light detection and ranging, post processing kinematic global positioning system, precision agriculture, topographic map, unmanned aerial vehicle
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