Development of 3-D GIS map generation system using an unmanned helicopter

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Abstract: The objective of this study is to generate a 3D-GIS map of farm field. The survey system was developed based on an unmanned helicopter. An RTK-GPS was adopted as a positioning sensor, and an inertial sensor that provides posture (roll and pitch angles) was installed on the helicopter. Moreover, a geomagnetic direction sensor (GDS) that outputs absolute direction is also equipped with the helicopter. And a laser scanner was adopted to detect the distances between a helicopter and ground. This leaser scanner provides a two-dimensional range data. Tthe sensor was attached on a pan-head can rotate in pan and tilt directions. Pan-head angles can be measured by two rotary encoders with 0.001 rad of resolution. Therefore, field elevation was sensed by rotating the pan head during hovering of an unmanned helicopter. In order to develop the precise survey system, the offset due to misalignment of sensor attachment was identified by measuring already measured position. And, because the GDS is influenced by a magnetic field surrounding the GDS, the direction data includes significant error. The GDS bias was also compensated by a FOG. Finally, the developed system accuracy was evaluated by the field test and express a farm field with 3D-GIS map. The 3D-GIS map was generated by transforming a laser scanner coordinate to global coordinate using a helicopter position and posture data.
Author Keywords: 3D-GIS; Laser range finder; Remote sensing; Unmanned helicopter

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