Development of a tiny orientation estimation device to operate under motion and magnetic disturbance

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Abstract: A tiny absolute orientation estimating device equipped with a network function has been developed using accelerometers and magnetometers to estimate gravity and the geomagnetic field, respectively. Because accelerometers measure motion other than gravity, a method has been proposed to eliminate the effect of motion. An estimation method is proposed that excludes the effect of magnetic disturbances. An advantage of this estimation method is that models can be switched according to the environment. Sigma Points Kalman Filters (SPKFs) were evaluated to determine the proper filter for the proposed algorithm. A Square-Root Central Difference Kalman Filter (SR-CDKF) was the best method considering stability, accuracy, and calculation cost. Using simulations and the realized device, the proposed algorithm stably estimated the orientation in the presence of motion and magnetic disturbances. © 2007 SAGE Publications.

Author Keywords: Absolute orientation; Magnetic disturbance; Motion disturbance; Sensor fusion; Sigma points kalman filters

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