

Low Cost Inertial Sensors Modeling Using Allan Variance

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Abstract : Micro-electromechanical system (MEMS) accelerometers and gyroscopes are suitable for the inertial navigation system (INS) of many applications due to the low price, small dimensions and light weight. The main disadvantage in a comparison with classic sensors is a worse long term stability. The estimation accuracy is mostly affected by the time-dependent growth of inertial sensor errors, especially the stochastic errors. In order to eliminate negative effect of these random errors, they must be accurately modeled. Where the key is the successful implementation that depends on how well the noise statistics of the inertial sensors is selected. In this paper, the Allan variance technique will be used in modeling the stochastic errors of the inertial sensors. By performing a simple operation on the entire length of data, a characteristic curve is obtained whose inspection provides a systematic characterization of various random errors contained in the inertial-sensor output data.

Keywords : Allan variance, accelerometer, gyroscope, stochastic errors

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