A robust nonlinear observer for rigid body attitude estimation

ABSTRACT
This paper deals with the attitude estimation of a rigid body equipped with angular velocity sensors and reference vector sensors. A quaternion-based nonlinear observer is proposed in order to fuse all information sources and to obtain an accurate estimation of the attitude. It is shown that the observer error dynamics can break up into two passive subsystems connected in "feedback". Then, this property is used to show that the error dynamics is Input-to-State Stable (ISS) when the measurement disturbance is seen as an input and the error state as the state. These results allow affirm that the observer is robust towards non ideal inertial sensors measurements.

INDEX TERMS
IEEE Terms
Angular velocity , Equations , Mathematical model , Noise , Observers , Quaternions , Sensors

INSPEC

Controlled Indexing
angular velocity control , attitude control , nonlinear control systems , observers , robust control , sensors

Non Controlled Indexing
angular velocity sensors , input-to-state stable , quaternion based nonlinear observer , reference vector sensors , rigid body attitude estimation , robust nonlinear observer

Author Keywords
ISS , Nonlinear Observer , Passivity , SVD , quaternion