Initial attitude acquisition result of the Alsat-1 first Algerian microsatellite in orbit

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Abstract: On the November 28th, 2002 at 06:07 am GMT, the first Algerian microsatellite Alsat-1 was launched from the cosmodrome of Plesetsk in Russia into a 700 km sun sunchronous orbit, Alsat-1 is an enhanced microsatellite (90 Kg), stabilised in 3 axis for image acquisition mode. It was designed for disaster monotoring and is a part of the international constellation dedicated for disaster monitoring (DMC). Immediately after separation from the final stage of the launcher, Alsat-1 can be tumbling at an undefined angular rate. The only attitude sensors useful at this stage will be the 3-axis magnetometer. Called B-dot rate damping, this controller requiring only a Y-axis magnetic moment and it will reduce the X and Z-axis angular rates and align the microsatellite to the orbit normal. The next step will be simultaneously control the Y-axis rate named Y-THOMFSON spin to a fixed reference value. The orbit reference Y-axis angular rate can be estimated from a pitch filter or Kalman rate filter. The pitch filter can be implemented once the satellite is in pure Y-THOMPSON spin. This filter will determine the pitch angle and rate using the magnetometer measurements and the modelled International Geomagnetic Reference Field vector. Finally when the pitch angle is 10 from nadir, we deploy the boom. The paper presented here is a part of my Phd thesis which describes the attitude determination control system algorithms implemented in the initial attitude acquisition phase on Alsat-1. This phase will complete the detumbling manoeuvres. The only attitude determination sensor required, is a magnetometer and the actuator required is a magnetorquer coil. The specific attitude controllers and estimators used during these modes are explained. In orbit commissioning results will be presented. © 2005 IEEE.

Author Keywords: Actuator; Alsat-1; Attitude; Sensor

Year: 2005

Source title: 2005 IEEE Networking, Sensing and Control, ICNSC2005 - Proceedings

Volume: 2005

Art. No.: 1461252

Page : 566-571

Link: Scorpus Link

Document Type: Conference Paper

Source: Scopus

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