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# DESIGN OF A SUPERVISORY ADAPTIVE ATTITUDE CONTROL (SAAC) SYSTEM FOR A STEREO-IMAGERY SATELLITE BASED ON MULTIPLE MODEL CONTROL WITH SWITCHING

Hossein Bolandi[1], Farhad Fani Saberi[1] and Bahman Ghorbani Vaghei[2]

[1]Electrical Engineering Department
Iran University of Science and Technology
Narmak, Tehran 16846-13114, Iran
Farhad_fanisaberi@ee.iust.ac.ir

[2]Railway Engineering Department
Iran University of Science and Technology
Narmak, Tehran 16846-13114, Iran
bahman_gh@ee.iust.ac.ir

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Abstract. *In this paper, a supervisory adaptive attitude control (SAAC) system for a remote sensing satellite based on multiple model control with switching has been designed to take a high resolution photograph or data collection according to a new stereo-imaging method. In the proposed stereo-imaging scenario, the satellite will maneuver in such a way that pitch and roll axes will be controlled simultaneously to provide stereo-imaging capability with free view direction as a new idea in capability of remote sensing satellites. This often needs highly accurate and stable pointing maneuvers that require the satellite to rotate along a relatively large angle attitude. The proposed SAAC method contains a PD controller that can always stabilize the satellite and a reduced order model reference adaptive controller to provide high pointing stability and accuracy. In this method, the knowledge about the bounds of system uncertainties is not required in the design of supervisory adaptive attitude control system. The performance and effectiveness of the proposed algorithm are investigated and compared through numerical simulations.*
**Keywords:** Satellite, Stereo-imaging, Attitude control, Adaptive, Supervisory, Switching, Multiple model

1. **Introduction.** One of the main objectives of Remote-Sensing satellites is to provide data services on an operational basis for integrated land and water resources management at micro level with enhanced multi-spectral and spatial coverage. Data collection in stereo mode is the most popular method for 3D topographic data acquisition for production of new and the revision of old inaccurate databases and maps [1]. Moreover, stereoscopy offers some important advantages in facilitating the identification of features especially in areas with only older poor cartographic base and in areas with significant high elevation differences.

A remote sensing satellite with stereo-imaging capability is able to capture images in stereo mode using one of two possible configurations: across track or along track [1,2]. In across track configuration, the pointing of the imaging sensor is oriented off-nadir and orthogonal with the track direction by rotating the satellite along the roll axis using reaction wheels. So, the stereo coverage is obtained by recording the same areas from one of the neighboring tracks after the sensor orientation has changed for an across track angle in the opposite direction [1,2]. The advantage of this configuration is to increase the ground coverage which will allow a revisit period about 4 to 5 times shorter than