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Author: Mr. Priyanshu M
BMS College of Engineering, Bengaluru, India

Mr. Surya Vaibhav DVR
BMS College of Engineering, Bengaluru, India

OPTIMIZING SATELLITE IMAGING CAPABILITIES OVER INDIAN LATITUDES: A STUDY ON SOLAR DECLINATION IMPACT ON DIGITAL SUN SENSOR FIELD OF VIEW

Abstract

The paper presents a comprehensive study on the Attitude Determination and Control Subsystem, focusing on the simulation of solar projections for Digital Sun Sensor (DSS) Field of View (FOV) analysis within Sun Synchronous Orbits. Digital Sun Sensors (DSS) are pivotal in satellite attitude determination, providing critical two-axis orientation information by determining the direction and position of the sun relative to the satellite. The DSS data is vital for the satellite's ability to perform accurate imaging, communication, and power generation. The purpose of the study is to analyze the impact of various solar declinations on the satellite's imaging capabilities over Indian latitudes. Methodologically, the study employs a J2 Propagation Model within the J2000 Coordinate System to simulate the satellite's orbit. The simulation considers three distinct solar declinations (-23.5, 0, 23.5 degrees) and corresponding longitudes of the ascending node. The results highlight the satellite's latitude-longitude position, sunlight intervals, and the azimuth and elevation range for the specified declinations. Notably, the satellite latitude range of 45-0 degrees was identified as the region of interest for imaging applications over Indian latitudes. In conclusion, the study provides valuable insights into the satellite's imaging capabilities and the influence of solar declinations on the DSS FOV. The simulation results, including the azimuth and elevation projections, are crucial for optimizing the satellite's performance for imaging purposes.