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IAF SPACE OPERATIONS SYMPOSIUM (B6)
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AI FOR SPACE OPERATIONS: THE NEXT GENERATION OF MISSION OPERATIONS FOR EARTH OBSERVATION CONSTELLATIONS

Abstract

Earth Observation Satellite constellations are more and more requested by customers to fit their strategic needs. They offer the ability to collect large amounts of data from various places, from various sensors. They offer versatility, robustness and an undeniable strategic advantage of revisit.

Classical way of operations, where every satellite, subsystems and the ground segment were operated by a team, does fit neither technically nor commercially for constellations. Artificial intelligence (AI) has proven its value in multiple applications. Automated mission operations, especially in multi-missions context, have a high impact in terms of efficiency where reduction of human interactions is foreseen: routine operations, monitoring, data processing and ground segment health.

Airbus has already developed automated collision avoidance maneuver (CAM), automated mission plan uplink and advanced monitoring that already allow us to operate with a limited number of operators. AI-based image production and analysis is one of the latest developments Airbus has performed: change detection and Deepzoom are now available on the market.

AI is set to play a major role in the automation of future EO systems, enabled by the significant advances in Machine Learning techniques of recent years. Data-driven AI-based solutions can be developed to improve operations effectiveness. Multi-variable multi-subsystems analysis (based on neural networks) for time series can be used to predict future behaviors. Identifying a potential upcoming failure before it occurs and proposing preventive procedures to reduce the downtime is one of the leaps where the classical way of operations is outdated.The spacecraft can no longer be controlled individually by operators: the impact of on-board AI will drastically shake current CONOPS.

Today, Airbus is working on artificial intelligence concepts for the next-gen EO constellations: AI on board and on ground to reach the lights-out center, where AI and automated systems can run the system without human intervention. This paper addresses the current development Airbus and its partners are running to manage complex constellations with novel automated procedure based on IA, machine learning for analytics on multi-sensors images to cope with ever-increasing amount of data and improve the situational awareness.