

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Space Communications and Navigation Systems (4)

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ADAPTIVE FILTER BASED ARTIFICIAL INTELLIGENCE APPROACH IN IMAGE PROCESSING
FOR DEEP SPACE & INTERPLANETARY AUTONOMOUS MISSIONS

Abstract

Technical advancements in communication systems design suitable for space conditions have hugely drawn inroads into space mission planning. Especially in deep space or interplanetary missions where the space conditions are extremely volatile and different from near earth missions, the total mission accomplishment is heavily dependent on communication and control systems onboard. Unmanned and autonomous missions completely rely on the onboard control circuitry and communication protocols that happen between the earth and the space vehicle. This paper discusses about the way how communication is done between the ground station and the space vehicle. Main focus is drawn towards designing a system for space vehicle which can autonomously think and take decisions on its own depending on the images the system (vehicle) captures. Artificial intelligence protocols that deal with the image processing techniques are discussed elaborately and the most important part of controlling the motion of the vehicle basing on the inputs after processing the image is given a deep insight. Controlling the motion of the vehicle using adaptive filter signal processing (kalman signal processing) is discussed with the kalman gain vector parameter specifications. Two most important aspects of autonomous space missions, image processing and motion controlling, are explained in relation with the communication that happens with the ground station. The advantages of how time delays are overcome by making the system autonomous, especially when distances count in terms of astronomical units, are listed out. A brief outlook of the systems design interconnecting all the sub systems is given and the selective image processing algorithms that can be dealt in tandem with artificial intelligence protocols are worked out.