

Detectability Analysis of Typical Aerial Targets from Space-Based Platforms

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Abstract : In order to achieve effective detection of aerial targets over long distances from space-based platforms, the mechanism of interaction between the radiation characteristics of the aerial targets and the complex scene environment including the sunlight conditions, underlying surfaces and the atmosphere are analyzed. A large simulated database of space-based radiance images is constructed considering several typical aerial targets, target working modes (flight velocity and altitude), illumination and observation angles, background types (cloud, ocean, and urban areas) and sensor spectrums ranging from visible to thermal infrared. The target detectability is characterized by the signal-to-clutter ratio (SCR) extracted from the images. The influence laws of the target detectability are discussed under different detection bands and instantaneous fields of view (IFOV). Furthermore, the optimal center wavelengths and widths of the detection bands are suggested, and the minimum IFOV requirements are proposed. The research can provide theoretical support and scientific guidance for the design of space-based detection systems and on-board information processing algorithms.

Keywords : space-based detection, aerial targets, detectability analysis, scene environment

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