

EOIR Sensor Radiance Predictions using MuSES and MODTRAN

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Abstract

The ability to predict electro-optical (EO) signatures of diverse targets against cluttered backgrounds is paramount for signature evaluation. Knowledge of target and background signatures is essential for a variety of defense-related applications. While there is no substitute for measured target and background signatures to determine contrast and detection probability, the capability to simulate any mission scenario with user-specified environmental conditions is a tremendous asset for defense agencies. This work presents a systematic process for the thermal and visible-through-infrared simulation of targets in cluttered outdoor environments. This process, utilizing the transient thermal and EO/IR radiance simulation tool MuSES (or TAIThermIR), provides a repeatable and accurate approach for analyzing contrast, signature and detectability of targets in multiple wavebands. Radiance renderings, which use Sandford-Robertson BRDF optical surface property descriptions, are coupled with MODTRAN for the calculation of atmospheric effects. Sensor effects such as optical blurring and photon noise can be optionally included, increasing the accuracy of detection probability outputs that accompany each EOIR rendering.