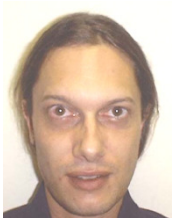
Techniques for Successful Sensor Band Imagery Validation & Verification Against Field Data

ABSTRACT

Sensor-band image generation has long been used for sensor training applications -- from NVG trainers designed for piloting and navigation tasks, to thermal or radar trainers designed to support target acquisition tasks. Increasingly, with UAV and other persistent sensor assets, where humans in the loop can be overwhelmed by the sheer imagery bandwidth, fast image processing algorithms are used for automated target detection and cueing. Scene content, signatures, and other aspects of image realism are thus crucial for not only human-in-the-loop testing, but for machine vision development, which can be negatively impacted by synthetic image artifacts. The ultimate test of a sensor-band image generator is how well it can replicate real-world sensor band imagery. Ideally, the sensor IG would be provided only an area of interest, and other "ground truth" information short of the actual sensor band imagery itself, and be able to produce synthetic imagery comparable to the field imagery, with similar clutter content and distribution, spatial and spectral radiance profiles, and 2D autocorrelation metrics. JRM Technologies will present its latest techniques in material classification and physics-based sensor image synthesis, with a particular emphasis on verification and validation against field imagery using appropriate metrics. The author will present an overview of physics-based sensor image synthesis, with a particular emphasis on verification and validation techniques and metrics.

Dr. Christopher Fink, Principal Investigator, JRM Technologies



Dr. Fink has 15 years experience developing real-time, OTF physics based atmospheric propagation modeling for EO, IR and radar sensors. He holds PhD and Masters degrees in Physics from Florida State University and dual Bachelor of Science degrees in Physics and Philosophy from the University of Wisconsin. Dr. Fink is chief technical architect of JRM's CPU-based software libraries for signature synthesis, atmospheric propagation and sensor modeling and simulation. His extensive experience includes physics-based EO/IR/RF/Acoustic signature synthesis and propagation modeling code development, sensor performance modeling and real-time sensor effects simulation code development. He's experienced in various NVESD model codes, including Acquire, AcquireX, FLIR92 and NVTHERM, and has developed new metric and image-based sensor performance model algorithms and conducted human performance tests to drive those model algorithms. His associated experience also includes in-depth algorithmic and code development in the areas of spectral meteorology and irradiance modeling, fully transient heat diffusion thermal modeling, BRDF modeling, atmospheric propagation modeling and spectral sensor modeling and simulation. He developed comprehensive real-time algorithms based on AFRL MODTRAN and RADTRAN atmospheric propagation codes and is a co-developer of JRM's RF and sonar gain distribution and signature synthesis modules. Dr. Fink also oversees JRM's material spectroscopy laboratory, and has over 30 years of experience in technical code development under Windows, Linux, Unix, VMS and DOS platforms. Dr. Fink's most recent technical publications are: "Improving Material Classification Quality with Elevation-derived Metrics" & "Simulation of Disturbed Earth and Buried Threat Signature Responses and Optimal Detection Strategies".