Synthetic Simulation and Modeling of Image Intensified CCDs (IICCD)

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Abstract

Image intensifying cameras have been found to be extremely useful in low-light-level (LLL) scenarios including military night-vision and civilian rescue operations. These sensors utilize the available visible region photons and an amplification process to produce high-contrast imagery. Today's image intensifiers are usually attached to a CCD and incorporate a microchannel plate (MCP) for amplification purposes. These devices are commonly referred to as image intensified CCDs (IICCD).

To date, there has not been much work in the area of still-frame, low-light-level simulations with radiometric accuracy in mind. Most work has been geared toward real-time simulations where the emphasis is on situational awareness. This research proposes that a high fidelity simulation environment capable of producing radiometrically correct multi-band imagery for low-light-level conditions can be an extremely useful tool for sensor design engineers and image analysts. The Digital Imaging and Remote Sensing (DIRS) laboratory's Image Generation (DIRSIG) model has evolved to respond to such modeling requirements.

The presented work demonstrates a low-light-level simulation environment (DIRSIG) which incorporates man-made secondary sources and exoatmospheric sources such as the moon and starlight. Similarly, a user-defined IICCD camera model has been developed that takes into account parameters such as MTF and noise.

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