

Testing and evaluation of thermal imagers, visible/NIR cameras, and SWIR imagers

Thermal imagers, visible/NIR cameras, and SWIR imagers are three main groups electronic imaging systems used by modern armed forces for surveillance applications. Thermal imaging and VIS/NIR imaging are fully matured technology of origin in 1970s/1980s that received a lot interest from scientific community including testing and evaluation. Excellent books and a series of papers on these subjects are available. However, in spite of rich literature practical testing and evaluation of thermal imagers or VIS/NIR cameras is a difficult task due to a set of different reasons. Results of testing thermal imagers/VIS/NIR cameras carried out by different test teams often differ significantly. There are problems with interpretation of test results, too. Metrological situation with SWIR imagers is much worse because it is a new technology and practically there is no international consensus on methodology to be used for testing these imagers. This course consists of three main parts.

First, a short review of modern thermal imagers, visible/NIR cameras, and SWIR imagers. The imagers are classified in dependence on spectral band, type of imaging sensors, targeted market.

Second, characterization of thermal imagers, visible/NIR cameras, and SWIR imagers. Here, parameters proposed by standards or literature sources for characterization of thermal imagers and VIS/NIR cameras are discussed. Situation with characterization of SWIR imagers is analyzed. Proposal for optimal set of parameters of SWIR imagers is presented. Finally, parameters needed to characterize performance of multi-sensor surveillance systems built using three earlier mentioned sensors are presented.

Third, equipment for testing earlier mentioned electronic imaging systems. An overview of requirements of standards or literature on equipment for testing thermal imagers, and visible/NIR cameras is presented. Possible technical solutions for testing SWIR imagers are presented, too. Sources of potential errors during tests of thermal imagers, visible/NIR cameras, and SWIR imagers are discussed. Finally, practical recommendations for calibration of the test systems to assure traceability to national standards are presented.

Intended Audience

This material is intended for engineers, scientists, and managers who need practical knowledge on testing and evaluation of modern thermal imagers, VIS/NIR cameras, and SWIR imagers.

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Krzysztof Chrzanowski received his Ph.D., and D.Sc. both in Electronics, from Military University of Technology in Warsaw, Poland. He works currently as Professor in the mentioned above university. His main scientific interests include testing and simulation of electro-optical surveillance systems and modules (thermal imagers, night vision devices, VIS/NIR cameras, SWIR imagers, laser systems, multi-sensor surveillance systems, image intensifier tubes, IR FPA/CCE/CMOS sensors, optical modules), non-contact thermometry and general metrology. Krzysztof Chrzanowski is also a founder and CEO of Inframet (www.inframet.com) - a high-tech company that specializes in high-tech equipment for testing, evaluation and simulation of surveillance electro-optical systems and modules. Nowadays, Inframet is a global high-tech company and one of top world leaders in optronic metrology.