Enabling Technologies for Advanced Imaging

Nibir K. Dhar*
DARPA/MTO, 675 N. Randolph St., Arlington, VA 22203

BIOGRAPHY

Dr. Nibir Dhar joined the Microsystems Technology Office at DARPA in March 2008. He is interested in developing innovative technologies in a broad field that adds value to the warfighter's objectives in the areas of novel architectures in infrared detectors and imaging, nanoelectronics including NEMS/MEMS components, novel materials synthesis techniques, bio-inspired concepts, and new modality power sources and storage. of

Dr. Dhar comes from the Army Research Laboratory (ARL) where he led the Integrated Power and Sensing Technology group to develop infrared sensors, soldier portable power sources (solar cells and thermoelectrics), thin films, nanomaterials development and integration of sensor/power technologies. Dr. Dhar was responsible for a wide variety of infrared focal plane array technology including mercury cadmium telluride materials and focal plane arrays (FPA), quantum well infrared photodetectors, Type-II strained layer superlattice, quantum dot infrared detecto rs and inter-band cascade Lasers.

Prior to joining ARL, Dr. Dhar worked as a research engineer for the Army's Research, Development and Engineering Center, Night Vision Electronic and Sensors Directorate (NVESD) primarily working on infrared FPA. Dr. Dhar received a master's degree and Ph.D. in Electrical Engineering from the University of Maryland at College Park in the area of Microelectronics and Electrophysics. He received a Bachelors's degree in Electrical and Computer Engineering from George Mason University.

TECHNICAL ABSTRACT

Advances in imaging technology have huge impact on our daily lives. Innovations in optics, focal plane arrays (FPA), microelectronics and computation have revolutionized camera design. As a result, new approaches to camera design and low cost manufacturing is now possible. These advances are clearly evident in visible wavelength band due to pixel scaling, improvements in silicon material and CMOS technology. CMOS cameras are available in cell phones and many other consumer products. Advances in infrared imaging technology have been slow due to market volume and many technological barriers in detector materials, optics and fundamental limits imposed by the scaling laws of optics. There is of course much room for improvements in both, visible and infrared imaging technology.

This presentation will describe the imaging vision of MTO, the technology challenges and projects currently fielded. In particular, description of new technology development under a portfolio program, "Advanced Wide Field of View Architectures for Image Reconstruction and Exploitation (AWARE)" will be described highlighting the following:

1. A modular and scalable camera architecture to overcome scaling limitations of conventional imaging system design, and to demonstrate the feasibility of near-linear growth of optical information throughput with increasing imaging system scale in reasonably small and affordable form factors.
2. Advancement in pixel scaling and high density FPA technology.
3. Development of Focal Plane Arrays with broadband (0.5-5 um wavelength band), continuous (visible to MWIR) day/night FPA technology.
4. A day/night visible/NIR and LWIR room temperature FPA with improved optics and integrated processing.
5. Low cost manufacturing and applications of infrared technology

* nibir.dhar@darpa.mil; http://www.darpa.mil