Adaptive Hyperspectral Imagers from UV to LWIR

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Hyperspectral imagers acquire images with narrow spectral bands and can differentiate objects and backgrounds based on their spectral characteristics. Traditional hyperspectral imagers use gratings and prisms and acquire images in hundreds of bands, requiring a huge amount of data processing. Such imagers have moving-parts and they are not robust. The US Army Research Laboratory has developed a family of random wavelength access hyperspectral imagers using an electronically tunable acousto-optic tunable filter (AOTF) as a programmable dispersive element in combination with an appropriate camera and optics for the spectral region of operation covering from the ultraviolet (UV) to the long wave infrared (LWIR). The wavelength is controlled by changing the radio frequency (rf) signal applied to the AOTF. These imagers are small, vibration-insensitive, robust, remotely-controlled, programmable and useful for field applications. Such imagers require minimum amount of data processing because they can collect data at only select wavelengths for a particular scene of interest. KDP, TeO₂, and TAS crystals have been used to design the AOTFs used in these imagers with Si-based CCD, InGaAs, InSb, and HgCdTe cameras to cover different spectral regions. The operation of each of these imagers and image acquisition is computer controlled. Here we will describe the development of these imagers and present results obtained.

Friday November 3rd, 1pm, Room 736 Academic Center