Integrated Polarization Imaging Sensors

Viktor Gruev
Department of Computer Science and Engineering
Washington University, St. Louis

Traditional CMOS and CCD imaging sensor capture two of the three fundamental properties of light: color and intensity. The third fundamental property of light, polarization, has been largely ignored by the imaging industry and research community in part by the human inability to "see" polarization properties. Nevertheless polarization-contrast imaging has proven to be very useful in gaining additional visual information in optically scattering environments, such as target contrast enhancement in hazy/foggy conditions, depth map of the scene in underwater imaging, and in normal environmental conditions, such as non-contact fingerprint detection among others. Polarization imaging tends to provide information that is largely uncorrelated with spectral and intensity images.

In this talk, I will present our latest research efforts in developing an imaging sensor capable of recording polarization properties of light in high resolution and in real-time. This sensor monolithically combines aluminum nanowires with CCD/CMOS imaging elements in order to create a 1 Mega pixel polarization imaging sensor. I will cover nanofabrication techniques as well as image processing algorithms that are mandated for this new type of sensor. I will conclude with examples of applications for this sensor in both medicine and biology.