The Importance of Being Unique from a Distance: Iris Recognition Under Less Constrained Environments (PI: Dr. Pathak Ajay Kumar; 2014/15)

Automated human recognition in real environments is one of the most critical and challenging tasks to meet the growing demand for stringent security. To date, no research effort has produced a machine with the ability to autonomously and covertly perform reliable recognition of human beings. Research programs that seek to pursue such initiatives use iris as the main trait and acquire data from moving subjects, at large distances, and under uncontrolled lighting conditions.

Iris texture is believed to be highly unique among humans and therefore iris recognition (IR) has emerged as one of the most popular research areas in biometrics. However, currently deployed automated IR technologies require good quality iris images acquired under near infrared illumination from close distances. These constrained imaging requirements constitute major obstacles for the deployment of IR technologies for surveillance, forensics, search for missing children and drug abuse detection.

The main goals of this project are three-fold: (1) the development of new theoretical models and algorithms to advance IR technologies, in order to be employed on real-world data, i.e., on images acquired under less constrained imaging environments and from increased standoff distances under defocus, off-angles and

occlusions from eyelashes, specular reflection, hair and eyeglasses; (2) utilization of discriminating information located in the vicinity of the eyes, from a region known as periocular, to significantly enhance the performance for IR under relaxed imaging constraints; and (3) the development of novel strategies to perform matching of multi-spectral iris data. Currently, satisfactory matching results can be obtained if both the enrollment and query images are acquired in visible/same illumination. Unfortunately, visible light iris data is rarely acquired or stored in databases while near infrared iris images are often saved/available in large databases developed for e-passports or other access control enrollments. Therefore, this project will deeply investigate and develop higher-order synthesis models to reliably match such cross-spectral iris images. With the help of current research on iris recognition, this project will introduce novel iris descriptors which are invariant not only to rotation but scale and perspective changes, develop feature-level formulation for multiple iris measurements, introduce nonlinear and local-feature matching strategies to accommodate varying pixel resolution in at-a-distance iris images. Our preliminary results are very encouraging, validating the feasibility of this project and its great potential. Advanced iris segmentation and identification using the developed techniques will significantly broaden the applicability of biometric recognition techniques for less constrained environments.