Title: Registration and Categorization of Camera Captured Documents
By Professor *Frank Y. Shih, NJIT, USA*

Abstract:
Camera captured document image analysis is concerned with processing of documents, which were captured with hand-held sensors, smart phones, or other devices, using advanced image processing, computer vision, pattern recognition, and machine learning techniques. As there is no constrained capturing in the real world, the captured documents suffer from illumination variation, viewpoint variation, highly variable scale/resolution, background clutter, occlusion, and non-rigid deformations e.g., fold and crumple. Document registration deals with a problem where the image of a template document whose layout is known is registered with a test document image. A novel methodology will be introduced in this talk for the registration of user defined Regions Of Interest (ROI) using corresponding local features from their neighborhood. The methodology enhances prior approaches in point pattern based registration, like RANdom SAmple Consensus (RANSAC) and Thin Plate Spline-Robust PointMatching (TPS-RPM), to enable registration of cell phone and camera captured documents under non-rigid transformations. Three novel aspects are adopted to embed into the methodology: (i) histogram based uniformly transformed correspondence estimation, (ii) clustering of points located near the ROI to select only close by regions for matching, and (iii) validation of the registration in RANSAC and TPS-RPM algorithms. Furthermore, two matching methods are developed for categorization: matching all features extracted from the query document as a single set and a segment-wise matching of query document features using segmentation achieved by grouping area under intersecting dense local affine covariant regions.

Professor Frank Shih received B.S. from National Cheng Kung University, Tainan, Taiwan, in 1980, M.S. from State University of New York, Stony Brook, U.S.A., in 1983, and Ph.D. from Purdue University, West Lafayette, IN, U.S.A., in 1987. He is presently a professor jointly appointed in the Department of Computer Science, the Department of Electrical and Computer Engineering, and the Department of Biomedical Engineering at New Jersey Institute of Technology, Newark, New Jersey. He served as chair of University Promotion & Tenure Committee, department acting chair, associate chair, and PhD director, and currently is the Director of Computer Vision Laboratory. Dr. Shih has held a visiting professor position at several universities, including Princeton University, Columbia University, National Institute of Informatics at Tokyo, and Conservatoire National Des Arts Et Metiers at Paris, National Taiwan University, Beijing Jiaotong University. He is an internationally renowned scholar and serves as the Editor-in-Chief for the International Journal of Multimedia Intelligence and Security (IJMIS). In addition, he is on the Editorial Board of 12 international journals. He served as a steering member, committee member, and session chair for numerous professional conferences and workshops. He has received numerous grants from the National Science Foundation, Navy and Air Force, and Industry.

Dr. Shih has authored four books: "Digital Watermarking and Steganography," "Image Processing and Mathematical Morphology," "Image Processing and Pattern Recognition," and "Multimedia Security: Watermarking, Steganography, and Forensics."

He has published 115 journal papers, 95 conference papers, and 10 book chapters. His research interests include image processing, computer vision, watermarking and steganography, digital forensics, sensor networks, pattern recognition, bioinformatics, information security, robotics, fuzzy logic, and neural networks.