Active Appearance Models with Rotation Invariant Kernels

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2D Active Appearance Models (AAM) and 3D Morphable Models (3DMM) are widely used to model faces and other objects. These models provide an efficient way to do detection, tracking and recognition of object classes. AAM provide a fast fitting process, but may represent unwanted 3D transformations unless strictly constrained not to do so. The reverse is true for 3DMM. The two approaches also require of a pre-alignment of their 2D or 3D shapes before the modeling can be carried out which may lead to errors. Furthermore, current models are insufficient to represent nonlinear shape and texture variations. In this seminar, I will present a new approach that can model nonlinear changes in examples without the need of a pre-alignment step. This makes both the training and fitting steps more reliable. In addition, the proposed method carries the advantages of AAM and 3DMM. To achieve this goal we take advantage of the inherent properties of complex spherical distributions, which provide invariance to translation, scale and rotation. To reduce the complexity of parameter estimation we take advantage of a recent result that shows how to estimate spherical distributions using their Euclidean counterpart, e.g., the Gaussians. This leads to the definition of Rotation Invariant Kernels (RIK) for modeling nonlinear shape changes. We show the superiority of our algorithm to AAM in several face datasets. Furthermore, we show how the derived algorithm can be used to model complex 3D facial expression changes observed in American Sign Language (ASL). Time permitting I will sketch the problem of Bayes optimality in feature extraction.

Short Bio:

Onur C. Hamsici received the BS degree in Electrical and Electronics Engineering and a minor degree in Mechatronics in Mechanical Engineering both from Middle East Technical University, Ankara, Turkey in 2003. He received the MS and PhD degrees in Electrical and Computer Engineering from The Ohio State University (OSU), in 2005 and 2008, respectively. He was a Postdoctoral Researcher at OSU and Visiting Faculty at Qualcomm in 2009. He is currently a Senior Engineer at the Office of the Chief Scientist at Qualcomm. His research interests are statistical pattern recognition, machine learning, and vision.