Announcing the Final Examination of Yuping Shen for the degree of Doctor of Philosophy

Time & Location: November 2, 2009 at 3:00 PM in HEC 356
Title: Geometric Invariance in the Analysis of Human Motion in Video Data

Human motion analysis is one of the major problems in computer vision research. It deals with the study of the motion of human body in video data from different aspects, ranging from the tracking of body parts and reconstruction of 3D human body configuration, to higher level of interpretation of human action and activities in image sequences. When human motion is observed through video camera, it is perspectively distorted and may appear totally different from different viewpoints. Therefore it is highly challenging to establish correct relationships between human motions across video sequences with different camera settings. In this work, we investigate the geometric invariance in the motion of human body, which is critical to accurately understand human motion in video data regardless of variations in camera parameters and viewpoints.

Unlike existing researches that study human motion as a whole 2D/3D object or a sequence of postures, we study human motion as a sequence of body pose transitions. We also decompose a human body pose further into a number of body point triplets, and break down a pose transition into the transition of a set of body point triplets. In this way the study of complex non-rigid motion of human body is reduced to that of the motion of rigid body point triplets, i.e. a collection of planes in motion. As a result, projective geometry and linear algebra can be applied to explore the geometric invariance in human motion. Based on this formulation, we have discovered the fundamental ratio invariant and the eigenvalue equality invariant in human motion. We also propose solutions based on these geometric invariants to the problems of view-invariant recognition of human postures and actions, as well as analysis of human motion styles. These invariants and their applicability have been validated by experimental results indicating that their effectiveness in understanding human motion with various camera parameters and viewpoints.

Major: Computer Science

Educational Career:
Bachelor's of B.Eng., BS, 2004, University of Science and Technology of China, Hefei, China
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Approved for distribution by Hassan Foroosh, Committee Chair, on October 16, 2009.

The public is welcome to attend.