- Friday, March 10, 2006
  Self-Organizing trees and forests for pattern clustering and recognition & Modeling and recognizing human movement and activities

  The Ryerson Multimedia Research Laboratory (RML) was established in 2001, sponsored by the Canada Research Chair Program, CFI/OIT, NSERC, SSHRC, Canada Council for the Arts, Ryerson University and industry partners. RML has been vigorously in pursuit of research excellence in image, video and multimedia processing, pattern recognition, machine learning, human-centered computing, data mining, and computational intelligence, with applications in digital asset management, special effect in film-making, streaming media over peer-to-peer networks, biometrics, and bioinformatics. I will start the talk with a briefly presentation of the areas and research projects conducted at RML, and then focus on two topics: 1) Self-Organizing Trees and Forests for Pattern Clustering and Recognition. We explore a family of computing architectures that have a basis in self organization, yet are somewhat free from many of the constraints typical of other well known self-organizing architectures. Within this family, the basic processing unit is known as the Self-Organizing Tree Map (SOTM), and the most sophisticated is the Self-Organizing Forest (SOF) which consists of numerous conceptually linked trees. We will look at how this model has evolved since its inception, how it has inspired new models, and how it is being applied to complex pattern clustering problems in image/video retrieval, and 3-D image analysis.

  2) Modeling and Recognizing Human Movement and Activities. Based on a novel paradigm - the alphabets of dynemes, we developed a continuous human movement recognition (CHMR) framework. The CHMR framework has been able to successfully infer the human movement skills that have produced the observed sequence of dynemes, enabling the tracking and recognition of hundreds of full-body movement skills from gait to twisting saltos, thus laying the basis for effective biometric authentication associated with full-body motion and body proportions. A differential evolution Monte Carlo particle filter was introduced to accurately track human movement. The unique and powerful anthropometrical features are investigated and utilized as the primary features for the study of biometrics and recognition of human skills in video images.

  Ling Guan
  Ryerson