AI 2012 Tutorial Proposal

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Tutorial Title:

Multimedia Information Extraction: *Methods and Applications*

Tutorial Abstract:

Audio and video signals are important sources of information in understanding the content of multimedia, and extracted features play an essential role in many key applications such as content-based information retrieval, information forensics fingerprinting, auditory and video scene analysis, multimodal biometrics and medical image/signal analysis. The first step in all the information extraction methods is to extract low-level representative and discriminative features from a multimedia file. Over the last several years, several information feature extraction techniques have been introduced. In general, all the information extraction methods utilize one of the following three signal representation domains: temporal domain, spectral or joint time-frequency (TF) domain. The tutorial will cover the main techniques that are associated with each of the three domains.

Temporal domain feature extraction approaches such as, signal energy, pitch, zero crossing rate and Entropy modulation will be discussed first. Spectral feature analysis methods such as spectral rolloff point, spectral centroid, mean frequency, cepstral coefficients, high and low frequency slopes will be covered in some detail. Advantages and challenges associated with

information extraction from temporal and spectral domains will be discussed. Spectral features generally assume the stationarity of the signal in the analysis frame, and do not provide any information on the temporal evolution or localization of the extracted features. As a result, only spectral feature are not enough for multimedia audio analysis. Because of the non-stationary nature of audio signals, specially the artificially created sounds such as music, and the shortcomings of the temporal and spectral features, there have been some recent attempts to derive joint TF features. In contrast to the two previous methods, TF features are effective for revealing non-stationary aspects of signals such as trends, discontinuities, repeated patterns and long-term feature representation where other information processing approaches fail or are not as effective. The tutorial will cover the recent advancements in information extraction using TF-methods based on adaptive data representations such as pursuits-based and empirical mode decompositions. The applications of these methodologies to areas such as content-based information retrieval, information forensics, auditory and video scene analysis, biometrics and biomedical information analysis will be discussed with some new results.

Time Allocation for Major Topics

Motivation and Objectives (15 minutes)

Information Extraction from Temporal and Transform Domains (60 minutes)

Information Extraction from Joint Time (space)-Frequency Domains (60 minutes)

Practical Applications (30 minutes)

Speaker's Biodata:

Sridhar (Sri) Krishnan received the B.E. degree in Electronics and Communication Engineering from Anna University, Madras, India, in 1993, and the M.S. and Ph.D. degrees in Electrical and Computer Engineering from the University of Calgary, Calgary, Alberta, Canada, in 1996 and 1999 respectively. He joined Ryerson University, Toronto, Canada in 1999 and is currently a Professor in the Department of Electrical and Computer Engineering, and Associate Dean (Research) for the Faculty of Engineering and Architectural Science. Since October 2007 he has also been holding the prestigious Canada Research Chair position. Sri Krishnanhas published more than 160 refereed papers in journals and conference proceediongs. He is a recipient of many national and provincial awards including the 2007 Young Engineer Achievement Award from Engineers Canada; 2006 South Asian Community Achiever Award; 2006 New Pioneers Award in Science and Technology; 2006 Best IEEE Chapter Chair Award (Toronto Section); and 2005 Research Excellence Award from the Faculty of Engineering, Ryerson University.