

EE/CmpE Department Seminar

June 17, 2014, Tuesday, 13:30

EE Department Yorgo I Stefanopoulos Meeting Lounge

Acoustic event recognition in everyday environments

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Abstract:

Auditory scenes in our everyday environments such as office, car, street, grocery store, and home consist of a large variety of acoustic events such as phone ringing, car passing by, footsteps, etc. Recognition of these events is easy for humans and allows us to gather information from the environment. Computational detection and recognition of acoustic events has plenty of applications e.g. in context-aware devices, acoustic monitoring, analysis of audio databases, and assistive technologies. This talk describes challenges in computational recognition of everyday acoustic events, such as defining event classes, acquiring acoustic models for them, and dealing with acoustic variability and overlapping sounds. We then present a hidden Markov model based framework for detecting and recognizing non-overlapping events, and then describe how the framework can be extended to deal with temporally overlapping events by applying source separation preprocessing. We also describe how the acoustic models of events can be acquired from acoustic material that is recorded in natural environments, where interfering noises are present. Event detection results on highly realistic acoustic material will be presented, and audio and video demonstrations will be given.

Short bio of the speaker:

Tuomas Virtanen is an Academy Research Fellow and an adjunct professor at Department of Signal Processing, Tampere University of Technology (TUT), Finland. He received the M.Sc. and Doctor of Science degrees in information technology from TUT in 2001 and 2006, respectively. He has also been working as a research associate at Cambridge University Engineering Department, UK. He is known for his pioneering work on single-channel sound source separation using non-negative matrix factorization based techniques, and their application to noise-robust speech recognition, music content analysis and audio event detection. In addition to the above topics, his research interests include content analysis of audio signals in general and machine learning. He has authored more than 100 scientific publications on the above topics. He has received the IEEE Signal Processing Society 2012 best paper award for his article "Monaural Sound Source Separation by Nonnegative Matrix Factorization with Temporal Continuity and Sparseness Criteria" as well as two other best paper awards.