

# Yu Shiu

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## OBJECTIVES

To pursuit a career in the field of **Digital Multimedia Signal Processing and Information Technology**

## EDUCATION

- Doctor of Philosophy, Electrical Engineering* Aug 2007  
University of Southern California (USC)  
*Field: Multimedia Signal Processing*  
*Minor: Computer Science/Natural Language Processing*
- Master of Science, Electrical Engineering* Jun 2002  
University of California, Los Angeles (UCLA)  
*Field: Digital Speech Processing*
- Master of Science, Electrical Engineering* Aug 1998  
National Taiwan University (NTU), Taiwan  
*Field: Electromagnetic Waves/Immersive Audio Processing*
- Bachelor of Science, Electrical Engineering* Aug 1996  
National Taiwan University (NTU), Taiwan

## PROFESSIONAL EXPERIENCE

Sept 02' – Aug 07' *Graduate Student Researcher*

*Prof. C.-C. Jay Kuo's Multimedia Communication Lab, USC*

Research projects on **Musical Information Retrieval System**:

(1) Probability-model-based **beat tracking for musical audio signals**

I developed two automatic musical beat tracking algorithms based on probabilistic methods:

- (a) One is based on Kalman filter with Probabilistic Data Association (PDA) to overcome the incorrect measurements in the tracking process.

(b) The other is based on hidden Markov model (HMM) to find the beat locations in non-causal way.

(2) **Audio source separation using matching pursuit** and content-dependent dictionaries

I worked with a co-worker on the separation of music and speech signals using a matching pursuit-based technique. First, we aim to build source models for speech and music signals, respectively by extracting the **basic sound elements** using matching pursuit with modified Gabor atoms. Second, based on the source models, music and speech are separated from the mixed signal via an optimized algorithm.

(3) **Semantic segmentation of musical audio signals** via dynamic programming-based similar section extraction

Targeted songs are segmented based on the detected boundaries of the repetition forms such as choruses and verses in pop and rock songs.

(4) **Musical onset detection** from classics music instruments

Sept 05' – Aug 07' *Research & Development Engineer*

*MAVS Lab Inc, Taiwan*

Research & development projects on **digital TV content management**:

(1) **TV highlight extraction** of baseball TV broadcasting program using gradient of pitch contours

(2) **Music video TV program segmentation** using similarity matrix and the optimization of the boundaries' cost function

(3) **Media content understanding via texts** using natural language processing such as POS tagger and parsers

Jan 04' – Jun 04' *Intern / Consultant*

*Verance Inc, San Diego*

Performance evaluation of **audio watermark security system**:

My work includes testing Verance audio watermark's robustness, exploiting the weakness from the perspective of an outside attacker to the security system and making recommendation to Verance's engineers to improve the security system.

Aug 98' – Apr 00' *System Administrator, Office of Information Management*

*Chinese Air Force Academy, Taiwan*

In the mandatory military service in Taiwan, I served as the system administrator of the internal network of the air base and of major databases for flight training scheduling and logistic management of airplane maintenance.

## **COMPUTING SKILLS**

Computational Language: Matlab, C/C++, Java.

Script Language: Perl, Python.

Operation System Platform: Macintosh MacOS, Unix/Linux, Windows.

## **PUBLICATIONS**

### **Hidden Markov Model-based Musical Beat Tracking**

(Submitted) Yu Shiu and C.-C. Jay Kuo, "A Hidden Markov Model Approach to Musical Beat Tracking," *IEEE International conference on Acoustics, Speech and Signal Processing (ICASSP 08')*, 2008

### **Musical Beat Tracking using Kalman Filter and Probabilistic Data Association**

(Submitted) Yu Shiu and C.-C. Jay Kuo, "Musical Beat Tracking via Kalman Filtering and Noisy Measurements Selection," *IEEE International Symposium on Circuits and Systems (ISCAS 08')*, 2008

Yu Shiu and C.-C. Jay Kuo, "On-line Music Beat Tracking with Kalman Filtering and Probability Data Association (KF-PDA)," *IEEE International Conference on Consumer Electronics (ICCE 08')*, Jan 2008

Yu Shiu and C.-C. Jay Kuo, "A Modified Kalman Filtering Approach to On-Line Musical Beat Tracking," *IEEE International conference on Acoustics, Speech and Signal Processing (ICASSP 07')*, Apr, 2007

Yu Shiu and C.-C. Jay Kuo, "On-Line Musical Beat Tracking with Phase-Locked-Loop (PLL) Technique," *IEEE International Conference on Consumer Electronics (ICCE 07')*, Jan 2007

### **Audio Source Separation using ICA and Matching Pursuit**

(Submitted) Namgook Cho, Yu Shiu and C.-C. Jay Kuo, "Efficient Music Representation with Content Adaptive Dictionaries," *IEEE International conference on Acoustics, Speech and Signal Processing (ICASSP 08')*, 2008

Namgook Cho, Yu Shiu and C.-C. Jay Kuo, "Audio Source Separation with Matching Pursuit and Content-Adaptive Dictionaries (MP-CAD)," *IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA 07')*, Oct 2007

Namgook Cho, Yu Shiu and C.-C. Jay Kuo, "An Improved Technique for Blind Audio Source Separation," *IEEE International Conference on Intelligent Information Hiding and Multimedia Signal Processing (IIH-MSP 06')*, Dec 2006

### **Musical Onset Detection from Classics Instruments**

Wan-Chi Lee, Yu Shiu and C.-C. Jay Kuo, "Musical Onset Detection with Joint Phase and Energy Features," *IEEE International Conference on Multimedia and Expo (ICME 07)*, July 2007

### **Detection of Similar Musical Sections and Musical Structure Analysis**

Yu Shiu, Hong Jeong and C.-C. Jay Kuo, "Similarity Matrix Processing for Music Structure Analysis," *1st ACM workshop on Audio and Music Computing Multimedia (under ACM Multimedia 06')*, Oct 2006

Yu Shiu, Hong Jeong and C.-C. Jay Kuo, "Similar Segment Detection for Music Structure Analysis via Viterbi Algorithm," *IEEE International Conference on Multimedia and Expo (ICME 06')*, Jul 2006

Yu Shiu, Hong Jeong and C.-C. Jay Kuo, "Musical structure analysis using similarity matrix and dynamic programming," *SPIE Optical Image 05', Proceedings Vol. 6015, Multimedia Systems and Applications VIII*, Oct 2005

### **Music Genre Classification and Audio Fingerprinting**

Yu Shiu and C.-C. J. Kuo, "Music Genre Classification via Likelihood Fusion from Multiple Feature Models," *SPIE Electronic Image 05', Proceedings Vol. 5682 Storage and Retrieval Methods and Applications for Multimedia*, Boston, Jan 2005

Yu Shiu and C.-C. Jay Kuo, "Music Genre Classification Using Temporal Domain Features," *SPIE ITCOM 04', Proceedings Vol. 5601 Internet Multimedia Management Systems V*, San Jose, Oct 2004

Yu Shiu, Chia-Hung Yeh and C. C. J. Kuo, "Audio Fingerprint Extraction for Content Identification," *SPIE ITCOM 03', Proceedings Vol. 5242 Internet Multimedia Management Systems IV*, San Jose, Nov 2003

### **PATENT**

Yu Shiu, Chia-Hung Yeh, Hsuan-Huei Shih & C. -C. Jay Kuo, "Highlight Detecting Circuit and Related Method for Audio Feature-based Highlight Segment Detecting," Taiwan (094123184), US (10/908,308) and China (200510089326.7) patents pending.

### **DOCTORAL DISSERTATION**

Yu Shiu, "Digital Signal Processing Techniques for Music Structure Analysis," University of Southern California, Aug 2007