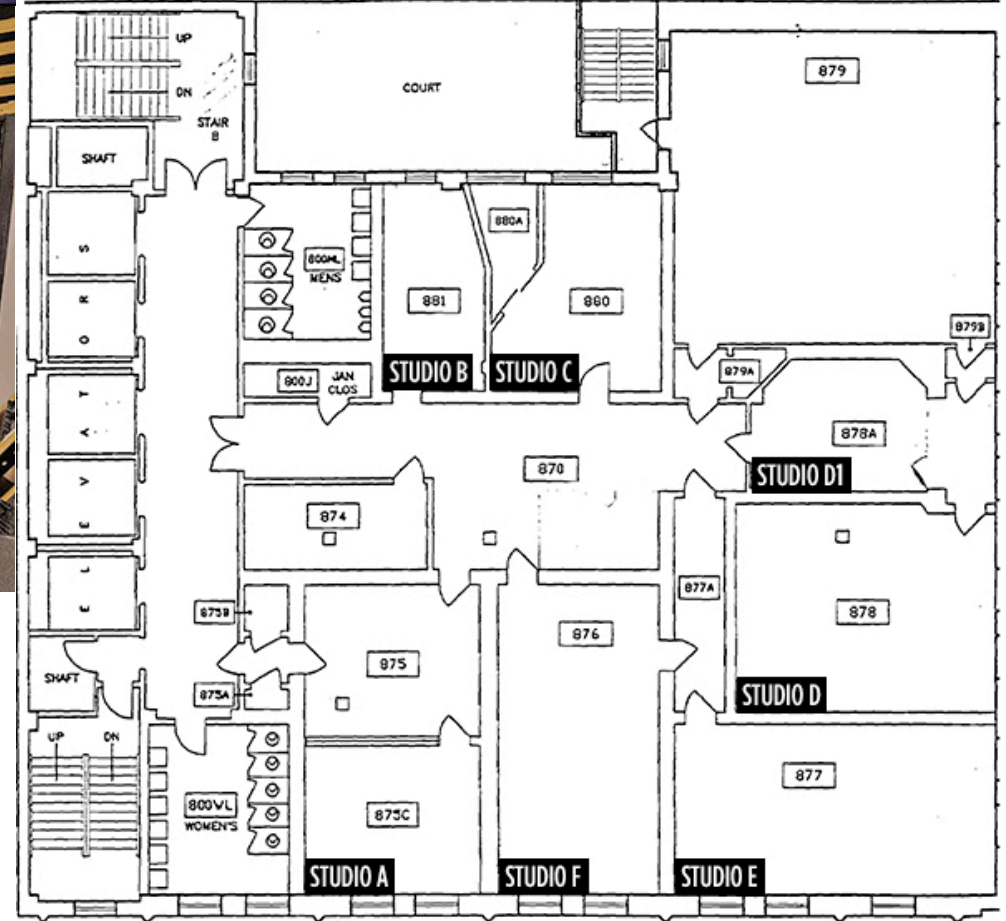# NYU Music Technology

Music Information-Related Research

New York University

MUSIC TECHNOLOGY

200 majors (B.M. & M.M.)
10 teaching/production studios
5 full-time faculty
Ph.D. program as of 2008
new recording/research lab facility as of 2009

Juan Pablo Bello

Dr. Juan Pablo Bello received his Engineering degree in Electronics from the Universidad Simón Bolívar in Caracas, Venezuela. After a two-year period working for Procter & Gamble, he was awarded scholarships by institutions in Venezuela, the U.S. and the U.K. to pursue Ph.D. studies, first at King's College London and then at Queen Mary, University of London, where he joined the Centre for Digital Music. His doctoral research concerned the automatic transcription of recorded music, an issue of great relevance to current applications on computer music and digital media distribution and retrieval.

Morwaread (Mary) Farbood
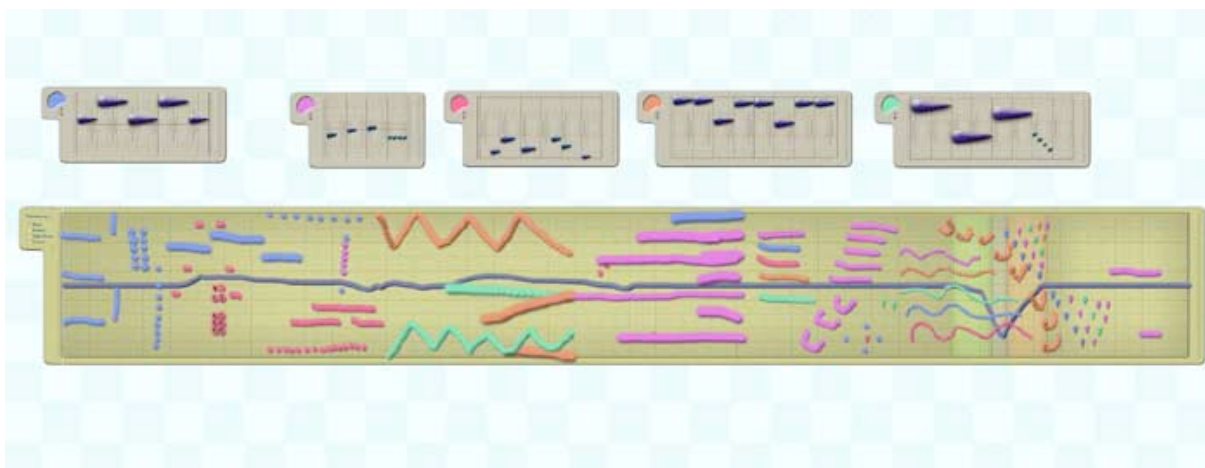
A Quantitative, Parametric Model of Musical Tension (Morwaread Farbood, doctoral dissertation, February 2006)

Panos Mavromatis

This talk explores the application of Hidden Markov Models (HMMs) to the extraction of structural rules from a musical corpus. These rules capture syntactic constraints among musical variables and/or related non-musical variables, such as word stress of sung text. The technique allows a systematic exploration of the unconscious internalized musical knowledge possessed by experts, which is usually not amenable to other types of analysis.

Myles Jackson: "As a historian of science and technology, I am interested in the historically contingent relationships between machines and humans from the Enlightenment to the present. I am particularly intrigued by the ways in which those interactions helped define aesthetics, particularly in music."

Myles W. Jackson, Harmonious Triads: Physicists, Musicians, and Instrument Makers in Nineteenth−Century Germany (MIT Press, 2006).

Agnieszka Roginska researches spatial and three−dimensional sound for the purposes of creating accurate simulations of acoustic spaces and reproducing sounds as they would appear in a natural environment. Before joining New York University, Dr. Roginska worked for six years as an audio research scientist at AuSIM Inc., a contract firm specializing in forward−looking audio technologies with a focus on sound reproduction for interactive environments. She has directed research in audio simulation and spatialization with grants from government agencies, research centers, and universities, including an award from the U.S. Army to study acoustic direction finding for soldiers.

Content-based MIR
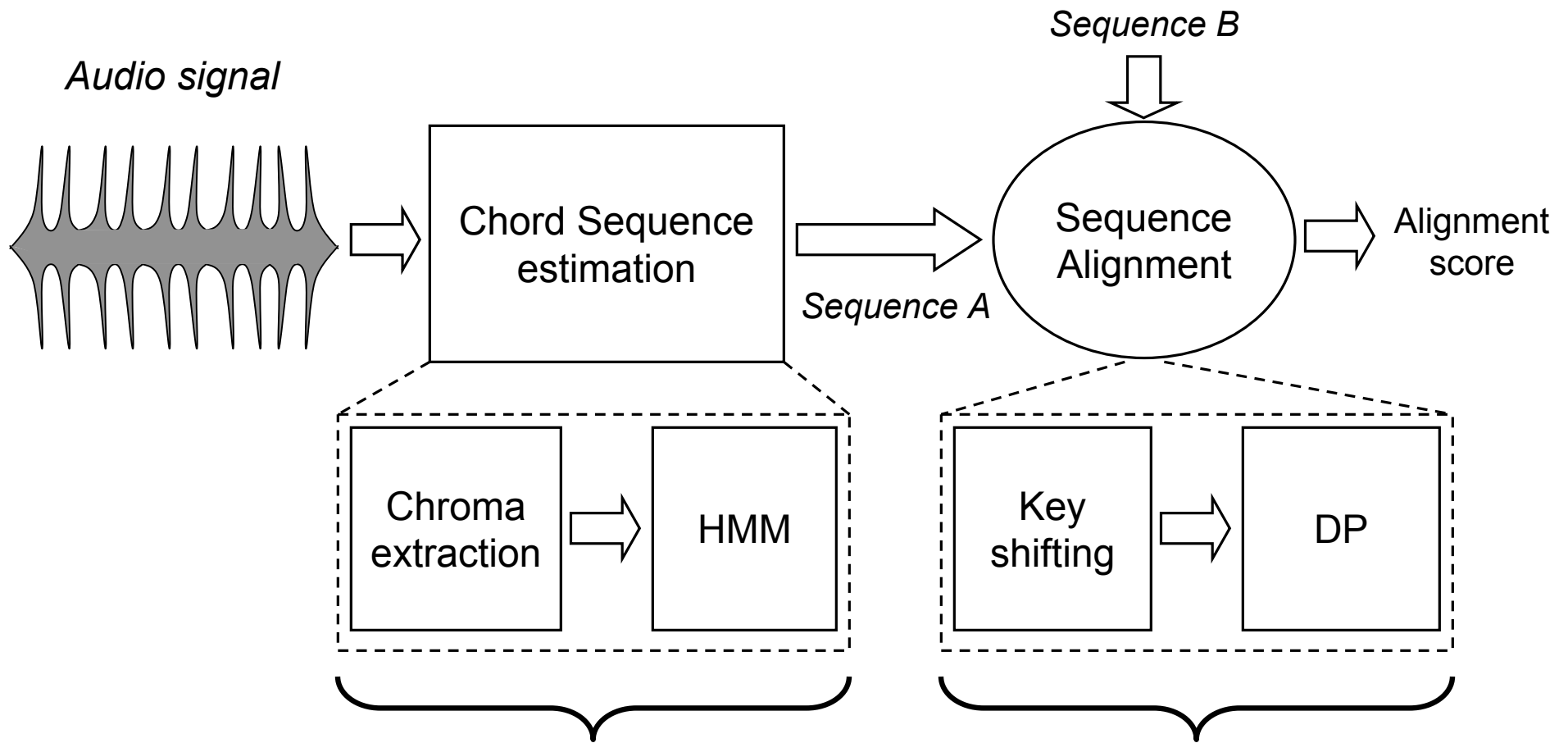
Mid-level Representation of Musical Audio

- Previous Work :
- 1. Classification of Harmonic Change (Li and Bello, 2007)
  - Novel feature to quantify transitions between adjacent chroma vectors
  - Measure Euclidean distance and phase deviation in the Tonal Centroid feature space
  - Musical audio is described by relative chord changes - key and tempo independent
- 2. Optimization of the Chroma Vector (Li, 2007)
  - Sparse NMF-based techniques to produce better performing chroma and tonal centroid vectors
  - Tonal centroid vectors derived from sparse NMF chroma had the highest overall accuracy in a chord classification test

- Future Work
  - Integration of automated segmentation or hierarchical HMMs
  - Explore sparse NMF features as a possible feature space itself for describing musical audio
  - Parsing of higher order structures using self-similarity and related techniques

Machine Listening in the Recording Studio

- Preprocessing and Analysis Tasks for Music Production Information Retrieval (MPIR): A Sound Stage Metric (Sarroff and Scott, 2007)

Spectral Mid-Side Similarity and Inter-Channel Cross Correlation of Spatial Width
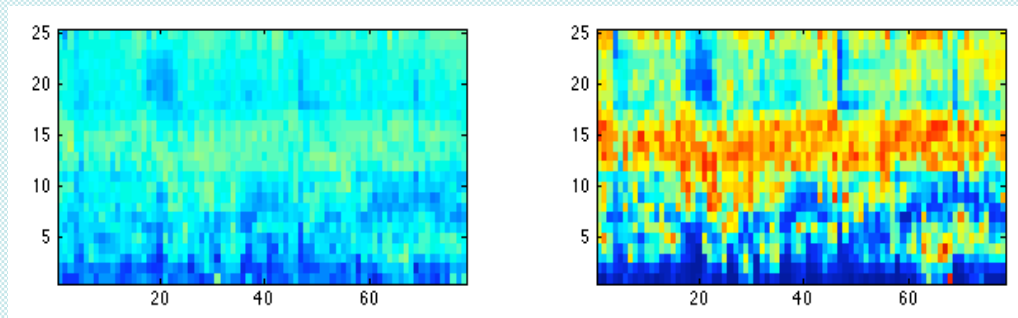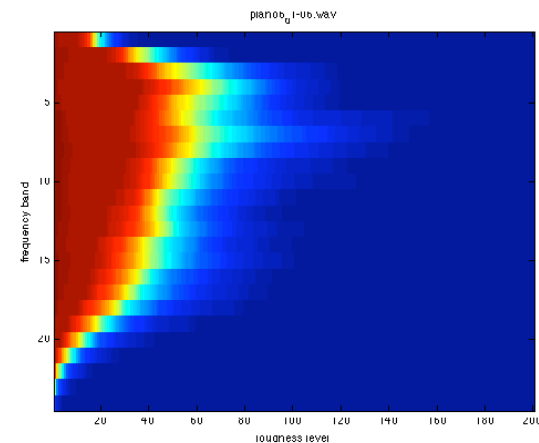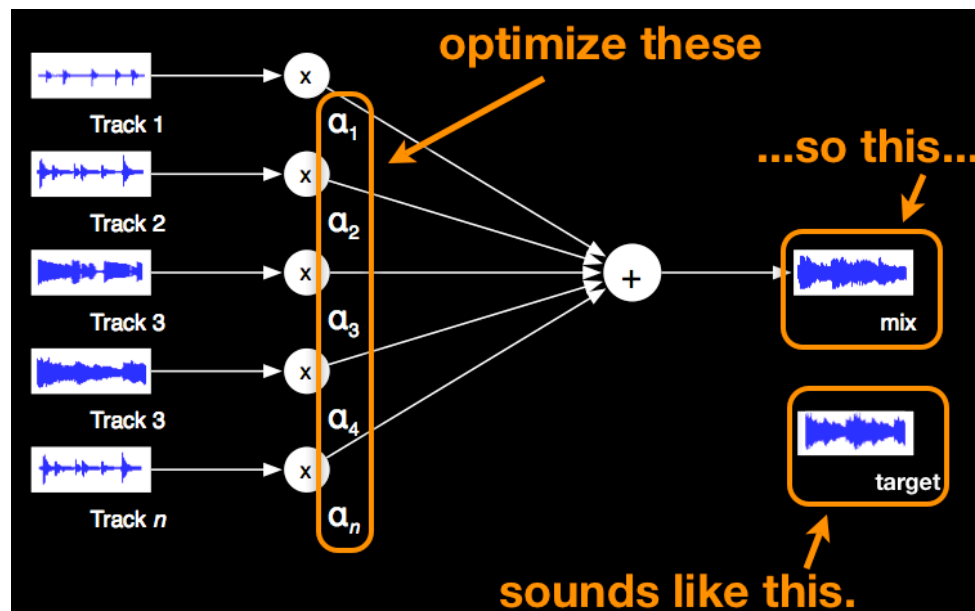
Nirvana, "Smells Like Teen Spirit"

- Temporal analyses of digital audio recordings for perception of sound stage: spatial width, depth of musical objects, frequency spread

Machine Listening in the Recording Studio

- Recording on Rails - The Quest for an Intelligent Recording Environment (Kolasinski, 2007)

- <u>Goal:</u> Integrate MIR & ML techniques in recording environments

- <u>Current work:</u> Automatic mixing using timbral similarity & GA
  - Use Genetic Optimization to minimize the distance between a mix and a target mix
  - Distance (Fitness) function: Euclidean distance between Spectral Histograms

Machine Musicianship (2001)