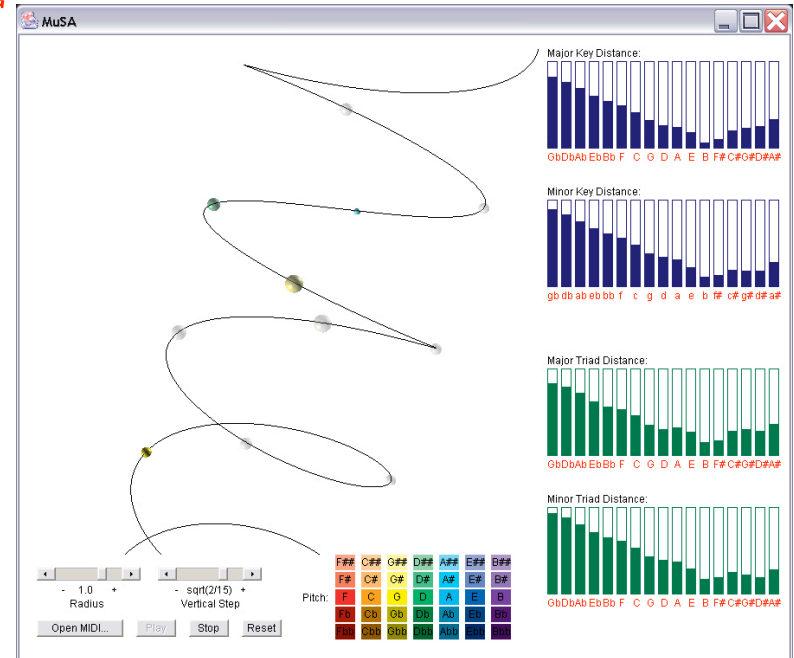# USC | IMSC

UNIVERSITY OF SOUTHERN CALIFORNIA

Integrated Media Systems Center

INTEGRATED MEDIA SYSTEMS CENTER
A National Science Foundation
Engineering Research Center at the
UNIVERSITY OF SOUTHERN CALIFORNIA

PRINCIPAL INVESTIGATOR

Elaine Chew

MuSA – Music and the Spiral Array

Beethoven's Piano Sonata Op.109

USC STUDENTS, DEGREES   Yun-Ching Chen (MS IMS, MS ISE)

BRIEF DESCRIPTION OF DEMONSTRATION

MuSA, a music visualization software, allows the user to visualize and track tonal patterns in real time as a MIDI file is read and played. Pitches map to positions in the Spiral Array model, and durations to the radii of the spheres. Each collection of notes also generates a center of effect (c.e.), and the distance of the c.e. to each key is graphed on the bar chart. The software was implemented using Java2 SDK, Standard Edition, with Java3D API.

UNIQUE OR DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART

We represent pitches, chords and keys in 3D space using the Spiral Array model (Chew, 2000).

The model clusters closely related entities and offers a distance metric for quantifying tonal relations.

The Spiral Array model has been shown to outperform existing models in determining key (Chew, 2001).

APPLICATIONS	RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES
Content-based music visualization Computer analysis of music	Developing nearest-neighbor techniques for disambiguating pitch spellings Using pitch structure to determine groupings for segmentation Developing more robust algorithms for analyzing large-scale tonal patterns Integrating models into systems for interactive performance

UNDERLYING TECHNOLOGIES

The software was implemented using Java2 SDK, Standard Edition, with Java3D API.

LIST OF PUBLICATIONS, REFERENCES, URLs

MuSA website: *http://cappriccio.usc.edu/MuSA*
Chew, E. Chen, Y.-C. (2002). Mapping MIDI to the Spiral Array: Disambiguating Pitch Spelling. In H. K. Bhargava and Nong Ye, eds., Computational Modeling and Problem Solving in the Networked World, Kluwer, pp.259-275. Proceedings of the 8th INFORMS Computer Society Conference, ICS2003, Chandler, AZ, Jan 8-10, 2003.
Chew, Elaine (2001). Modeling Tonality: Applications to Music Cognition. In Proceedings of the 23rd Meeting of the Cognitive Science Society, Edinburgh, Scotland, UK, August 1-4, 2001.
Chew, Elaine (2000). Towards a Mathematical Model of Tonality. Ph.D. dissertation. Operations Research Center, MIT. Cambridge, MA.
Sapp, Craig Stuart (2001). Harmonic Visualizations of Tonal Music, *http://www-ccrma.stanford.edu/~craig/keyscape*.

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