

# Zachary Seldess

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<http://www.zacharyseldess.com>

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## EDUCATION

### **Ph.D.** in Music Composition (ABD)

The Graduate Center CUNY, New York, New York

2005 - Present

### **Master of Philosophy** in Music Composition - *student of Morton Subotnick, Amnon Wolman*

The Graduate Center CUNY, New York, New York

2012

### **Master of Music** in Classical Guitar Performance - *student of Anne Waller*

Northwestern University, Evanston, Illinois

GPA: 4.0 / 4.0

1999

### **Bachelor of Music** in Composition - *student of Alan Stout, Michael Pisaro*

### **Bachelor of Music** in Classical Guitar Performance - *student of Anne Waller*

Northwestern University, Evanston, Illinois

GPA: 3.81 / 4.0, SUMMA CUM LAUDE

1998

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## WORK EXPERIENCE

### **Senior Director of Audio Research Engineering**

Comhear Inc., La Jolla, CA

<http://comhear.com>

January 2015 – Present

- Fixed-point DSP firmware development for Comhear's product line, including small form-factor speaker array beam former.
- Design and implement proprietary audio control encoding/decoding technology for fixed-point and floating-point architectures.
- Research and develop new applications for Comhear's beam forming and other DSP technologies.

### **Senior Audio Research Engineer, Sonic Arts R&D**

UC San Diego, San Diego, CA

<http://sonicarts.calit2.net>

October 2012 – January 2015

- Software and algorithm development and implementation across a wide array of spatial audio use-cases, including:
  - Embedded and PC-based speaker and microphone array beam forming technologies.
  - Graphics, data, and computer vision-driven multi-channel and binaural spatial sound.
  - Computationally efficient and scalable multi-channel spatialization algorithms.

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- Develop advanced experimental audio systems for VR/Vis, Arts/Entertainment, and Communications, from the initial research and development stages to prototyping and variable states of industrial maturity.
- Lead new research initiatives via coding and algorithm development, grant writing and negotiation, budget development, research methodology proposals and ratification, etc.

## **Audio Systems Coordinator and Lead Developer, Visualization Lab**

King Abdullah University of Science and Technology, Jeddah, Saudi Arabia

<http://kvl.kaust.edu.sa>

August 2009 – October 2012

- Managed, operated, and conducted research on multi-channel networked audio systems throughout facility, including:
  - Stereoscopic CAVE (100-million pixels) with 20.4-channel Meyer Constellation system.
  - 32-million pixel stereoscopic theater with 50.4-channel Meyer Constellation system.
  - Showcase room with a 35-channel custom audio systems and 5 large-scale tiled display video walls.
  - Audio development/production room including a 20.4 channel experimental speaker cage.
- Software and algorithm development and implementation, including:
  - Graphics-driven auditory display and multi-channel spatialization software tools.
  - Audio system control and automation software tools.
  - RGB-D camera-controlled speaker array beamforming software tools and VR CAVE tracking software.

## **Engineer and Instructor**

Harvestworks Digital Media Arts Center, New York, NY

<http://www.harvestworks.org>

January 2007 – August 2009

- Developed software for real-time surround sound spatialization, audio/video processing, computer/sensor interfaces.
- Taught interactive real-time programming with Max/MSP/Jitter and Processing.

## **Adjunct Lecturer**

Brooklyn College (CUNY) Conservatory of Music, Brooklyn, NY

September 2005 – June 2009

Classes taught:

- 20<sup>th</sup> Century Music Theory
- Introduction to Music

## **Graduate Researcher**

CUNY New Media Lab, New York City, NY

<http://www.nml.cuny.edu>

December 2005 – August 2009

- Designed networked interactive virtual sound environments in 3D Game Space using Max/MSP and the Torque 3D Game Engine.

## **Guitar Instructor**

First Conservatory of LaGrange, LaGrange, IL

December 2000 – July 2003

January 2005 – August 2005

- Taught private guitar lessons for all ages (classical, rock/blues, pop, etc.).

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## Adjunct Lecturer and Instructor in Music

Wilbur Wright College, Chicago, IL

August 2000 – June 2003

Classes taught:

- Introduction to Music
- Classical Guitar Performance

## Adjunct Lecturer and Instructor in Music

Harold Washington College, Chicago, IL

January 2002 – June 2003

Classes taught:

- Fundamentals of Music Theory
- Introduction to Music
- Classical Guitar Performance

## Classical Guitar Instructor

Suzuki-Orff School of Music, Chicago, IL

July 1998 – June 1999

- Taught group classes and private guitar lessons to children ages of 4 and older

## English Teacher

Guizhou University, Guiyang, Guizhou Province, China

September 2003 – July 2004

- Taught Conversational English for all sophomore English majors

## Classical Guitar Instructor

Northwestern University School of Music, Evanston, IL

September 1998 – June 1999

- Taught beginning and intermediate guitar classes and lessons for music major and non-music majors

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## PUBLICATIONS / PROJECTS

### MIAP: Manifold-Interface Amplitude Panning for Max/MSP and Pure Data

Published in Proceedings of Audio Engineering Society 137<sup>th</sup> Convention 2014, Los Angeles, CA, USA

Website: <http://www.zacharyseldess.com/miap>

Paper: <http://www.aes.org/e-lib/browse.cfm?elib=17435>

Videos: <https://www.youtube.com/playlist?list=PLHc927eu2oKbvllvzYbc8L5JEUZ-xU8uN>

- MIAP is a suite of externals for MaxMSP and Pure Data that provides a new and expanded implementation of Meyer Sound's SpaceMap™ abstract spatialization software. These objects provide virtually all of the expressive depth of Meyer's SpaceMap as a spatial sound control tool, while also providing a new vehicle for the exploration of new applications/implementations made possible by the tool's "manifold-interface" approach. Several examples of such expanded implementations are provided in the download package (such as binaural encoding, variable reverberation and audio decorrelation).

## **Stampede: Large-Scale Graphics and Data-Driven Sound Spatialization Software**

Video: [http://www.zacharyseldess.com/Skywalker/stampede\\_demo\\_final\\_novoiceover.mov](http://www.zacharyseldess.com/Skywalker/stampede_demo_final_novoiceover.mov)

- The driving innovative technology behind this project is an efficient multi-threaded lockless design for spatialization algorithms (currently implemented with VBAP, but Ambisonics should benefit as well). The above video demonstrates the software rendering several hundred discrete sound objects across 24 channels (each with perceptual cues such as air absorption, Doppler shift, etc.). For browser-based listening, the results are then rendered to binaural based on approximate real-space speaker locations.

## **KVL Kinect Tracker: Depth-Sensitive Tracking Software**

Website: [http://www.zacharyseldess.com/KVL\\_KinectTracker/](http://www.zacharyseldess.com/KVL_KinectTracker/)

Videos: <https://www.youtube.com/playlist?list=PL8A41437E25969DAD>

- This software implements a depth-sensitive blob sorting and tracking algorithm for robust hands-free user interaction. The software features 3D background subtraction, and custom carving out of the tracking space, and can stream blob location data (pixel x/y and 3D coordinates in meters) to an arbitrary number of software clients via Open Sound Control.

## **Interactive Projection for Aerial Dance Using Depth Sensing Camera**

Published in Proceedings of SPIE 9012, The Engineering Reality of Virtual Reality 2014

Paper: <http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1839979>

- An interactive performance system for Floor and Aerial Dance that controls visual and sonic aspects of the presentation via a depth-sensing camera (MS Kinect). In order to detect, measure and track free movement in space, 3 degrees of freedom (3-DOF) tracking in space (on the ground and in the air) is performed using IR markers. Gesture tracking and recognition is performed using a simplified HMM model that allows robust mapping of the actor's actions to graphics and sound.

## **The Sound of Exodus (EX3): Adaptive, Listener-Centered Auditory Display for Multimodal Narrative in Advanced Visualization Spaces**

Published in "Israel's Exodus in Trans-Disciplinary Perspective: Text, Archeology, Culture, and Geoscience"

Book : <http://www.springer.com/statistics/social+sciences+%26+law/book/978-3-319-04767-6>

- Using advanced, adaptive, listener-centered audio systems in development at UCSD, the authors experimented with computer-audio digital signal processing and acoustical design strategies to provide a well-controlled listening environment that complemented the advanced display technologies of EX3. Primary hardware and software components included custom control and signal processing software, audio beamforming using small format speaker arrays for optimal auditory intelligibility, and human image tracking driving auditory content rendering.

## **Sonnotile: Audio Annotation and Sonification for Large-Scale Audio/Visual Display Environments**

Published in Proceedings of 17<sup>th</sup> International Conference on Auditory Display 2011, Budapest, Hungary

Paper: <http://hdl.handle.net/1853/51766>

Video: <https://www.youtube.com/watch?v=8Ayoe-jURJM>

- Sonnotile is an auditory display tool to enhance scientific data exploration, representation, and analysis within tiled-display visualization environments. This software aims to assist researchers in the customization and embedding of sound objects within their data sets, leveraging the strengths of the ears in improving way-finding abilities, and in widening the perceptual bandwidth through simultaneous multi-modal data realizations.

## **Tahakum: A Multi-Purpose Audio Control Framework**

Published in Proceedings of New Interfaces in Musical Expression 2011, Oslo, Norway

Website: <http://www.zacharyseldess.com/Tahakum/index.html>

Paper: <http://www.nime2011.org/proceedings/papers/Eo1-Seldess.pdf>

- Tahakum is a collection of software tools designed to enhance workflow on multi-channel audio systems within complex multi-functional research and development environments. Tahakum aims to provide critical functionality required across a broad spectrum of audio systems usage scenarios, while at the same time remaining sufficiently open as to easily support modifications and extensions via 3rd party hardware and software. Features provided in the framework include software for custom mixing/routing and audio system preset automation, software for network message routing/redirection and protocol conversion, and software for dynamic audio asset management and control.

## **TrichordSpace: Trichordal Pitch-Class Space Visualization and Exploration Software**

Software: <http://www.zacharyseldess.com/TrichordSpace/>

Videos: <https://www.youtube.com/playlist?list=PL5oBBF4DE9FBB2DE9>

- TrichordSpace allows users via spatial/visual representation to explore concepts common in post-tonal musical analysis, such as trichordal set-class structure, transformational networks, and parsimonious atonal voice-leading.

## **Music Cre8tor: Sensor-Software Interface for Musical Exploration and Education**

Published in Proceedings of New Interfaces in Musical Expression 2007, New York, USA

Software: [http://www.nime.org/proceedings/2007/nime2007\\_415.pdf](http://www.nime.org/proceedings/2007/nime2007_415.pdf)

Videos: <http://www.zacharyseldess.com/musiccre8torvids.html>

- The Music Cre8tor is an interactive music composition system controlled by motion sensors designed for the needs of people with disabilities to be used as an educative, therapeutic and emotionally rewarding artistic outlet for this population and their teachers, therapists and parents. This system was built to allow the physically and cognitively challenged population to create new music by using motion sensors which are held or attached to a person's wrist, arm, leg, head, etc.

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## WORKSHOP / SEMINAR EXPERIENCE

### **Adventures and Challenges in Spatial Sound**

Demo/Presentation at NYU Waverly Labs for Computing and Music

<http://nyu-waverlylabs.org/2014/03/22/25-mar-14-guest-lecture-zach-seldess-on-spatial-sound/>

March 25 2014

### **Immersive Audio and Auditory Display within Multimedia Systems**

Presentation at Stony Brook University (SUNY), Center for Digital Arts, Culture, and Technology

<http://cdact.stonybrook.edu/DataSensorium/>

October 12 2011

### **Workshops/Seminars on new uses of technology in the Arts**

- SUNY Fredonia University, Fredonia, NY, March 4 2008
- SUNY Stony Brook University, Stony Brook, NY, April 3 2008
- Hartwick College, Oneonta, NY, April 8-9 2008

## CONFERENCE PRESENTATIONS / AWARDS / RESIDENCIES

### **Siggraph Asia 2009 Conference, Yokohama, Japan**

*A Head Of View* installed at Siggraph Asia 2009 "Adaptation" Art Gallery exhibition

December 17 – 19 2009

### **ZKM Institute for Music and Acoustics, Artist in Residency, Karlsruhe, Germany**

Premiered *A Head of View* in the ZKM Kubus Theater

June 2009 – August 2009

### **Chamber Music America 2009 National Conference, New York City, NY**

Presented custom performance software using wireless sensors and computer vision tracking  
(designed for Harvestworks 2008 Artist in Resident, Jane Rigler)

January 17, 2009

### **Nominated for "Most Distinguished Faculty Award," Harold Washington College, Chicago**

Fall 2003

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## PRODUCTION / ORGANIZATIONAL EXPERIENCE

### **Juror – ICMC Paper and Music Submissions**

<http://www.computermusic.org/page/23/>

2010, 2011, 2013, 2014

### **Judge Panelist – Harvestworks 2009 Artists Residency Program**

<http://www.harvestworks.org/category/residency-list/>

2008

### **Co-founder / Co-director – New York City Electroacoustic Music Festival**

<http://nycemf.org>

2009, 2010, 2013, 2014

### **Founder and Co-director – Intermedia Arts Group**

<http://www.intermediaartsgroup.org>

2006 – 2009

### **Artistic Director / Organizer – Gerhard Stabler's vocal work "SPEED" (American premiere)**

May 2003

### **Artistic Director / Organizer – Antennae Performance, Chase Cafe, Chicago, Illinois**

July 2011

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REFERENCES (available upon request)