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Director, Human-Centered Design iPhD
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Virginia Tech, School of Performing Arts
Center for Human-Computer Interaction
Computer Science (by courtesy)

CURRICULUM VITAE

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EDUCATION

- **Management Academy**, Virginia Tech, 2014-5.
- **D.M.A.** in Composition (cognates in Computer Music Programming and Music Theory), University of Cincinnati, College-Conservatory of Music, 2005.
- **M.M.** in Composition, University of Cincinnati, College-Conservatory of Music, 2001.
- **B.M.** in Composition (Summa Cum Laude), University of Cincinnati, College-Conservatory of Music, 1998.
- **Gymnasium degree** in Music Theory, Music Academy "Vatroslav Lisinski" (Zagreb, Croatia), 1992.

ADMINISTRATIVE EXPERIENCE

VIRGINIA TECH

- Institute for Creativity, Arts, and Technology's Creativity + Innovation Director (see http://ci.icat.vt.edu), 2019-present.
  - Leading the Creativity + Innovation (C+I) transdisciplinary Destination Area, consisting of 30+ core faculty and another 100+ affiliate faculty.
  - Developing self-sustaining strategy for the inter- and transdisciplinary efforts by leveraging curricular, research, and engagement opportunities, including introduction of the University's first Destination Area C+I Honors Diploma, second such diploma at Virginia Tech.
  - Developing an interdisciplinary curricular pipeline from undergraduate to PhD, resulting in 2 Pathways minors (Design Tech and Innovation), one C+I Honors Diploma, Human-Centered Design individualized interdisciplinary PhD, and Human-Centered Technology Design (HCTD) Professional Masters (currently in development).
  - Building community through new initiatives, cross-campus, and private-public partnerships.
  - Coordinating with ICAT's Executive Director and other three ICAT Directors.
  - Established 5 faculty-led working groups: Diversity & Inclusion (first among Virginia Tech's transdisciplinary communities), Education, Engagement, Infrastructure, and Experience+.
  - Introduced new student-centric theme titled "The Year of Student Creativity + Innovation" with a major push to recruit and engage more students.
  - Worked with Deans and leadership towards establishing new mechanisms for the support of inter- and transdisciplinary work.
  - Developed inaugural Immersive Audio thematic working group within C+I attracting faculty from science, engineering, arts, and design. Co-organized thematic group's Information Expression Immersion symposium engaging national audience. In 2020, suspended meetings due to pandemic. In 2022 restarted the initiative through a student- and faculty-centric weekly audio research seminar series with up to 20 students in attendance during the fall 2022 semester.
  - New initiatives and grant applications for renovating historical Media Building with over $160,000 already invested towards this goal.
  - Developed a new College-level MOU model for cost and revenue sharing towards the goal of making the initiative self-sustaining.

- Appointed co-director of the Human-Centered Design individualized iPhD program hosted by the Graduate School. Integrated the program into the C+I with a goal of building a transdisciplinary undergraduate-graduate pipeline.
- Launched first of a kind summer transdisciplinary curriculum, Summer 2021.

- College of Liberal Arts and Human Sciences Interim Associate Dean for Research and Graduate Studies and Director for College Diversity Initiatives, 2018.
  - In charge of all college-level research initiatives, including internal seed grants (through strategic partnerships increased fall faculty grants funding from $50,000 to $70,000), organizing and leading the Faculty Research Grant Committee.
  - Organizing the Graduate Curriculum Committee, College Diversity Committee, Honors & Awards Committee, and two special committees for the selection of the Alumni Distinguished Professor and University Distinguished Professor, and the Andrew Carnegie Fellows.
  - Representing college in various diversity & inclusion initiatives. Facilitated reinstatement of the College's Diversity Fellow position and the appointment of prof. Sam Cook (selected by the committee vote).
  - Managing faculty conflict of interest and ensuring research training and compliance.
  - Organizing Pre-Tenure Mentoring meetings and panels, and the Grants 101 workshops.
  - Managing College space needs and allocation, including instructional renovations and budgetary requests.
  - Supervising one post-doc in the area of Humanities.
  - Recruitment and oversight of the Dean's office assistant.
  - Serving on the Data & Decisions Destination Area Stakeholder Committee.
  - Spearheading the Alt Metrics and VT Confluence initiatives (see Research below).
  - Substituting for the College Dean in select functions and meetings.
- Creativity + Innovation (C+I) Strategic Growth Area and the Intelligent Infrastructure and Human-Centered Communities (Ubiquitous Mobility) Destination Area campus-wide Provost-led transdisciplinary initiatives faculty lead, 2016-0218.
  - Serving as one of the five faculty members on the Provost-appointed C+I Stakeholder Committee.
  - Participating in shaping mission, vision, research agenda, curricula, and infrastructure investment, including $150K initial seed money for C+I, and visioning for the new $500+M multi-building Creativity and Innovation District.
  - Developing a new interdisciplinary curricula and working with the administration on restructuring existing curricular infrastructures that limit interdisciplinary potential.
- Introduced a new Creative Technologies in Music undergraduate degree option with two sub-tracks with ongoing recruitment, online presence, and social media presence, 2015-present.
- Presented COMPEL initiative to the School of Performing Arts' music program as an opportunity for shaping the music program's identity (see Research below), 2016-present.
- New Interfaces for Musical Expression international conference co-chair (co-hosted with University of Virginia, staged at Virginia Tech) http://nime2018.icat.vt.edu, 2015-2018.
  - Coordinate a 20+ member multi-institutional collaborative team.
  - Work with the committee to improve review rigor—converting all reviews to double-blind peer reviews.

- Raised $40,000 towards the conference, with a total budget of $115,000.
- 500+ submissions, 250+ visitors from 27 countries, 4 keynotes, 43 papers (26% acceptance rate), 49 poster and demo papers, 30 demos, 44 music pieces, 6 installations, 13 workshops, 5 curated works.
- Focus on diversity and inclusion: out of 4 keynotes 3 were minority, and 2 women, partnership with the Women in Music Technology (WIMT) and their permanent integration in the NIME Steering Committee. Formulation of the official NIME diversity and inclusion statement.

- Society for Electro-Acoustic Music in the United States (SEAMUS) national conference Chair http://seamus.music.vt.edu, 2015.
  - Raised $34,000 through internal and external sources with conference producing $30,000 in residual funds towards supporting self-sufficient programming of similar future events (a $60,000 project).
- Senior Fellow, Institute for Creativity, Arts, and Technology (ICAT) http://www.icat.vt.edu, 2012-present.
  - Interim co-director, Fall 2014.
  - One of the key drivers of and contributors to the design, development, and implementation of ICAT's signature space--the Cube with its 148-speaker audio diffusion system including 9 holosonics, designed to support Wave Field Synthesis, Ambisonics, and Vector Based Amplitude Panning (a $650,000 project).
- Assistant Co-Director, Collaborative for Creative Technologies in the Arts and Design (CCTAD), 2008-2012.
  - Contributed to the design of and fundraising for Institute for Creativity, Arts, and Technology (ICAT) spaces in the new Center for the Arts (a $100M project), including Cube, Perform Studio, and Sandbox.
- Founder and director of the Linux Laptop Orchestra (L2Ork) and supporting outreach initiatives http://l2ork.icat.vt.edu, 2009-present.
  - Recruited 20 on-campus stakeholders and 6 corporate sponsors.
  - Raised funds towards initial implementation and ongoing programmatic needs (est. $250,000 since 2009).
  - Spearheaded K-12 outreach initiatives with regional and national partners.
- Founder and director of the Digital Interactive Sound and Intermedia Studio (DISIS) http://disis.music.vt.edu, 2006-present.
  - Secured $125,000 for studio infrastructure, design and oversight of the development of the first DISIS in an off-campus rented facility, 2006-7.
  - 50+ undergraduate part-time assistantships funded through various internally and externally funded projects and initiatives, 2007-present.
  - Incubator for other initiatives, including Linux Laptop Orchestra (L2Ork), 2009-present.
  - Through ICAT-led initiative designed a new and permanent DISIS space in the Newman Library (a $600,000 project). Supervision of its implementation and transition into the new space, 2014-5.

OTHER

- Society for Electro-Acoustic Music in the United States (SEAMUS) 501c3 national organization Board inaugural Director Preservation (appointed), 2019-2020.

- Society for Electro-Acoustic Music in the United States (SEAMUS) 501c3 national organization Board Member as Vice President of Programs (elected), 2017-2019.
- New Interfaces for Musical Expression Steering Committee member, 2015-present.
- Society for Electro-Acoustic Music in the United States (SEAMUS) 501c3 national organization Board Member as Treasurer (elected), 2005-2011.
- International Linux Audio Consortium Director (elected) http://linuxaudio.org, 2005-2022.
  - Consolidation of online resources, building membership base, and securing permanent content hosting solution with 10+ TB (Terabytes) of monthly traffic.
- Production manager for the *ICMC 2003* conference, Singapore, 2003.
- *MusicX* international summer music festival series administrative assistant, 1998-2005.

RESEARCH

Additional information on select projects also available at:

- http://ico.bukvic.net
- http://disis.music.vt.edu/main/portfolio.html (faculty and student projects)
- http://ico.bukvic.net/PDF/Ivica_Ico_Bukvic_Portfolio.pdf (pre-2012 project highlights)

"L2Ork Tweeter" (PI): 2020-present.

- Inspired by the COVID-19 pandemic, developed a new platform for distance-based instrument design, improvisation, composition, rehearsal, and performance, including the ability to support audience participation.
- The system relies on the local synthesis-based audio output, thus requiring minimal bandwidth, while providing pristine audio quality to all connected clients.
- A unique pattern-based framework ensures perfect execution of tightly-timed rhythmic and beat-based musical gestures, thus alleviating limitations of latency and drift in a majority of scenarios.
- Implemented as a backbone of the Linux Laptop Orchestra (L2Ork) socially distant ensemble instruction, ensuring that L2Ork remained one of the few, if not the only such ensemble in the world with continued operation without interruption during the pandemic.
- Premiered in the Fall 2020 featuring originally composed crowdsourced music work. Up until December 2021, it has had 5 telematic performances, including Argentina, Poland, Shanghai, and the United States. Second work was premiered in November 2021, establishing a foundation for a crowdsourced music genre.
- Enabled Linux Laptop Orchestra (L2Ork) to remain active throughout the COVID-19 pandemic, including 6 international telematic performances in 2021.
- Available at https://bit.ly/L2Ork-Tweeter

"Dancing Plants" (Co-PI): 2019-21.

- $25,000 awarded by the Institute for Creativity, Arts, and Technology SEAD grant.

- Working on sonifying plant movement to classify their responses to various stimuli and decipher their behavior by matching it to various genome variations. Using sound to stimulate plant responses based on the newfound information.

C+I Metrics (PI): 2018-present.

- Virginia Tech College of Liberal Arts and Human Sciences Dean's charge to work on developing methodologies by which the university may be able to identify optimal metrics for disciplines currently not represented by the traditional science- and engineering-centric metrics.
- Developing survey, collecting data, analysis and pattern identification.
- Participating in Responsible Research University-level taskforce in developing guidelines for improved faculty assessment.

"Pulling at the heartstrings: An Interdisciplinary New Approach for Drug Discovery" (Co-PI): 2018-22.

- $20,000 awarded by the Institute for Creativity, Arts, and Technology SEAD grant.
- Development of the *Cellular Stethoscope* that enables computer-vision-based analysis and sonification of individual cells and cell clusters to monitor their health and reaction to various chemical stimuli.

VT Convenio (PI): 2018-20.

- $10,000 awarded by the Coastal@VT Strategic Growth Area (SGA).
- Developing a matchmaking platform for interdisciplinary faculty collaborators across multiple institutions and private/public partners.
- Building a network of partners and stakeholders, including internal (C+I SGA, Destination Areas, VTEngage, Media Relations, Advancement), and external (Academic Analytics).

NASA LINC (PI): 2018.

- $12,000 awarded by the NASA Langley and $5,000 by the Tech Center Inc., funding two Virginia Tech interns for 5 months.
- Design of a new patent-industry matching search database engine (https://linc-nasa.herokuapp.com offers the final prototype).
- Project resulted in a NASA disclosure and the current prototype is in the process of being adopted as the default search engine for NASA Langley and potentially other NASA Centers across the country.

"Spatial Audio Data Immersive Experience (SADIE)" (PI): 2017-21.

- $149,930 awarded by the National Science Foundation.
- Developing immersive real-time sonification platform using 129-loudspeaker Cube array in conjunction with the Qualisys motion capture system and the newly developed D^4 spatialization algorithm (see below) to spatialize geospatial satellite data to explore the extent of human aural perception with the goal of uncovering new patterns in the big data model.
- Inspired the creation of the *Locus* system for interactive tracking of hand and arm motion using motion tracking cameras and translating it into a collection of instructions that can be utilized in

computer music software, such as Max and/or Pure-Data. The same was utilized as a New Interface For Musical Expression in the work *Traces*.

Embodied virtual reality for training and performance (Co-PI): 2017-19.

- $25,000 awarded by the Virginia Tech Institute for Creativity, Arts, and Technology SEAD grant.
- Developing an immersive experience inside the Cube for training quarterback by leveraging a comprehensive motion capture system, high density loudspeaker array and head-worn pass-thru earphones, embodied/haptic interaction using wearable loudspeakers capable of reproducing low frequencies, a head-mounted display, and a full football gear.

Audio-Visual Biofeedback System (Co-PI): 2017-18.

- Sponsored by Biopac Inc.
- Pd-L2Ork-based system for musicians to monitor for unwanted muscle tension during music performance.

COMPEL (PI): 2016-present.

- Developed in collaboration with Virginia Tech Libraries who committed two summers of 4-6 staff working on the project (est. value $50K+).
- Project designed to capture interactive computer music artifacts to ensure their reproducibility, including software, hardware specifications, score, and any additional necessary documentation using the "composer/artist" persona.
- Ability to also capture individual instances/performances of catalogued works through the "performer" persona.
- Support for multiple communities, and the expansion of personas.
- Adopted as the default repository for the Society for Electro-Acoustic Music in the United States (SEAMUS), largest national organization of its kind.
- Currently being evaluated as the default repository for the International Computer Music Association (ICMA), largest international organization of its kind.
- Developed partnership with the New York University Steinhardt and its Libraries and the Electro-Acoustic Music Mine (EAMM) initiative.
- Website temporarily down due to transition onto a new (Omeka) platform.

Raspberry Pi Orchestra (PI): 2016-present.

- An addition to the Linux Laptop Orchestra initiative inspired by the Maker idea.
- Crowd-sourced element where students partake in designing an instrument and collaboratively composing a piece through improvisation-centric rehearsals.

"Interactive Multimodal Data Platform for Bridging Strategic Planning & Thinking" (PI): 2016.

- $50,000 awarded by the National Science Foundation.
- Research team: Ivica Bukvic, Siddharth Narayanan, Tianyu Ge, Lisa Garcia.

Cinemacraft (PI): 2016-2018.

- Interactive Machinima using Kinect HD and a custom Minecraft mod.
- Internal pilot showcased at Virginia Tech's SXSW 2016.
- Installed in the Science Museum of Western Virginia and Virginia Tech Visitor Center, 2016.

Ultrasonic mobile communication and synchronization prototype (PI): 2016.

- Devised in collaboration with the Diavolo performance group.

"Collaborative Analysis of Large-scale Mixed Reality Data" (Co-investigator): 2016.

- $100,000 awarded by Microsoft Inc.
- Use of HoloLens in sound-centric AR scenarios.

The Development of novel spatialization and sonification strategies for dense speaker arrays (Co-PI): 2014-6.

- $650,000 internal infrastructure grant.
- A unique 147-speaker environment with Dante backend, Wave1 Wave Field Synthesis system, Vector-Based Amplitude Panning, and Ambisonic software diffusion, and 9 holosonic speakers, 4 of which are on motorized remotely controllable units.
- Design of a high-performance commercial *D⁴* audio spatialization library for Max/MSP programming language. *D⁴* was tested with 1,011 channels of 24bit 48KHz audio streams mixed down to 128 physical outputs in real-time with sub-10 millisecond latency.

Orb interactive audio-visual exploration of a large multimedia project database in collaboration with Profs. Dane Webster and Aki Ishida (PI): 2014-6.

- $20,000 grant for an interactive kiosk in the Virginia Tech National Capital Region.
- $5,000 grant (2015-6) from NASA to implement a pilot interactive visualization of the autonomous vehicle projects in the Hampton Roads, Virginia, region.
- Use of Leap Motion, Processing, and a custom database backend to render projects and their relationships, while providing an intuitive way to navigate project landscape.
- One graduate and one undergraduate assistantship.

Glasstra modular GUI for a laptop orchestra using Google Glass and FUDI networked protocol, 2014-5.

- Pilot integration with the Linux Laptop Orchestra (L2Ork) using pd-l2ork.
- Showcase as part of the SEAMUS 2015 conference.
- One graduate assistantship.

"II-NEW: Living Lab for Asynchronous and Synchronous Investigation of Virtual and Real Environments" (Co-PI): 2013-15.

- $585,510 awarded by the National Science Foundation.
- Research team: Benjamin Knapp, James Ivory, Yong Cao, Ivica Bukvic, Nicholas Polys.
- Infrastructure grant for visual and aural tracking hardware for the new Center for the Arts for the purpose of linking real and virtual Center for the Arts through various artistic and scientific pilot projects.

OPERAcraft (Co-PI): 2013-15.

- $25,000 internal award by Institute for Creativity, Arts, and Technology (ICAT).
- Retrofitting Minecraft sandbox software platform to support world's first telematic opera performance, including real-time mouth movement based on captured audio signal from singers, expanded expressive power of avatars (arm movement, gestures, facial expressions), and added real-time production tools, including multiple camera angles, scene transitions, subtitles, and backstage cues.
- Implemented FUDI networked protocol between Pd-L2Ork and Minecraft.
- Creation of two K-12 student operas and their performance.

"EAGER: Drummer Game: A Massive-Interactive Socially-Enabled Strategy Game" (Co-PI): 2009-10.

- $149,648 awarded by the National Science Foundation.
- Cross-disciplinary research involving Computer Science, Center for Human-Computer Interaction (CHCI), School of Performing Arts (SOPA), and School of Visual Arts (SOVA).
- Focus on design and development of a new gaming paradigm that combines spectacle/live performance and professional musicianship, CUDA platform for massive crowd simulation, and interactive algorithmic music.
- 12 performers (percussionists) use beat patterns to control their respective cohorts of Terracotta soldiers in a battle. Audience members' engagement boosts troops' morale.
- Use of authentic water buffalo skin Chinese drums.

Linux Laptop Orchestra (L2Ork) (PI): Summer 2009-present.

- The design and development of World's first Linux-powered laptop orchestra, including custom hardware, supporting software, and optimization of the Linux platform.
- Development of the Pd-L2Ork (an independent fork of Pure-Data maintained as part of the L2Ork project) with thousands of code changes and improvements to the pd-extended platform (http://l2ork.music.vt.edu/main/?page_id=56). Its development was selected as one of the Google Summer of Code projects to be funded for three consecutive years (2018-20).
  - In 2021, Pd-L2Ork was awarded funding as part of a $600K external proposal to the Office of Naval Research, resulting in rapid development.
- Initial summer research initiative sponsored 12 undergraduate researchers.
- Created a network of 20 on-campus stakeholders. Raised $50,000 in startup funds from internal and external (MSI Computer, Renoise, Roland Corp., and Sweetwater) sources.
- Secured ongoing $10,000 sponsorship through Virginia Tech Technology-enhanced Learning and Online Strategies (TLOS) for the purpose of purchasing new laptops, 2012.

- $46,250 ($26,500 through on-campus stakeholders and another $19,750 through coordinated student initiatives) fund-raising for the inaugural three-week tour of Europe, 2011.
- Secured over $15,000 for additional laptop orchestra tours.
- Partnership with Boys & Girls Club of Roanoke, Virginia, building a satellite laptop orchestra for the inner city 4th and 5th graders. Students were trained as part of an afterschool program with the goal of designing their own instruments and co-performing as part of a DISIS event at Virginia Tech. The project was originally externally funded by 21st Century and Bank of America grants ($20,000), securing additional 3 undergraduate research positions, 2010-present.
- Developed pd-l2ork K-12 module for K-12 education purposes, interfacing with Arduino boards, Nintendo Wii hardware, and Raspberry Pi GPIO. K-12 module was used in over half-dozen Maker camps and after-school educational programs across the world, including inaugural Raspberry Pi Orchestra gifted summer program in partnership with the Montgomery County Public Schools, 2012-present.
- Showcased L2Ork as part of various outreach activities, including Honor Band, Kids Tech University, VT Roanoke campus, Pre-College Initiative, and presentations at conferences (MUSICACOUSTICA 2010, SEAMUS 2011, NIME 2011, SLEO 2012).
- Established L2Ork endowment fund through Virginia Tech College of Liberal Arts & Human Sciences, 2012.
- Helped start 7 similar international laptop orchestra initiatives (Boys & Girls Club of Southwestern Virginia, University of North Carolina Greensboro, Stetson University, Shawnee State University, Santa Clara University, Brasilia laptop ensemble, Sweet Briar College), 6 of which rely in part on L2Ork hardware design and software infrastructure.
- Over dozen publications.

Discrete REconfigurable Aural Matrix (DREAM) (a.k.a. AMHDI) two-dimensional speaker array for the sonification of composite Geometric shapes and images (PI): 2006-2012.

- Principal Investigator for a collaborative project involving Virginia Tech's Computer Science, Center for Human-Computer Interaction (CHCI), Collaborative for Creative Technologies in the Arts and Design (CCTAD), and Music.
- 'Interactive Aural Painting' concept.
- Use of an aural technology for the visually impaired: the aural PONG game concept.
- $32,000 Virginia Tech College of Liberal Arts and Human Sciences exploratory research grant for the phase I.
- $20,000 Virginia Tech Institute for Society, Culture, and Environment (ISCE) summer grant.
- One Patent disclosure, two publications.

Use of Sonification to Improve Code Comprehension (Co-PI): Summer 2008-2012.

- Research into use of sonification in IDEs.
- Project in part sponsored by the NSF's Research Experience for the Undergraduates (2008, 2009).
- One Publication.
- Foundation for one Masters thesis in the Center for Human-Computer Interaction.

Digital Arts Research Collaborative REVO:OVER commissioned by the new Arts Museum of Western Virginia (Co-PI): 2007-2008.

- Est. $500,000 in funding of a multimedia installation.
- Interactive multimedia installation featuring video, 3D graphics, experimental 3D audio array and supporting algorithms, and interactive layer for audience participation.
- Responsible for building a CAVE-like system in Max/MSP/Jitter as a "glue" infrastructure for contributions from six members of the collaborative, sound and music production, and the interaction design and implementation.

Intelligent Sustainable Space, a collaborative endeavor among Wake Forest, Wachovia, Virginia Tech, Winston-Salem, Winston-Salem Center for Design Innovation, and Workplace Strategies Inc. (PI): Fall 2007.

- Focus on development of intelligent sustainable space shared between Wachovia inc. and the Wake Forest MBA program.
- Use of interactive multimedia installation to facilitate collaboration and information retrieval.
- $14,200 in initial funding for virtual interactive space prototyping using Unity3D.
- $10,000 in Phase 2 funding from Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS), and the Institute for Society, Culture, and Environment (ISCE).

Networked Ensemble (collaborator) – joint project among National University of Singapore, Stanford University and Virginia Tech with focus on exploring collaborative potential of network-based music interaction: 2007-2009.

- Awarded $975,978 SGD.

Mind-Body Interactive (a.k.a. Interactive Taiji) (PI): Summer 2008-2012.

- Project involving Music, Computer Science, Center for Human-Computer Interaction (CHCI), Human Development, and Education.
- The design and development of a taiji audio-visual game system for use in K-12 education and its assessment as a catalyst for promoting self-regulation.
- Collaborative effort with regional K-12 institutions (Craig and Montgomery Counties).
- $5,000 Art+Technology+Education seed grant.
- $5,000 grant from the Virginia Tech's Institute for Distance and Distributed Learning (IDDL) for phase II, focusing on retrofitting the system for distance learning, with a goal of producing an online-based physical education module.

μ Library for Interfacing Max/MSP/Jitter with Unity3D (PI): Spring 2008.

- Software layer for seamless integration of Max/MSP/Jitter (and/or Pure-Data) and Unity3D.
- Available from http://ico.bukvic.net/Max/
- One patent disclosure June 2008.

Virginia Tech Stakeholders Project soundtrack, effects, and interactivity for the multimedia 2-DVD production for the funding campaign of the new Performing Arts Center (Co-PI): Spring 2007.

- Received $25,000 internal grant.
- Soundtrack for the visual flyby animation.
- Sound effects, ambiental sounds, and interactive algorithms for the interactive first-person virtual our of the new facility using Unity3D engine.
- Orchestral soundtrack for the video documentary.
- Two undergraduate assistantships.

SMILE project dedicated to teaching science and mathematics to young children in remote regions of Appalachia (Co-PI): 2007-present.

- $20,000 Virginia Tech ISCE summer grant, April, 2007.
- Design of tunes as scientific metaphors.
- Three undergraduate assistantships.

Shaders Ahoy! collection of real-time texture processing algorithms using shader language for Max/MSP/Jitter released under the GPL license: 2007.

- Available for download from http://ico.bukvic.net/Max/

disis_munger~ (a.k.a. *munger1~*) porting and enhancing the munger~ real-time granular synthesis external using a platform and software-independent flext framework (PI): Spring 2007.

- Collaboration with Princeton University's PeRColate author Dr. Dan Trueman, and flext author Thomas Grill.
- Pure-Data and Max/MSP-transparent code.

0th Sound recontextualization of silence through association with a mathematical paradox of number zero: 2005-2006.

- Philosophical and pragmatic exploration of silence in contemporary multimedia art.
- Preliminary work presented at SPARK festival in Minnesota, February, 2005.

RTMix Real-Time Interactive Multimedia Art Performance, Composition, and Coaching Interface: 2001-2004.

- Libre software written in C++/Qt for the purpose of establishing a unifying performance interface for the live and interactive multimedia art employing a variety of DSP software.
- $1,500.00 University of Cincinnati Research Council Grant, 2002.
- 3 conference presentations and 2 papers, including *Organised Sound*, December 2002.
- Central interface for several personal compositions.
- Featured on the Stanford's CCRMA (http://ccrma.stanford.edu/planetccrma/software/), Eastman University's *Turnkey*, DeMuDi, and APODIO Linux distributions, and College-Conservatory of Music *(CCM)²* studios.

- Documentation available at http://ico.bukvic.net/Linux/RTMix/RTMix-docs/

Interactive 3D Multimedia Landscapes as a form of modular work of art: 2001-2002.

- Utilizes *3DML* meta-language that enables users to experience interactive 3D world populated with the 3D positioned sound in their Internet browsers.
- $1,500.00 University of Cincinnati Research Council Grant, 2001.
- Exploration of an immersive artistic installation genre accessible via web browser in which listener/observer actively determines the pace and subsequently the structure of a piece.

Stochastic Phrase and Density Structure Generator (*SPiDSiG*): 2001.

- Cross-platform open source software written in C designed for sculpting formal density of a work of art by utilizing subtractive stochastic approach with complementary prime forms of mathematical curves as probability descriptors.
- Presented at the *SEAMUS 2002* conference in Iowa City, Iowa, April 2002.

Soundmesh Internet2 low-latency real-time performance framework in collaboration with Mara Helmuth: 2000-2005.

- One publication.

Contributions to the *RTcmix* project, designing interactive DSP unit generators: 1998-2001.

GRANTS & FUNDING

EXTERNAL

2023

- $3,808,992 (sub-award PI in the amount of $31,342). Office of Naval Research (ONR) funded project entitled "Manufacturing Education for Electromagnetic Functional Composites". Research team: Bradley Davis et al., Ivica Ico Bukvic (sub-awardee). May-December 2023.

2021

- $600,000 (50% Co-PI). Department of Navy (DON) STEM Education and Workforce Program administered by the Office of Naval Research (ONR) (N00014-21-S-F004) project entitled "Building a Workforce for Wave-Physics". Research team: Bradley Davis, Ivica Ico Bukvic. December 2021.

2020

- $15,000 (33% Co-PI) Google Summer of Code (GSoC) grant by Google Inc. to pay for three summer student researchers who worked on developing Pd-L2Ork and who were mentored by an

international group of scholars. Research team: Ivica Ico Bukvic, Jonathan Wilkes, Matt Barber. Summer 2020.

2019

- $10,000 (50% Co-PI) Google Summer of Code (GSoC) grant by Google Inc. to pay for two summer student researchers who worked on developing Pd-L2Ork and who were mentored by an international group of scholars. Research team: Ivica Ico Bukvic, Jonathan Wilkes. Summer 2019.

2018

- $3,500 (50% Co-PI) Google Summer of Code (GSoC) grant by Google Inc. to pay for summer student researchers who worked on developing Pd-L2Ork and who were mentored by an international group of scholars. Research team: Ivica Ico Bukvic, Jonathan Wilkes. Summer 2018.
- $12,000 (100%) Two student internships through the NASA Langley, building on the Orb project (see below) for facilitating connections between NASA patents and industry. January-May 2018.
- $10,000 (50%) Virginia Department of Education 21st Century grant and Bank of America (through Boys & Girls Clubs of Southwest Virginia) for organizing 2-week summer Musical Robots workshops for the fourth and fifth graders at Christiansburg and Shawsville public schools. 2018-2020.

2017

- $149,930 (50%, PI) EAGER: Spatial Audio Data Immersive Experience (SADIE), Sponsored by the National Science Foundation. Research team: Ivica Ico Bukvic, Greg Earle.
- $10,000 (25%) Boys & Girls Club of Southwestern Virginia L2Ork K-12 partnership to promote Maker-like activities in two regional schools, Sponsored by the 21st Century grant. Funding allocated for infrastructure and part-time student facilitators, and education impact assessment.

2016

- $50,000 (100%, PI) Interactive Multimodal Data Platform for Bridging Strategic Planning & Thinking, Sponsored by the National Science Foundation. Research team: Ivica Ico Bukvic, Siddharth Narayanan, Tianyu Ge, Lisa Garcia.
- $100,000 (20%) Collaborative Analysis of Large-scale Mixed Reality Data, Sponsored by Microsoft Inc. to explore use scenarios of the Hololens.

2014

- $20,000 (40%, PI) The Orb: A Proposal for an Interactive Audio-Visual Installation for the Arlington Virginia Tech Research Center, Sponsored by VT National Capital Region research center. Research team: Ivica Ico Bukvic, Dane Webster, Aki Ishida.

2013

- $2,000 (100%) Boys & Girls Club of Southwestern Virginia to fund one undergraduate student to work with 4th and 5th graders to design their own laptop orchestra instruments and eventually perform a new improvisatory composition using newfound instruments.
- $12,000 (50%, Co-PI) commission from Ballston Business Improvement District for "Cloud" interactive community-driven installation. Research team: Ivica Ico Bukvic, Aki Ishida.

- $585,510 (20%, Co-PI) II-NEW: Living Lab for Asynchronous and Synchronous Investigation of Virtual and Real Environments, National Science Foundation (NSF). Research team: Benjamin Knapp, James Ivory, Yong Cao, Ivica Bukvic, Nicholas Polys.
- $36,124 (25%, Co-PI) sponsorship/commission for the Interactive Lantern Field audio-visual installation from Philips Corporation ($30,634), Japan Foundation New York ($1,390), National Cherry Blossom Festival ($1,400), Smithsonian ($1,800) and private donors ($900). Research team: Aki Ishida, Ivica Ico Bukvic, Benjamin Knapp, Brennon Bortz.

2010

- $1,261 (100%) Secured fourth corporate sponsorship from *Renoise* software company in a form of a site license for the *Linux Laptop Orchestra*.
- $20,000 (100%) external grant through the *Boys & Girls Club* of Southwest Virginia (sponsored by *21st Century* and *Bank of America*) for the creation of the satellite laptop orchestra. Research team: Ivica Ico Bukvic, Eric Standley.

2009

- $149,648 (25%, Co-PI) awarded "EAGER: Drummer Game: A Massive-Interactive Socially-Enabled Strategy Game" proposal to the National Science Foundation. Research team: Yong Cao, Francis Quek, Ivica Bukvic, Dane Webster.
- Est. $2,000 (100%) Secured three corporate sponsorships for the *Linux Laptop Orchestra* (L2Ork), including seven laptops sponsored by MSI and eight soundcards sponsored by Sweetwater and additional hardware sponsored by Roland Inc. at cost. Research team: Ivica Ico Bukvic, Tom Martin.

2008

- $14,200 (67%) *Sustainable, Intelligent Environment for Communal Interaction with Art and Culture* pilot project sponsored by the Wake Forest for the virtual rendition of the multimedia installation concept. Research Team: Ivica Ico Bukvic, Dane Webster, Scott Betz (Winston-Salem), Peter Marsh (Workplace Strategies), Dan Fogel (Wake Forest).

2007

- $975,978 SGD, (Collaborator) *Networked Ensemble* proposal in collaboration with National University of Singapore and Stanford University. Research team: Lonce Wyse (National University of Singapore), Chee-Kong Ho, Kevin McGee, Damien Lock, Roger Zimmermmann, Michael Gurevich, Ivica Ico Bukvic.
- Est. $500,000 (15%, Co-PI) Arts Museum of Western Virginia grant as part of the Digital Art Research Collective (DARC) group to develop an interactive multimedia art installation for the grand opening of the new museum. Sponsored four graduate and two undergraduate assistantships. Credit and PI responsibility equally distributed among participants. Research Team: Truman Capone, Carol Burch-Brown, Ivica Ico Bukvic, Steve Harrison, Joy Rosenthal, Simone Paterson, Dane Webster.

INTERNAL

2023

- $40,000 (100% PI) Connecting through STEAM ICAT/ICTAS Diversity and Inclusion SEED Investment grant. Research team: Ivica Ico Bukvic, Tremayne Waller, Bradley Davis. Fall 2023.

2019

- $2,500 (50% PI) Learning Systems Innovation and Effectiveness grant to develop the inaugural symposium with the Immersive Audio working group faculty. Summer 2019.

- $1,500 (10% PI) Faculty Writing Grant to develop the inaugural symposium with the Immersive Audio working group faculty. Summer 2019.
- $25,000 (33%) Dancing Plants: Integrating Plant Imaging and Acoustics to Improve Plant Growth by Institute for Creativity, Arts, and Technology (ICAT). Research team: Bingyu Zhao, Ivica Ico Bukvic, Jia-Bin Huang, and Daniel Pillis. Spring 2019.

2018

- $10,000 (50%) Convenio faculty matching platform for the Destination Areas funded by the Coastal@VT Strategic Growth Area (SGA) in partnership with the Creativity + Innovation SGA. Summer 2018.
- $20,000 (33%) Pulling at the 'Heartstrings:' A New Approach for Drug Discovery project by Institute for Creativity, Arts, and Technology (ICAT). Research team: Amrinder Nain, David Brown, and Ivica Ico Bukvic. Spring 2018.

2017

- $5,500 for hosting Manu Delago, a renown international artist for the purpose of collaborating with the Linux Laptop Orchestra (L2Ork) on a new piece. Funding made possible through a partnership including the Institute for Creativity, Arts, and Technology (ICAT), School of Performing Arts (SOPA), and the West Ambler Johnston Residential College.
- $25,000 (17%) Institute for Creativity, Arts, and Technology (ICAT) mini-grant for the Embodied virtual reality for training and performance. Research team: Todd Ogle, Doug Bowman, Ivica Ico Bukvic, Stefan Duma, Nathan Lau, and Robin Queen. Spring 2017.

2016

- $3,000 grant from Institute for Creativity, Arts, and Technology (ICAT) for the Aural Surface proposal. Research team: Matt Wagner, Ivica Ico Bukvic.

2015

- $2,500 grant from Institute for Creativity, Arts, and Technology (ICAT) for the Awareness Practice and the Foundations of The Creative Process series of workshops. Research team: Douglas Lindner, Richard Goff, Ivica Ico Bukvic.

2014

- $8,000 sponsorship from Institute for Creativity, Arts, and Technology (ICAT), College of Architecture and Urban Studies, College of Liberal Arts & Human Sciences, and the School of Performing Arts for the "Cloud" installation. Research team: Aki Ishida, Ivica Ico Bukvic.
- $31,000 Society for the 2015 Electro-Acoustic Music in the United States (SEAMUS) national conference sponsorship from Virginia Tech Provost, College of Liberal Arts & Human Sciences (CLAHS), School of Performing Arts, Institute for Creativity, Arts, and Technology (ICAT), Institute for Critical Technology and Applied Science (ICTAS), Center for Human-Computer Interaction (CHCI), Graduate School, Vice President for Information Technology, College of Engineering, Institute for Society, Culture, and Environment (ISCE), University Libraries, and Department of Computer Science. Conference organizers: Ivica Ico Bukvic (chair), Eric Lyon, Charles Nichols.
- $13,000 Institute for Creativity, Arts, and Technology Fellowship.

2013

- $5,000 sponsorship from Virginia Tech Research Center Arlington and the Institute for Society, Culture, and Environment for the "Cloud" installation. Research team: Aki Ishida, Ivica Ico Bukvic.
- Virginia Tech Center for Human-Computer Interaction fall Graduate Research Assistantship for the sonification research project. Research team: Ivica Ico Bukvic, Benjamin Knapp.

- $4,200 sponsorship for the Interactive Lantern Field audio-visual installation from the Institute for Creativity, Arts, and Technology (ICAT), College of Architecture and Urban Studies, and the Department of Music. Research team: Aki Ishida, Ivica Ico Bukvic.
- Virginia Tech Center for Human-Computer Interaction spring Graduate Research Assistantship for the audio editing and cybersecurity data analytics project. Research team: Chris North, Benjamin Knapp, Ivica Ico Bukvic. Spring, 2013.
- $2,500 Linux Laptop Orchestra (L2Ork) sponsorship by Virginia Tech Center for Human-Computer Interaction (CHCI).
- $25,000 OPERAcraft by the Institute for Creativity, Arts, and Technology (ICAT). Research team: Ariana Wyatt, Ivica Ico Bukvic, Tracy Cowden, Katie Dredger, Kelly Parkes.

2012

- $3,000 Virginia Tech Institute for Creativity, Arts, and Technology (ICAT) matching support for the Luminous Kite Lanterns exhibit at Blacksburg Farmers Market. Research team: Aki Ishida, Ivica Ico Bukvic, Benjamin Knapp, Brennon Bortz.
- $16,000 Virginia Tech Center for Human-Computer Interaction Summer Graduate Research Assistantship for the GAMES Project Teacher Dashboard project. Research team: Michael Evans, Troy Abel, Ivica Ico Bukvic.
- $4,100 Institute for Creativity, Arts & Technology grant for the development of a K-12 version of the pd-l2ork software and its deployment in collaboration with the Boys & Girls Club of Southwest Virginia. Research team: Ivica Ico Bukvic, Liesl Baum, Bennett Layman, Kendall Woodard.

2011

- $8,188 Virginia Tech Institute for Distance and Distributed Learning grant for the implementation of the *Mind-Body Interactive* (formerly known as *Interactive Taiji*) course, including teaching the course for three consecutive years. Research team: Ivica Ico Bukvic, Matthew Komelski.
- $5,000 Virginia Tech Institute for Distance and Distributed Learning grant for further development of an online distance learning system based on *Interactive Taiji* for teaching Taiji. Research team: Ivica Ico Bukvic, Matthew Komelski.

2010

- $3,000 supplemental Education Enhancement Grant for the *Interactive Taiji* Education Enhancement grant (EECG) sponsored by the Virginia Tech Arts Initiative. Includes compensation for one graduate assistant (Matthew Komelski) and one undergraduate student researcher. Research team: Ivica Ico Bukvic, Isabel Bradburn.

2009

- $5,000 Virginia Tech Institute for Distance and Distributed Learning grant for the development of an online distance learning system based on *Interactive Taiji* for teaching Taiji. Research team: Ivica Ico Bukvic, Isabel Bradburn, and Matthew Komelski.
- $20,000 Virginia Tech Institute for Society, Culture and Environment (ISCE) summer scholars grant for the establishing of the *Linux Laptop Orchestra* (L2Ork). Sponsored summer undergraduate student assistantships. As part of the Research Experience for Undergraduates (REU) CS department program also engaged three undergraduate students, including one visiting student from Rochester. Research team: Ivica Ico Bukvic, Tom Martin.
- $2,303 Virginia Tech Vice President of Information Technology grant for the purchase of MSI Wind netbooks for the *Linux Laptop Orchestra* (L2Ork). Research team: Ivica Ico Bukvic, Tom Martin.

- $930 Virginia Tech School of Performing Arts & Cinema (SOPAC) grant for sponsoring a visit of a Hungarian artist Tibor Varszegi for the spring DISIS event theatrical multimedia piece production in collaboration with College of Liberal Arts & Human Sciences (CLAHS) Dean Sue Ott Rowlands.

2008

- $5,000 *Interactive Taiji* Education Enhancement grant (EECG) sponsored by the Virginia Tech Arts Initiative. Includes compensation for one graduate assistant (Matthew Komelski) and one undergraduate student researcher (Sabrina Killian). Research team: Ivica Ico Bukvic, Isabel Bradburn, Denis Gracanin, Kelly Parkes.
- $10,000 *Sustainable, Intelligent Environment for Communal Interaction with Art and Culture* phase II grant by Virginia Tech Institute for Society, Culture, and Environment (ISCE) and Institute for Critical Technology and Applied Science (ICTAS), dealing with physical prototyping of installation modules proposed in phase I. Research team: Ivica Ico Bukvic, Dan Fogel (Wake Forest).

2007

- $400 Virginia Tech Center for Instructional Development and Educational Research (CIDER, formerly known as CEUT) Faculty Study Group (FSG) grant for an interdisciplinary collaboration study group involving College of Engineering, College of Architecture and Urban Studies (CAUS), and College of Liberal Arts & Human Sciences (CLAHS).
- $500 Virginia Tech *Collaborative for Creative Technologies in the Arts and Design* (CCTAD) and the Department of Music matching grant for the Soundtrack and Effects Composition course field trip and recording session in Williamsburg, Virginia.
- $20,000 Institute for Society, Culture and Environment (ISCE) summer scholars grant for the Science and Mathematics Inclusive Learning and Engagement (SMILE) study. Sponsored four undergraduate music assistantships for a total of $1,000. Research team: Carlos Evia, Ivica Bukvic.
- $2,400 Science and Mathematics Inclusive Learning and Engagement (SMILE) project collaborator on preliminary research. Research team: Carlos Evia, Tonya Lynette Smith Jackson, Ivica Ico Bukvic.
- Est. $25,000 Virginia Tech Stakeholders Project. Generation of promotional materials and multimedia content for the purpose of raising $29M for the new Performing Arts Center. Sponsored two student undergraduate music assistantships. Research team: Dane Webster, Ivica Bukvic.
- $20,000 Institute for Society, Culture and Environment (ISCE) summer scholars grant for the pilot study utilizing Aural Matrix Haptic Display Interface. Sponsored two summer undergraduate music student assistantships for a total of $3,200. As part of the Research Experience for Undergraduates (REU) Computer Science (CS) department program also engaged a visiting undergraduate CS student from Oberlin College. Research team: Ivica Ico Bukvic, Denis Gracanin, Francis Quek.

2006

- $1,200 Virginia Tech *Collaborative for Creative Technologies in the Arts and Design* (CCTAD) branding project sponsored by CCTAD and the School of Visual Arts (SOVA). Design of audio-visual branding materials for CCTAD including website and other promotional materials. Oversight of four CCTAD GTAs.
- $500 Virginia Tech College of Liberal Arts & Human Sciences (CLAHS) grant writing workshop participant.
- $12,500 Virginia Tech *Collaborative for Creative Technologies in the Arts and Design* (CCTAD) complementing grant for DISIS development.
- $45,000 Virginia Tech *Collaborative for Creative Technologies in the Arts and Design* (CCTAD)/Digital Arts Research Collective (DARC) equipment grant proposal to the School of Visual Arts. Research team: Truman Capone, Ivica Ico Bukvic, Simone Paterson, Dane Webster.

- $32,000 Virginia Tech College of Liberal Arts & Human Sciences (CLAHS) Dean equipment grant for Aural Matrix Haptic Display Interface exploratory research involving CHCI, Engineering, Assistive Technology and Music Technology. Research team: Ivica Ico Bukvic, Francis Quek, Tom Martin, William Holbach, Michael Dunston.
- $300 Virginia Tech Center for Instructional Development and Educational Research (CIDER, formerly known as CEUT) Faculty Study Group (FSG) grant for an interdisciplinary collaboration study group involving College of Engineering, Architecture, College of Liberal Arts & Human Sciences (CLAHS), and Music.
- $3,000 College of Liberal Arts & Human Sciences (CLAHS) Faculty Research Grant for producing commissioned multimedia interactive work.

PUBLICATIONS

Digital copies of select papers available at http://ico.bukvic.net/main/publications/

CONFERENCE PROCEEDINGS (double- or single-blind peer reviewed)

- I. Bukvic, "Enhancing Virtual Audio Immersion Using Binaural Mesh," 2023 Immersive and 3D Audio: from Architecture to Automotive (I3DA), Bologna, Italy, 2023, pp. 1-5, doi: 10.1109/I3DA57090.2023.10289401.
- I. Bukvic, "Latency-, Sync-, and Bandwidth-Agnostic Tightly-Timed Telematic and Crowdsourced Musicking Made Possible Using L2Ork Tweeter," *New Interfaces for Musical Expression*, the University of Auckland, New Zealand, 2022. [international]
- I. Bukvic, *D. Sardana, and *W. Joo, "New Interfaces for Spatial Musical Expression," *New Interfaces for Musical Expression* Birmingham City University, 2020, pp. 249–254.
- *D. Sardana, *W. Joo, I. Bukvic, and G. Earle, "Perception of spatial data properties in an immersive multi-layered auditory environment," in *Proceedings of the 15th International Conference on Audio Mostly*, New York, NY, USA, Sep. 2020, pp. 30–37, doi: 10.1145/3411109.3411134.
- *K. Tsoukalas, J. Kubalak, and Ivica Ico Bukvic, "The impact of scaling the production of a new interface for musical expression on its design: a story of L2Orkmotes," in *Proceedings of the 15th International Conference on Audio Mostly,* New York, NY, USA, Sep. 2020, pp. 138–145. doi: 10.1145/3411109.3411110.
- I. Bukvic, G. Earle, *D. Sardana, and W. Joo, "STUDIES IN SPATIAL AURAL PERCEPTION: ESTABLISHING FOUNDATIONS FORIMMERSIVE SONIFICATION," International Conference on Auditory Display, Newcastle upon Tyne, United Kingdom, 2019, pp. pending. [international]
- *D. Sardana, *W. Joo, I. I. Bukvic, and G. Earle, "Introducing Locus: a NIME for Immersive Exocentric AuralEnvironments," *New Interfaces for Musical Expression*, Porto Alegre, Brazil, 2019, pp. pending. [international]
- I. Bukvic and A. Ogier, "COMPEL: A Crowdsourced Community-Building Repository for Reproducible Computer Music," *International Computer Music Conference*, Daegu, Korea, 2018, pp. 130-133. [international]
- I. Bukvic and G. Earle, "REIMAGINING HUMAN CAPACITY FOR LOCATION-AWARE AUDIO PATTERN RECOGNITION: A CASE FOR IMMERSIVE EXOCENTRIC SONIFICATION," *International Conference on Auditory Displays*, Houghton, Michigan, 2018, pp. 153-159. [international]
- *K. Tsoukalas, and I. Bukvic, "Introducing a K-12 Mechatronic NIME Kit," *New Interfaces for Musical Expression*, Blacksburg, Virginia, 2018, pp. 206-209. [international]

- *K. Tsoukalas, J. *Kubalak, and I. Bukvic, "L2OrkMote: Reimagining a Low-Cost Wearable Controller for a Live Gesture-Centric Music Performance," *New Interfaces for Musical Expression*, Blacksburg, Virginia, 2018, pp. 275-280. [international]
- *S. Narayanan, and I. Bukvic, "Cinemacraft: Immersive Live Machinima as an Empathetic Musical Storytelling Platform," *International Computer Music Conference*, Shanghai, China, 2017, pp. 384-389. [international]
- M. Wagner, I. Bukvic, and D. Webster, "Using Immersive Digital Environments to Evaluate the Effectiveness of Multi-Sensory Responsive Surfaces," *Architectural Research Centers Consortium Conference: Architecture of Complexity*, Salt Lake City, Utah, 2017, pp. 212-221. [international]
- I. Bukvic and *S. Lee, "Glasstra: Exploring the Use of an Inconspicuous Head Mounted Display in a Live Technology-Mediated Music Performance," *New Interfaces for Musical Expression*, Copenhagen, Denmark, 2017, pp. 313-318. [international]
- I. Bukvic, A. Gräf, and J. Wilkes, "Meet the Cat: Pd-L2Ork and its New Cross-Platform Version 'Purr Data'," *Linux Audio Conference*, Saint-Etienne, France, 2017. [international]
- I. Bukvic, J. Wilkes, and A. Gräf, "Latest developments with Pd-L2Ork and its Development Branch Purr-Data," *PdCon*, New York, New York, 2016. [international]
- I. Bukvic, "Introducing D4: an Interactive 3D Audio Rapid Prototyping and Transportable Rendering Environment Using High Density Loudspeaker Arrays," *International Computer Music Conference*, Utrecht, Netherlands, 2016, pp. 496-500. [international]
- A. McPherson, E. Berdahl, A. Jensenius, M. Lyons, I. Bukvic, and A. Knudsen, "NIMEhub: Toward a Repository for Sharing and Archiving Instrument Designs," *New Interfaces for Musical Expression*, Brisbane, Australia, 2016. [international]
- I. Bukvic, "3D TIME-BASED AURAL DATA REPRESENTATION USING D4 LIBRARY'S LAYER BASED AMPLITUDE PANNING ALGORITHM," *International Conference on Auditory Displays*, Canberra, Australia, 2016. [international]
- I. Bukvic and *M. Matthews, "AEGIS AUDIO ENGINE: INTEGRATING A REAL-TIME ANALOG SIGNAL PROCESSING, PATTERN RECOGNITION, AND A PROCEDURAL SOUNDTRACK IN A LIVE TWELVE-PERFOMER SPECTACLE WITH CROWD PARTICIPATION," *International Conference on Auditory Displays*, Graz, Austria, 2015, pp. 35-42. [international]
- N. Polys, B. Knapp, C. Lidwin, D. Webster, N. Waggoner, and I. Bukvic, "Fusality: an open framework for cross-platform mirror world installations," New York, NY: *20th International Conference on 3D Web Technology* (Web3D '15), 2015, pp. 171-179. [international]
- I. Bukvic, *C. Cahoon, A. Wyatt, T. Cowden, and K. Dredger, "OPERAcraft: Blurring the Lines between Real and Virtual," *International Computer Music Conference*, Athens, Greece, 2014, pp. 228-235. [international]
- I. Bukvic, "Pd-L2Ork Raspberry Pi Toolkit as a Comprehensive Arduino Alternative in K-12 and Production Scenarios," *New Interfaces for Musical Expression*. London, United Kingdom, 2014, pp. 163-166. [international]
- B. Bortz, A. Ishida, I. Bukvic, and B. Knapp, "Lantern Field: Exploring Participatory Design of a Communal, Spatially Responsive Installation," *New Interfaces for Music Expression*. Seoul, Korea: NIME, 2013, pp. 73-38. [international]
- B. Sawyer, J. Forsyth, *T. O'Connor, B. Bortz, T. Finn, L. Baum, I. Bukvic, B. Knapp, and D. Webster, "Form, function and performances in a musical instrument Makers camp," *ACM Special Interest Group on Computer Science Education*, Denver, Colorado: ACM, 2013, pp. 669-674. [international]

- I. Bukvic, L. Baum, *B. Layman, and *W. Kendall, "Granular Learning Objects for Instrument Design and Collaborative Performance in K-12 Education," *New Interfaces for Musical Expression*, Ann Arbor, Michigan: NIME, 2012, pp. 344-346. [international]
- I. Bukvic, "A Behind-the-Scenes Peek at World's First Linux-Based Laptop Orchestra – The Design of L2Ork Infrastructure and Lessons Learned," *Linux Audio Conference*, Stanford, California, 2012, pp. 55-60. [international]
- I. Bukvic and M. Komelski, "Strategies for Structured *Ork Performance Choreography: Integrating Taiji Martial Arts into L2Ork Repertoire," *Symposium for Laptop Ensembles and Orchestras*, Baton Rouge, Louisiana, 2012. [international]
- I. Bukvic and S. Betz, "USING GAMING ENGINE FOR VIRTUAL PROTOTYPING AND IMPACT ASSESSMENT OF COMPLEX INTERACTIVE ART INSTALLATIONS," *International Computer Music Conference*, Huddersfield, England: International Computer Music Association, 2011, pp. 527-531. [international]
- I. Bukvic, T. Martin, E. Standley, and *M. Matthews, "Introducing L2Ork: Linux Laptop Orchestra," *New Interfaces for Musical Expression*, Sydney, Australia: NIME, 2010, pp. 170-173. [international]
- I. Bukvic and *J. Kim, "PERCEPTION AND INTERPRETATION OF CONCURRENT AURAL SHAPES USING DREAM INTERFACE," *International Computer Music Conference*, Stony Brook, New York: International Computer Music Association, 2010, pp. 542-545. [international]
- I. Bukvic, I. and *J. Kim, "μ MAX-UNITY3D INTEROPERABILITY TOOLKIT. *International Computer Music Conference*", Montreal, Canada: International Computer Music Association, 2009, pp. 375-378. [international]
- *K. Hussein, E. Tilevich, I. Bukvic and *S. Kim, "Sonification design guidelines to enhance program comprehension," IEEE's *International Conference on Program Comprehension*, Vancouver, Canada: IEEE, 2009, pp. 120-129. [international]
- I. Bukvic, D. Gracanin, and F. Quek, "Investigating artistic potential of the DREAM interface: The Aural Painting," *International Computer Music Conference*, Belfast, United Kingdom: International Computer Music Association, 2008, pp. 475-482. [international]
- I. Bukvic, *J. Kim, D. Trueman, and T. Grill, "munger1~: TOWARDS A CROSS-PLATFORM SWISS-ARMY KNIFE OF REAL-TIME GRANULAR SYNTHESIS," *International Computer Music Conference*, Copenhagen, Denmark: International Computer Music Association, 2007, pp. 349-354. [international]
- I. Bukvic, "Made in Linux — The Next Step," *Linux Audio Conference* proceedings, Karlsruhe, Germany, 2005.
- I. Bukvic, "The 0th Sound," published in proceedings for the *SPARK* festival, Minnesota, 2005.
- I. Bukvic, "Linux as a Mature Digital Audio Workstation in Academic Electroacoustic Studios – Is Linux Ready for Prime Time," *Proceedings of the International Computer Music Conference*, Miami, Florida, 2004.
- M. Helmuth, I. Bukvic, M. Schedel, and J. Bernard. "University of Cincinnati, College-Conservatory of Music Center for Computer Music - $(CCM)^2$ in 2004," *International Computer Music Conference*, Miami, Florida, 2004.
- I. Bukvic, "RTMix – towards a standardized interactive electroacoustic art performance interface." *Organised Sound* Vol.7 No.3 (December 2002), pp. 275-286.
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- I. Bukvic, "RTMix: a Real-Time Interactive Electroacoustic Music Performance, Composition, and Coaching Interface." *Proceedings of the International Computer Music Conference*, 2002, pp. 79-82.

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- A. Wyatt, T. Cowden, I. Bukvic, K. and Dredger, "OPERAcraft: Opera outreach for the 21st Century," *National Opera Association Opera Journal*. 2018. [national]
- E. Lyon, T. Caulkins, D. Blount, I. Bukvic, C. Nichols, M. Roan, and T. Upthegrove, "Genesis of the Cube: The Design and Deployment of an HDLA-Based Performance and Research Facility," *Computer Music Journal*, Winter 2016, Vol. 40, no. 4, pp. 62-78. [international]
- D. Webster, and I. Bukvic, "Small Data, Big Impact," *IEEE Multimedia*, vol. 23, no. 1, pp. 6-9, 2016. Retrieved April 10, 2017 from http://gateway.webofknowledge.com/ [international]

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- I. Bukvic, "Introduction to Sonification," in *Foundations in Sound Design for Embedded Media*, M. Filimowicz, Ed. Routledge. [in press]
- K. Dredger, A. Wyatt, T. Cowden, I. Bukvic, and K. Parkes, "Minecraft opera: Intersections of creative narrative, music, and video games," In *Writing in the Performing and Visual Arts: Creating, Performing, and Teaching*, S. Corbett, T. Decker, and B. Cooper, Eds., Across the Disciplines (ATD publishers), 2018. [in press]

OTHER

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- M. Wagner, I. Bukvic, and D. Webster, "Immersive Data Visualization Informs the Design of a Responsive Surface," *Between Data and Senses: Architecture, Neuroscience and the Digital Worlds*, 2017. Available from https://www.uel.ac.uk/Events/2017/March/Between-data-and-senses
- M. Wagner, I. Bukvic, and D. Webster, "Using Immersive Digital Environments to Design a Responsive Surface for Educational Multi-Use Spaces,"*Seventh International Conference on the Constructed Environment*, Krakow, Poland, 2017.
- A. Wyatt, T. Cowden, and I. Bukvic, "OPERAcraft: Creating live virtual opera," *National Opera Association*, Santa Barbara, California, 2017.
- M. Wagner, I. Bukvic, and D. Webster, "Using Immersive Environments to Evaluate Multi-Sensory Responsive Surfaces," Architecture of Complexity Conference, Salt Lake City, Utah, 2017.
- K. Dredger, I. Bukvic, T. Cowden, D. Thompson, and A. Wyatt, "Minecraft Opera: Advocating the Application of Out-of-School Literacies to ELA Standards," In *National Council of Teachers of English Conference*, Atlanta, Georgia, 2017.
- K. Parkes, I. Bukvic, T. Cowden, A. Wyatt, and K .Dredger, "OPERAcraft: Using Minecraft to create opera," Imagining America: Artists and Scholars in Public Life, Baltimore, Maryland, October 3, 2015.
- I. Bukvic, "Pd-L2Ork as an Age-Agnostic Rapid Prototyping and Learning Environment," *International Conference on Auditory Displays*, Graz, Austria, July 7, 2015.
- I. Bukvic, "Cloud installation workshop," *New Interfaces for Musical Expression*, Baton Rouge, Louisiana, May 31, 2015.

- A. Ishida, B. Knapp, I. Bukvic, B. Bortz, M. Cowden, and *T. O'Connor, "Luminous Kite Lanterns: Spatially responsive audio-visual field," Poster presented at *Association of Collegiate Schools of Architecture conference*, San Francisco, California, 2013. [peer review, national]
- I. Bukvic, T. Martin, and *M. Matthews, "Moving Beyond Academia Through Open Source Solutions– Introducing L2Ork, Virginia Tech's Linux Laptop Orchestra," *Society for Electro-Acoustic Music in the United States*, Miami, Florida, 2011. [peer review, national]
- I. Bukvic and T. Sipes, "Communal Performance Art through Technology: A Study of *Soul* Composition for Baritone, Computer, and Audience," Lecture recital presented at the *College Music Society National Conference*, Atlanta, Georgia, September 27, 2008. [peer review, national]
- I. Bukvic and T. Cowden, "Complementing Traditional Performance Idiom with Contemporary Technology—A Study of SlipStreamScapes V: Lullaby Interactive Electroacoustic Piece for Two Pianos and Interactive Computer," Lecture recital presented at the *College Music Society National Conference*, Salt Lake City, Utah, November 17, 2007. [peer review, national]
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- *All Your Sprache Are Belong to Strauss* featured on the SEAMUS 20th Anniversary Electroclips CD, Fall 2006.
- CD review (Eric Chasalow's *Left to His Own Devices*) published in the printed edition of *Array*, *ICMA's Array* magazine, 2005.
- I. Bukvic, "Tabula rasa," (D.M.A. Dissertation) *Ohiolink*, 2005. Available at http://www.ohiolink.edu/etd/view.cgi?acc%5Fnum=ucin1131065629.
- I. Bukvic, "MIDI and Art Music – an Aesthetic Comparison," *M-Station* online magazine (available at http://mstation.org/ico.php), 2002.
- *ICMC 2002* concert review published in the *Array*, *ICMA's* online magazine. Available at http://www.computermusic.org/array.php?artid=95.
- I. Bukvic, "Meditations III: The Sea," (Master of Music Thesis) *Ohiolink*, 2000. Available at http://www.ohiolink.edu/etd/view.cgi?ucin984494016.

SELECTED WORKS

A complete list of performances and links to select media are available at
http://ico.bukvic.net/main/works/

COMPOSITIONS

- *Transcontinental Grapevine* – interactive work for the Linux Laptop Orchestra's (L2Ork) L2Ork Tweeter platform that makes the work's strict EDM timing possible despite two groups of performers (total of 11) being over 5,000 miles apart (Blacksburg, VA, USA, and Buenos Aires, Argentina). A theme and variations based on the opening from Lane 8's "Grapevine" feat. Elderbrook. All the content is crowdsourced, or co-created by 11 participants, including instruments. 2022.

- _-=◢▌▒▒▄▆▒ *(pronounced as "4th beat")* – interactive work for the Linux Laptop Orchestra's (L2Ork) L2Ork Tweeter platform. Every aspect of the work is crowdsourced and performed live telematically. This and previous work set the stage for the telematic crowdsourced music genre. 2021.
- *Into the Abyss* – interactive work for the Linux Laptop Orchestra (L2Ork) and a first ever work written for the new L2Ork Tweeter platform. Every aspect of the work is crowdsourced and performed live telematically. 2020.
- *Traces* – interactive multichannel work that uses D^4 spatialization library and the Locus motion-tracking-based glove controller. Utilizes 8,000 channels of audio and mixes them down to 130 physical channels with sub-20ms latency. 2019.
- *Envelop* – interactive multichannel work that uses D^4 spatialization library and the Sensel Morph controller. 2018.
- *Three arrangements* – for the Linux Laptop Orchestra (L2Ork) to accompany world renown visiting artist Manu Delago's performance. 2018. (20')
- *Alien* – live video scoring composition for the Linux Laptop Orchestra (L2Ork). 2018. (5')
- *Take 007* – soundtrack for the New Interfaces for Musical Expression 2018 conference promotional video. 2017.
- *An Ending (Ascent)* – an arrangement of Brian Eno's composition for the *Raspberry Pi Orchestra*, 2016. (4').
- *L2Orkin'Around* – a crowd-sourced composition for a woman rapper and the *Raspberry Pi Orchestra*, 2016. (3')
- *Rain* – composition for horn and the *Linux Laptop Orchestra* (L2Ork), 2015. (10')
- *Tornado* – real-time simulation of a tornado designed specifically for the Institute for Creativity, Arts, and Technology's (ICAT) Cube audio system with 128-channel sound diffusion (with contributed recordings from Jim Metzner and Sergio Nunez), 2014. (2')
- *Dust* – for Kandinsky Trio, 2014. (4')
- *Between* – composition for the *Linux Laptop Orchestra* (L2Ork), 2013. (10')
- *Rain* – composition for the *Linux Laptop Orchestra* (L2Ork), 2011. (10')
- *Serene* – composition for the *Linux Laptop Orchestra* (L2Ork), 2011. (9')
- *13* – structured improvisation for the *Linux Laptop Orchestra* (L2Ork) and percussion, 2010. (9')
- *What's He Building?* – an arrangement of Tom Waits' piece for *Linux Laptop Orchestra* (L2Ork) and narrator, 2010. (6')
- *Citadel* – composition for the *Linux Laptop Orchestra* (L2Ork) and soprano, 2009. (6')
- *Half-Life* – composition for the *Linux Laptop Orchestra* (L2Ork) and narrator, 2009.
- *Mind-Body Interactive* (a.k.a. *Interactive Taiji*) – dynamic/evolving soundtrack for the *Interactive Taiji* research pilot, 2009.
- *17* – interactive audio-visual theatre for a solo performer, computer, and visuals, 2008-9. (50')
- *derelicts of time* – interactive audio-visual work for trombone and computer, 2008. (10')
- *iteration13* – interactive audio-visual work for tap dancer, visual artist, audio-visual hyperinstrument and computer, 2008. (13')
- *air.crane.moo.latte.runway* – interactive audio-visual work for an actor, computer and video, 2008. (10')

- *with delicate risk* – audio-visual work, 2007. (3')
- *TWISTS* – "Reconsidering Nuclear Power" an evening-long play by Theatre Workshop in Science, Technology and Society. (60')
- *Pandora* – for laptop, visuals, quad audio and motion-based gestural hyperinstrument, 2007. (5')
- *Soul* – for baritone and laptop, based on a poem by Emily Dickinson, 2007. (5')
- *Gaudeamus* – for woodwind nonet, 2006. (5')
- *Structured Improvisation I – Chalybs* – for laptop, 2006. (7')
- *All Your Sprache are Belong to Strauss* – for tape, 2006. (2')
- *Symmetries* – for 8-channel computer, violin, and hyperinstrument, 2005. (10')
- *Borealis* Linux Desktop Sound Theme – collection of freely downloadable desktop sounds, 2004.
- *Legisonitus #1 – Gone in 8 Minutes and 11.527 Seconds* – for tape, 2004.
- *Tabula rasa* – DISSERTATION work for flute, cello, piano, and computer, 2004. (14')
- *Out of Doors Suite Part 2* – audio-visual composition created using Adobe Flash, 2003. (4')
- *What Happened* – intermedia project involving video, animation, and audio, 2003. (4')
- *Synaesthesia* – endless ever-changing aural installation in Adobe Flash format, 2003.
- *Jadran poslije kiše* – for solo cello, 2003. (4')
- *Imitation Crabmeat Rag* – an interactive 4-channel electroacoustic work for a live performer and
- *SlipStreamScapes V: Lullaby* – an interactive electroacoustic work for 2 pianos and a computer, 2002. (9')
- *Mr. Ping* – for tape, 2001. (7')
- *SlipStreamScapes III: The Sea* – interactive work for a solo guitar and computer in 5 movements, 2000. (28')
- *SlipStreamScapes II: Visions* – for flute, bassoon, trumpet, piano, and marimba, 1999. (6')
- *Polaris* – for tape, 2000. (9')
- *String Quartet No.2 "Croatian Anthem",* 1998, revised 2003. (8')
- *SlipStreamScapes I : Ruins* for mezzo and stereo tape, 1998, revised 2005. (9')
- *Nebulae* – for 5 oboes, 1997.
- *Sziget* – for SSAATTBB *a capella* choir, solo boy soprano, and percussion, 1997. (13')
- *Moonwaltz* – for solo piano, 1994. (5')

INSTALLATIONS

- *Forgetfulness*, immersive virtual reality interactive installation, a communal rendering Denise Duhamel's poem from the Mobius series for virtual reality, motion tracking, and biofeedback (heart rate and galvanic skin response) in collaboration with Zachary Duer and Meaghan Dee. 2018.
- *Mirrorcraft* interactive installation that combines Minecraft with Kinect full body and facial tracking. 2016.
- *Visual Jukebox* visualization for the SEAMUS 2015 conference listening rooms. 2015.

- *The Orb* interactive visualization. I was responsible for adapting the visualization concept into a public interactive display. 2015.
- *Cloud*, interactive installation consisting of 50 sculptures that monitor and emit light and sound and are programmed through a series of community engagement workshops. Developed in collaboration with Aki Ishida. 2014. Premiere video available at http://youtu.be/A2dZ1oYluaY
- *Constellation* interactive audio-visual installation and demo for ICAT's Perform studio. 2013.
- *Interactive Lantern Field* site-specific audio-visual installation commissioned by the Freer Gallery (Smithsonian) in Washington D.C. Developed in collaboration with Aki Ishida, Benjamin Knapp, and Brennon Bortz. 2013.
- *Luminous Kite Lanterns* site-specific interactive audio-visual installation designed for the Blacksburg Farmers Market in collaboration with Aki Ishida, Benjamin Knapp, and Brennon Bortz. 2012.
- *Kinesthesia* interactive telematic aural installation commissioned by Manchester University's NOVARS, Manchester, UK. The work uses remote GPS data from multiple participants and broadcasts it to a specific location where it is rendered as an interactive sound installation. 2012.
- *Singing Darwin* self-generating aural installation for solo hemispherical speaker, originally created as part of a larger collaborative project with whom the installation shares its name. 2009.
- *NUPUY* interactive aural wall sculpture (in collaboration with sculptor Steven Bickley) commissioned by Institute for Critical Technology & Applied Science (ICTAS) designed to provide juxtaposition of aural soundscapes and tangible information about the Institute (a.k.a. *ambient art*). 2009.
- *Interactive Taiji* audio-visual exercise game/installation prototype with dynamic self-evolving music (in collaboration with Matthew Komelski). 2009.
- *FORGETFULNESS* interactive audio-visual setting of a poem by Denise Duhamel. 2009.
- *Elemental* and *Cyrene Reefs* interactive aural installations commissioned for the Digital Arts Research Collective (DARC) collaborative exhibition titled *Revo:oveR* for the opening of Taubman Museum of Art in Roanoke, Virginia (other DARC collaborators are Carol Burch-Brown, Steve Harrison, Simone Paterson, Joy Rosenthal, and Dane Webster). 2008.
- *heads will roll* interactive audio-visual installation. 2007.

COMMISSIONS

- *Unnamed* (2016) for piano and Linux Laptop Orchestra (L2Ork) by Richard Masters.
- *Rain* (2015) for horn and Linux Laptop Orchestra (L2Ork) by Wallace Easter.
- *Infinity* (1992) digital soundtrack licensed for use in a "24 Sata" car review magazine for a video review. 2014. www.24sata.hr/auto/pogledajte-video-test-nissan-navare-25-dci-king-cab-4x4-381744
- *Cloud* audio-visual community-driven installation by Ballston Business Improvement District in collaboration with Aki Ishida. Fall 2013-Fall 2014.
- *Dust* for Kandinsky Trio. May 2014.
- *Interactive Lantern Field* audio-visual installation by Smithsonian Foundation in collaboration with Aki Ishida, Benjamin Knapp, and Brennon Bortz. April, 2013.
- *Between* for Linux Laptop Orchestra by Temple University's Vice Provost for the Arts, 2013.

- *Kite Lanterns* interactive aural installation by American Institute of Architects in collaboration with Aki Ishida, Benjamin Knapp, and Brennon Bortz. September 14, 2012.
- *Virginia Tech ICTAS* interactive aural sculpture installation (permanent exhibit) in collaboration with sculptor Prof. Steve Bickley. November 3, 2009.
- *callitwhatchawant* for the Virginia Tech TWISTS *Living Darwin* play. October 7, 2009.
- 9 sounds from the *Borealis* desktop sound theme incorporated into the Freedesktop project that is used by a majority of Linux distributions and thereby being accessed by est. 73+ million desktop users worldwide (as of 2014), September 2009.
- *Borealis* desktop sound theme licensed by Fididel Inc. (http://www.fididel.com/index.php). March 2, 2009.
- SUN Microsystems sound theme for Open Solaris. Fall 2008.
- TWISTS soundtrack for online podcasts. Fall 2008.
- *17* a collaboration with Sue Ott Rowlands and Tibor Varszegi on a theatrical multimedia play, Romania. Fall 2008.
- *derelicts of time* by Jay Crone, project in part sponsored by the CLAHS creative grant. Spring 2008.
- *TWISTS* "Nuclear Power Reconsidered" theatrical play. Fall 2007.
- *Soul* for computer and voice by Theodore Sipes. 2007.
- VT Stakeholders Project soundtrack, effects, and interactivity for the design of multimedia fund-raising materials. 2007.
- *FreeCol* soundtrack http://www.freecol.org. 2007.
- *Gaudeamus* by Virginia Tech Graduate School. 2006.
- *Borealis* expansion of the sound theme by Gregoire Gentil (for an undisclosed software project). 2006.
- *Symmetries* by violinist Anna Zielinska. 2005.
- *Tabula rasa* by *NeXT Ens* contemporary ensemble. 2004.
- *SlipStreamScapes V: Lullaby* by pianist Michael Fowler. 2002.

AWARDS AND RECOGNITION

- Virginia Tech National Security Institute Faculty Affiliate. Fall 2022-present.
- Forgetfulness immersive interactive installation won two awards at the Western Virginia Advertising Awards hosted by American Advertising Federation: Gold ADDY, in the Posters category and Silver ADDY in the Virtual Reality category. Roanoke, Virginia. March 2019.
- L2Ork nominated for the People's Choice Award by the Roanoke Blacksburg Technology Council (RBTC). April, 2017.
- L2Ork selected by peer review as one of the six transdisciplinary exemplars among member A2RU research universities, including top 30 institutions with transdisiciplinary initiatives in the United States, September 4, 2015.
- April 21, 2015: *OPERAcraft* featured in the USA Today writer Greg Toppo's book The Game Believes in You: How Digital Play Can Make Our Kids Smarter.

- Cloud received the Merit Award by the International Downtown Association as part of the Public Displays of Innovation program. The award recognizes excellence in the areas of innovation, representation, and sustainability, September 30, 2015. Retrieved April 9, 2017 from https://www.idadowntown.org/eweb/docs/2015_Awards/IDA_Presentation.pdf.
- Nominated and selected to join the Virginia Tech Catalyst group of faculty creatives and innovators to serve as consultants to external partners and industry. 2015-present.
- DCist.com (November 8, 2014). The Washington DC-based news blog listed Linux Laptop Orchestra (L2Ork) as one of the "eight awesome research projects at Virginia Tech." Retrieved February 9, 2015, from http://dcist.com/2014/11/8_awesome_research_projects_at_virg.php
- Nominated (by Institute for Creativity, Arts, and Technology's Director Dr. Benjamin Knapp) and selected for Virginia Tech Management Academy, Summer 2014.
- Special Citation for Community Engagement with Lighting - Lantern Field, Architectural Lighting. August 13, 2013. Retrieved March 23, 2013 from http://www.archlighting.com/cultural-projects/special-citation-for-community-engagement-with-li.aspx
- Winner of the Newblankets Inc. Satchmo SuitSup Award for work on pd-l2ork and L2Ork, October 14, 2012.
- Teacher of the Week, Center for Instructional Development and Educational Research, October 17-23, 2011.
- Virginia Tech Scholar of the week, August 29-September 4, 2011.
- 1st place in the first international laptop orchestra commission competition for the revamped version of *Half-Life* composition with added choreography for *Linux Laptop Orchestra* (L2Ork) and narrator organized by Electric Monster Laptop Ensemble at Montana State University, February 18, 2011.
- Winner of 2010-11 Virginia Tech College of Liberal Arts & Human Sciences Excellence in Research and Creative Scholarship award, February 4, 2011.
- Virginia Tech *Linux Laptop Orchestra* (L2Ork) featured on the front cover of the international *Linux Journal*. The magazine also includes eight-page coverage of the ensemble and an interview, April 3, 2010. Phillips, D. (2010). State of the Art: Linux Audio 2008. Linux Journal. Champlain, NY, HME Publishing Limited**:** 193 50-57.
- Recipient of the Virginia Tech XCaliber award for "for exceptional, high caliber contributions to technology-enriched teaching and learning", March 5, 2010.
- Invited to give talk at the inaugural TEDxMidAtlantic conference with the theme being "the power of stories," Baltimore, MD, November 5, 2009. Retrieved February 17, 2015 from https://www.youtube.com/watch?v=IPvd_d_baNw
- *with delicate risk* audio-visual work (in collaboration with visual artist Dane Webster) was recognized as part of the 2009 Best Animated Short category award at the *Frozen Film Festival*, San Francisco, CA, July 9, 2009. Retrieved February 17, 2015, from http://www.frozenfilmfestival.com/pages/lineup09.php
- Recipient of the Creative Achievement Award from VT CAUS for the *Revo:oveR* interactive multimedia installation exhibit, April 21, 2009.
- Courtesy appointment in Computer Science, Fall 2007-present.
- Courtesy appointment in School of Visual Arts, Fall 2007-2010.
- *All Your Sprache Are Belong to Strauss* voted winner of the 20th anniversary Electroclips composition contest sponsored by the *Society for Electro-Acoustic Music in the United States* (SEAMUS), Spring, 2006.

- First Artist Member of the Virginia Tech's Center for Human Computer Interaction (CHCI), 2006-present.
- Elected Director of the international Linux Audio Consortium, 2005-present.
- Winner of the national graduate student award by the Croatia's National Ministry of Science, Education, and Sports, 2004.
- Author of *Borealis*, the most downloaded and one of the most popular desktop sound themes on kde-look.org, 2004.
- *Upbeat* composition competition winner, Croatia, Hvar, 2003.
- *Presser Music Award* finalist, University of Cincinnati, College-Conservatory of Music, 2003.
- *RTMix* software featured by the Stanford and Eastman electroacoustic studios, 2003.
- Summer Graduate Scholarship, University of Cincinnati, College-Conservatory of Music, 1999, 2000, 2003.
- Graduate Assistantship Award, University of Cincinnati, College-Conservatory of Music, 1999-2003.
- *Sigma Alpha Iota* composer competition winner, Cincinnati, OH, 1998.
- University Honors Scholarship, University of Cincinnati, College-Conservatory of Music, 1993-1998.
- Second place in the National Pascal programming competition, Zagreb, Croatia, 1992.

PATENT DISCLOSURES

- NTR ID 1526910255 titled LINC - Langley Industry Networking Collaborative disclosure through the NASA Langley, as part of the LINC project (see V.B. for more info). Inventors: Ivica Ico Bukvic, Christie Funk, Alec Heylar, Jeff Johnson, Justin Rhee. May, 2018.
- Versatile real-time granular synthesis external (self-standing object) for Max/MSP environment. February 15, 2013.
- 13-066 Remote Physical Activity Monitoring and Feedback Method and System. Inventors: Ivica Ico Bukvic, Benjamin Knapp, Matthew Komelski. December, 2012.
- A method of enhancing existing aural cues commonly associated with human-computer interaction (e.g. desktops and portables) to provide greater additional information and lower cognitive load, while offering greater level of immersion. December, 2008.
- Provisional patent on the sonification of shapes using Discrete Reconfigurable Aural Matrix (DREAM) interface (see V. B.5). August, 2008.
- μ [myu] Max/MSP/Jitter & Unity3D interoperability toolkit. June, 2008.

SELECTED PRESENTATIONS, WORKSHOPS, AND CONSULTING

- A. Jensenius, I. Bukvic, H. Wittman, and A. Ogier, "Workshop on NIME Archiving," *New Interfaces for Musical Expression*, the University of Auckland, New Zealand, 2022. [international]
- Virginia Tech L2Ork: Reflections on a Decade of Creativity and Innovation presentation at the 15th International Poznan Composers Forum, Poznan Music Academy, Poland (also livestreamed online). November 17, 2021.

- Tech for Humanity: Exploring Creativity and Emerging Technologies in the Arts and Design and their Societal Impacts. Workshop for 20 Miami Dade Community College faculty and administrators utilizing Pd-L2Ork and focusing on Tech for Humanity discussing the use of technology in classroom and its societal implications. A collaboration with a University with one of the largest minority student populations in the country as a way to develop a pipeline for more minority students to attend Virginia Tech. June 21-23, 2021.
- Cinemacraft: Immersive Storytelling through Sensory Fusion peer-reviewed presentation at The Power of Immersive Stories conference. Virginia Tech. Retrieved from https://sova.vt.edu/immersive-stories/. April 2021.
- Invited workshop on spatial sound, laptop ensembles, and new interfaces for musical expression; consulting on the expansion of the technology-centric music program; Croatian Zagreb Music Academy. December 17-19, 2019.
- C+I Metrics Initiative: Introducing a Crowdsourced Bottom-Up Approach to Developing Transdisciplinary Scholarship Metrics; single-blind peer reviewed presentation at the a2ru (Alliance for the Arts in Research Universities) conference, Lawrence KS. November 2019.
- Invited guest artist at the CubeFest and presenter at the Spatial Music Workshop, Blacksburg, Virginia, August 8-17, 2019.
- Consulting Colorado University Boulder ATLAS institute leadership on developing a Cube-like space and a transdisciplinary C+I-like community. Summer 2019.
- Open Research Strategies and Tools in the NIME Community; New Interfaces for Musical Expression international conference, Porto Alegre, Brazil, June 2019.
- Raspberry Pi Orchestra-Promoting Access to and Participation in Community-Driven Computer Music Ensembles, double-blind peer reviewed workshop held at the International Computer Music Conference in New York, NY. June 2019.
- D^4 Spatialization Library; Envelop, San Francisco, California, October 9, 2018.
- Spatializing Sound Made Easy Using D4 Spatialization Library, invited workshop, Moogfest, Durham, May 21, 2017.
- Raspberry Pi, Pd-L2Ork and Quantified Self, invited workshop, Moogfest, Durham, May 21, 2017.
- Guest lecture on professional work. Georgia State University, Atlanta, Georgia, February 8, 2017.
- Rapid Prototyping in Music, Maker, and Robotics Scenarios using Raspberry Pi and Pd-L2Ork K12 Module, invited workshop, Brooklyn College, Brooklyn, New York, November 19, 2016.
- Rapid Prototyping in Music, Maker, and Robotics Scenarios using Raspberry Pi and Pd-L2Ork K12 Module, peer-reviewed workshop, PdCon 2016, Stevens Institute of Technology, Newark, New Jersey, November 17, 2016.
- Spatial Audio: The Last Frontier, invited visiting lecture, Steinhardt University, New York, New York, November 17, 2016.
- Rapid Prototyping in Music, Maker, and Robotics Scenarios using Raspberry Pi and Pd-L2Ork K12 Module, invited workshop, New York University, New York, New York, November 16, 2016.
- Introducing D4: An Interactive 3D Audio Rapid Prototyping and Transportable Rendering Environment Using High Density Loudspeaker Arrays, peer-reviewed workshop, International Computer Music Conference, Utrecht, Netherlands, September 15, 2016.
- Layer-Based Amplitude Panning, peer-reviewed workshop, International Conference on Auditory Displays, Canberra, Australia, July 6, 2016.
- Designing Synthesizers with Pd-L2Ork, invited workshop, Moogfest, Durham, North Carolina, May 21, 2016.

- Interactive Spatialization of Sound, invited lecture, Moogfest, Durham, North Carolina, May 20, 2016.
- Baum, L., Martin, T., Bukvic, I., Zacharias, K. "A Scientist, an Engineer, an Artist, and a Designer Walked Into a Bar: An SEAD of a Story," T-Summit, Washington D.C, March 21, 2016.
- Bukvic, I., Martin, T., Baum, L. L2Ork A2RU Exemplar presentation and critique, Alliance for Arts in Research Universities (A2RU) 2015 National Conference, A2RU, Blacksburg, Virginia, November 10, 2015.
- Cloud interactive installation community workshop, University of Maryland Baltimore County, Maryland, March 9, 2015. [invited]
- Guest lecture titled "Fostering Creativity, Education, and Community through Technology," University of Maryland Baltimore County, Maryland, March 9, 2015.
- Wisnioski, M. (Chair), Bukvic, I. (Co-presenter), Martin, T. (Co-presenter), Baum, L. (Co-presenter), Zacharias, K. (Co-presenter), "Coordinating the Dance between Research, Infrastructures, and Arts Practices," Alliance for Arts in Research Universities (A2RU) 2014 National Conference, A2RU, Ames, IA, November 5, 2014.
- Virginia Tech; presentation to the Pulaski County K-12 Teachers and Administration to facilitate ongoing and spawn new collaborations with K-12 regional education sector; October 27, 2014.
- Panel member discussing arts in research one institutions; inaugural A2RU Emerging Creatives Student Conference; Stanford University, Stanford, California, February 1, 2014.
- **Keynote** speaker and workshop presenter for the 14th Brazilian Symposium on Computer Music, Brasilia, Brazil, October 31-November 2, 2013.
- Guest lecture discussing Linux Laptop Orchestra (L2Ork); Drexel University ExCITe Center, Philadelphia, Pennsylvania, April 18, 2013.
- Guest lecture discussing Linux Laptop Orchestra (L2Ork); Temple University, Philadelphia, Pennsylvania, April 17, 2013.
- Guest lecture discussing Interactive Lantern Field; Freer Gallery, Smithsonian, Washington, D.C., April 6, 2013.
- Visiting lecturer discussing Linux Laptop Orchestra (L2Ork); Texas A&M University, College Station, Texas, November 2, 2011.
- IRCAM; seminar discussing Linux Laptop Orchestra (L2Ork), Paris, France, May 30, 2011.
- Workshop on building your own Linux Laptop Orchestra (L2Ork) at Hogeschool vor de Kunsten Utrecht, Utrecht, Netherlands, May 26, 2011.
- Workshop on building your own Linux Laptop Orchestra (L2Ork) at STEIM, Amsterdam, Netherlands (http://www.steim.org/steim/events.php?event=411), May 24, 2011.
- Workshop on building your own Linux Laptop Orchestra (L2Ork) at Art Meets Radical Openness (LiWoLi) festival, Kunstuniversität Linz, Austria (http://www.liwoli.at/vortragende/l2ork), May 14, 2011.
- Montreal Pd users meeting; guest speaker covering pd-l2ork software; Montreal, Canada, May 7, 2011.
- CPATH NSF-funded workshop; guest speaker on Music and Computing; Wake-Forest University, Winston-Salem, Virginia, April 2, 2011.
- MUSICACOUSTICA 2010 international music festival; guest speaker discussing *Linux Laptop Orchestra* (L2Ork); Beijing, China, October 28, 2010.
- Guest lecture discussing Linux Laptop Orchestra (L2Ork); Roanoke Higher Education Center, Roanoke, Virginia, October 22, 2010.

- Visiting lecturer discussing own creative work; Louisiana State University, Baton Rouge, Louisiana, April 26-27, 2010.
- Lecture covering Discrete Reconfigurable Aural Matrix (DREAM); University of Virginia Colloquium series, Charlottesville, Virginia, January 23, 2009.
- Guest lecture discussing own creative work; College-Conservatory of Music, University of Cincinnati, Cincinnati, Ohio, January 19, 2010.
- **TEDxMidAtlantic**; a talk with the theme being "the power of stories", Baltimore, Maryland, November 5, 2009.
- Noon series lecture series on the Digital Arts Research Collective's (DARC) Revo:oveR exhibit; Taubman Museum of Art, Roanoke, Virginia. January 9, 2009.
- Bukvic, I. "libALSA, libJACK,... lib-what? I Just Want To Do My Work." **Keynote** at the 25th Tonmeistertagung conference, Leipzig, Germany, 274-277, November 13-16, 2008.
- The Art of Composer and Multimedia Sculptor; *50 years of Computing* Conference, Cincinnati, Ohio, Fall 2008.
- Bukvic, I., Sipes, T., "Communal Performance Art through Technology: A Study of 'Soul' Composition for Baritone, Computer, and Audience," *College Music Society National Conference*, Atlanta, Georgia, Fall 2008.
- Guest lecture discussing use of music through ambient art to enhance architectural spaces; Building Communities Through the Arts, South Boston, Virginia. June 4, 2008.
- *Wake-Forest Intelligent Sustainable Space Multimedia Installation Project* (Phase I PI) prototype showcase as part of the Workplace Strategies booth at the University of North Caroline Greensboro's *Design, Art and Technology Symposium*, Spring 2008.
- Visiting lecturer covering own creative work; Duke University, Durham, North Carolina. March 28, 2008.
- Yong Siew Toh Conservatory of Music at the National University of Singapore; guest lecturer discussing own creative output; Singapore, Winter 2008.
- *New Music Festival* guest speaker, UNC Greensboro, November 2007.
- Bukvic, I., Cowden, T., "Complementing Traditional Performance Idiom with Contemporary Technology—A Study of *SlipStreamScapes V: Lullaby* Electroacoustic Piece for Two Pianos and Interactive Computer," *College Music Society National Conference*, Salt Lake City, Utah, Fall 2007.
- Pebble Space: An Intelligent Communal and Collaborative Space; Interactive multimedia installation proposal to the Wake Forest partners for the new downtown Charlotte seven building construction project, Fall 2007.
- Visiting lecturer discussing own creative work; College-Conservatory of Music, University of Cincinnati, Cincinnati, Ohio. May 14, 2007.
- Bukvic, I., "Integrating Documentation, End-User Support, and Developer Resources using *.linuxaudio.org," *Linux Audio Conference* at TU Berlin, Germany, Spring 2007.
- The Genius of the Place: Land and Identity in Contemporary Art; visiting lecturer for the exhibition at the Arts Museum of Western Virginia, Roanoke, Virginia, November 2006.
- Visiting lecturer at the *mama.mi2.hr* contemporary multimedia institute in Zagreb, Croatia, Summer 2006.
- University of Manchester; guest lecturer; United Kingdom, Spring 2006.
- Bukvic, I., "Linuxaudio.org — Who, What, and Why?" *Linux Audio Conference* in Karlsruhe, Germany, Spring 2006.

- Bukvic, I., "Practical Guide to Interactive Electroacoustic Art." *SEAMUS 2005* Conference, Ball State University, Indiana, Spring 2005.
- *Accent05* festival; guest lecturer; Cincinnati, Ohio, Summer 2005.
- Panel member by invitation on the topic "Standards From the Computer Music Community." *International Computer Music Conference* 2004, Miami, Florida, Summer 2004.
- *Workshops in Electronic and Computer Music* visiting lecturer, Oberlin College, Summer 2004.
- *Accent04* festival; guest lecturer; Cincinnati, Ohio, Summer 2004.
- Panel member by invitation on the topic "Future of Linux Audio." *Linux Audio Conference* in Karlsruhe, Germany, Spring 2004.
- Bukvic, I., "Unlocking the Full Potential of RTMix real-time interactive multimedia Art Performance, Composition, and Coaching Interface," *Linux Audio Conference* in Karlsruhe, Germany, Spring 2004.
- Bukvic, I., "Hurdles and Benefits of Introducing Linux as a Viable Digital Audio Workstation in the Academic Environment," *Linux Audio Conference* in Karlsruhe, Germany, Spring 2004,
- *Uzmah* festival; guest lecturer; Hvar, Croatia, 2003.
- Bukvic, I., "RTMix — a Real-Time Interactive Multimedia Art Performance, Composition, and Coaching Interface," *SEAMUS 2003* Conference, Tempe, Arizona, Spring 2003.
- Bukvic, I., "Stochastic Phrase and Density Structure Generator (SPiDSiG) Music Software," *SEAMUS 2002* Conference, Iowa City, Iowa, Spring 2002.

PRESS

A near complete list of media coverage available at http://ico.bukvic.net/main/press/

TEACHING EXPERIENCE

Professor, Virginia Tech (teaching evaluations consistently score in the top 15%), 2006-present.

- History of Electronic Music (MUS 3164), Spring 2023.
- Introduction to Human-Centered Design (GRAD 5134), Spring 2023.
- Play to Make (IDS 1114, CAUS 1114) introductory course for all majors, a part of the Creativity + Innovation Design Tech minor. The course covers creative making and reflection using multiple modalities, with particular focus on Arts, Design, and Technology, Spring 2022.
- Topics in Advanced Electroacoustic Research (MUS4014/H) (new transdisciplinary honors-credit-eligible course taught as part of this rotating topics course), Spring 2017, 2020, 2021, 2022.
  - Introduced a number of topics, including New Musical Interfaces, New Interfaces for Socially Distant Collaboration, Immersive Spatial Sound, Music, and Sonification, and Tech for Humanity.
  - Covering elements of UI/UX, design thinking and iterative design, entrepreneurship, engineering, computer programming, including audio- and interaction-centric digital signal processing, sound, and music.
- Digital Sound Manipulation (MUS3064) (new course), 2015-present.
- Linux Laptop Orchestra (MUS4124, MUS3314, MUS2974 and MUS 4974) (new ensemble and independent studies), Fall 2009-present.

- Soundtrack & Effects Composition (pilot course), Fall 2007.
- Computer Music & Multimedia Design (MUS3065-6) (new 2-semester course), Fall 2006-present.
- Revamped version of the Introduction to Music Technology (MUS2054), Spring 2006-2011.
- Independent Studies, Spring 2006-present.
- Composition, Spring 2006-2012.

Adjunct Faculty, University of Cincinnati, College-Conservatory of Music, 2005.

- Linux and Multimedia, Winter, Spring, 2005.

Visiting Professor, Oberlin College, Spring 2004.

- Composition, Spring 2004.
- Studio Skills for Composers (TECH 150), Spring 2004.
- Computer Music (TECH 201), Spring 2004.

Graduate Teaching Assistant, University of Cincinnati, College-Conservatory of Music, 1999-2003.

- Linux and Multimedia (new course), 2002-2003.
- Computer Music Composition (substitute faculty), 2002-2003.
- Intro to Electronic Music, 2000-2003.
- Honors Music Theory and Analysis, 1999-2000.
- Composition, 1998-2003.

SERVICE

- Invited to serve on the Virginia Tech university-level Responsible Research Assessment Task Force tasked to develop new research metrics for areas that are not currently adequately supported with quantifiable metrics 2021-present.
- Creative Technologies in Music mentor 2015-present.
- Human-Centered Design graduate student mentor 2013-present.
- National Science Foundation's Research Experience for Undergraduates (CS, CHCI) mentor, 2007-2009.
- VT Linux and Unix Users Group (VTLUUG) student organization mentor, 2007-2009.

COMMITTEES

- A2RU Executive Committee Special Advisor on the Integration and Evaluation of Interdisciplinary Scholarship, chairing a special working group consisting of upper-level administrators from leading Research One institutions in the US focusing on the development of tools and guidelines for the assessment and valuing of creative scholarship in Arts and Design, 2023-present.
- Technology+ and Tech for Humanity working groups member, a part of the newly introduced College of Liberal Arts & Human Sciences' Academy for Transdisciplinary Studies, 2020-present.

- Member (by invitation) of the Public Interest Technology University Network working group, 2020-present.
- A2RU Research Groundworks online journal Editorial Board member by nomination, 2019-present.
- A2RU Research Committee member by nomination, 2016-2018.
- A2RU Third Space Committee member by invitation, 2016-2017.
- Center for Human-Computer Interaction executive committee member, 2015-2017.
- A2RU/XSEAD Peer Review Task Force member by invitation, 2014-15.
- Executive Committee Member of the new Human-Centered Design PhD program, 2014-2020.
- Contemplative Practice for a Technological Society, 2013.
- Personnel committee (Department of Music), 2012-13.
- ICAT Science, Engineering, Arts, and Design (SEAD) request for proposals, 2012-present.
- Search committee chair (Music Technology), 2012-13.
- Mindfulness Conference steering committee member, 2012-13.
- Martin Luther King Virginia Tech program organizing committee, 2012.
- Search committee (English, Creative Technologies), 2011-12.
- Information Technology 2020 Visioning Task Force, 2010-11.
- School of Performing Arts and Cinema working group, 2008.
- Institute for Society, Culture and Environment (ISCE) visioning panel, 2007.
- Member of the CEUT interdisciplinary design group (by invitation), 2006-2007.
- Member of the SEAMUS Conference Committee (by invitation), 2004-2006.

REVIEWER

- Research Grants Council of Hong Kong first reader and meta-reviewer, 2021-4. [international, invitation]
- Virginia Tech internal School of Architecture + Design reviewer, 2021.
- DAFX conference paper reviewer, 2020-1.
- Alliance for the Arts in Research Universities (a2ru) GroundWorks online journal founding Editorial Board member, 2016-2022.
- Paper reviewer for the Sound and Music Computing, 2015-6.
- Paper reviewer for the Divergent Press Issue #3, 2014.
- Paper reviewer for the Computer Music Journal, 2013.
- External reviewer for Tenure and Promotion at peer institutions, 2021-present.
- Paper reviewer for the Journal of Human-Computer Studies, 2013.
- Paper reviewer for the *Pure Data Convention*, 2011, 2016.
- Paper reviewer (by Professor Emeritus Daniel Schneck) for the Journal of Biomusical Engineering, March, 2011.
- Paper and performance submission reviewer for the *New Interfaces for Music Expression* conference, 2010-present.

- Paper and multimedia performance reviewer for the *International Computer Music Conference*, 2007, 2010-present (most years).
- Paper reviewer for the *Linux Audio Conference*, 2005-present.

OTHER PROFESSIONAL EXPERIENCE

- Music Director at the St. Pius X Parish, KY, 2004-2005.
  - Spearheaded fundraising campaign, raised $60,000 for the overhaul of the worship area audio system.
- College-Conservatory of Music, Center for Computer Music Studios *(CCM)²* systems administrator, 1999-2003.
- *Interactive and Experimental Music Festival* chief technician, 2002.
- College-Conservatory of Music computer systems assistant administrator, 1998.
- University of Cincinnati computer lab technician, 1997-1998.

SOFTWARE DEVELOPMENT

Miscellaneous software development not included in the Research section, 1998-present.

- OSC-based middleware for communication between Optitrack motion tracking camera system and Max for the ICAT Perform studio.
- Ported series of externals to Pure-Data platform, including John Gibson's *spectdelay~*.
- Designed series of new externals for Pure-Data platform, including disis_netsend/netreceive, disis_wiimote, disis_phasor~.
- A fork of *libcwiid* designed to support Bluetooth connectivity with Nintendo Wii controllers.
- Designed free DISIS Metronome 9000, and DISIS Tuner 11 standalone applications for students and faculty.
- Contributor to *Pure-Data* and *Gem* software, including patches for the support of MSI Wind hardware.
- *disis.aka.wiiremote* Max/MSP external for interfacing with *Wii Fit* balance boards.
- *Neverball* patch allowing networked input from Max/MSP for interfacing of the Wii Fit balance board with the game.
- Contributions to Linux Kernel's PCMCIA and ALSA drivers.
- *Recorder9* Max/MSP abstraction for real-time audio loop recording and processing released as public domain software.
- Contributor to the Linux *Superkaramba* desktop enhancement project.

PERFORMANCE EXPERIENCE

HYPERINSTRUMENTS

- *Linux Laptop Orchestra* (L2Ork) 2009-present.
- Performing own works utilizing custom instruments and/or interfaces 2000-present.

PIANO/KEYBOARD

- Performing own works and the contemporary piano literature, 1983-2007.
- Organ performance, Cincinnati, Ohio, 1995-2005.

CONDUCTING

- Music Director at St. Pius X Parish, Edgewood, Kentucky, 2004-2005.
- Choral conductor, Cincinnati, Ohio, 1995-2004.
- Music Academy capstone in choral conducting, performing sacred works including J.S. Bach's chorales, Zagreb, Croatia, 1991.

MISCELLANEA

LANGUAGE SKILLS

- Fluent in English and Croatian.
- Adept in German and Russian (reading and speaking).
- Proficient in French (reading, basic speaking skills).
- Reading skills in Latin.
- Familiar with several other Slavic languages and dialects.