

## CURRICULUM VITAE

# Alex S Hill

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## RESEARCH INTERESTS

As a research scientist in the field of human-computer interaction, my focus is on developing methods to augment the productivity of the individual in 3D computing environments. My work has centered on techniques that allow users to leverage the geo-spatial nature of augmented and ubiquitous computing while retaining the high precision command execution and relatively low fatigue associated with desktop computing. I developed a framework that extends the desktop metaphor into virtual environments to solve prior problems with accuracy and fatigue by eschewing a reliance on physically intuitive methods. I have a strong interest in addressing the needs and feedback of stakeholders in my research. Along with employing empirical evaluation techniques, I am interested in software and hardware abstractions that match the cognitive framework of the users employing them. I enjoy working with artists, students and other end users to develop tools to maximize their creativity and productivity in tangible ways.

## EDUCATION

- 12/07 *Ph.D. in Computer Science. University of Illinois at Chicago*  
Dissertation: A Unified Framework for the Development of Desktop and Immersive User Interfaces  
Electronic Visualization Laboratory directors Tom DeFanti and Daniel Sandin were recipients of the 2007 IEEE VGTC Virtual Reality Technical Achievement Award.
- 5/92 *M.S. in Mechanical Engineering. University of Texas at Austin*  
Thesis: Reduced Order Modeling and First-Order Multivariate Control of a Coal Fired Power Plant  
Cockrell Graduate School of Engineering is consistently ranked in the top 10 (*U.S. News & World Report*).
- 12/88 *B.S. in Mathematics. Trinity University, San Antonio, Texas*  
Minor: Art History  
Ranked No. 1 in "America's Best Colleges" guide 16 consecutive years (*U.S. News & World Report*).

# EMPLOYMENT

- 08- *Postdoctoral Fellow at the Augmented Environments Laboratory*  
I am currently a postdoctoral fellow working with Associate Professor Blair MacIntyre in the Interactive Computing department at the Georgia Institute of Technology. One of the main research goals of the laboratory is to contribute to the understanding and development of AR entertainment applications for handheld devices. My responsibilities include providing leadership for several new initiatives involving the integration of virtual worlds with the physical world both in collaborative workspaces and in more general purpose outdoor environments.
- 5-9/08 *Research Scientist at the Center for Technology and Social Behavior*  
I conducted research on the development of Embodied Conversational Agents in the Articulab, the principle laboratory started by Justine Cassell after she moved from MIT. My focus was on developing a modular architecture for social behavior research using virtual peers. I was responsible for their current effort to develop target controllers for the SmartBody character realizer that we worked on in collaboration with Reykjavik University and USC. My research at the lab also included the development of BML character markup language extensions to model the interaction between virtual characters, objects in their environment and other virtual agents.
- 01-06 *Adjunct Assistant Professor at the University of Illinois at Chicago*  
I was the sole instructor for the advanced section of Computer Art-Design in the School of Art and Design (AD 408). The class is designed to teach computer science topics to Master of Fine Arts students affiliated with the Electronic Visualization Laboratory. Lecture topics include polygon rendering techniques, scene graphs, stereo display, tele-immersion, spatialized sound, tracking and display hardware along with historical and artistic perspectives on virtual reality and gaming. Students can retake the course up to 2 times. I concurrently taught repeating students advanced subjects such as C++, the Performer rendering library and node development for the Ygdrasil VR system. The course also requires a laboratory section that I developed and instructed. In the final semester, I introduced a new graphical IDE to the instruction and revised the labs accordingly. In my role in the School of Art and Design, I also oversaw several students doing independent studies related to their MFA work.
- 99-05 *Research Assistant at the University of Illinois at Chicago*  
The Electronic Visualization Laboratory is a 35-year collaboration between computer scientists and artists best known for developing the CAVE virtual reality system. During my graduate studies at the lab my main responsibility was maintaining and continuing development of the Ygdrasil authoring platform. Ygdrasil is a script-based virtual reality authoring system using dynamic plug-ins and built-in tele-collaboration. I added numerous features including an overhaul of the message passing system, state persistence, state variable access and spatialized sound. I was also responsible for developing an automatic documentation system, maintaining a user forum and creating user tutorials. My responsibilities also included acting as technical director for a large number of virtual reality projects initiated either by faculty or MFA students.
- 92-98 *Senior Project Engineer with Aspen Technology, Incorporated*  
As a member of the Advanced Hydrocarbon Controls department, I worked on a number of projects implementing multi-variable controls at client sites around the world. Over time, I became specialized in developing plant historian databases and eventually moved into in client-server technology and user interfaces. A client outside of Chicago, Illinois requested my services for a 2-year contract to build a plant historian and laboratory sample management system using Aspen's SETCIM relational database and the SQL query language. The final system gave desktop users access to over a decade of DCS and lab trend data through a customized graphical system and ODBC enabled spreadsheets.
- 91-92 *Research Assistant at the University of Texas at Austin*  
My work in the Dynamics Systems area involved multivariable control schemes based on reduced order models. Through consultations with SPS Energy in Lubbock, Texas, I replaced the pneumatic control scheme on a 69 state model with a digital system to reflect recent system upgrades at the target plant.

# PUBLICATIONS

## REFEREED CONFERENCES

- 3/08 **Hill, A.**, Johnson, A., Withindows: A Framework for Transitional Desktop and Immersive User Interfaces, appearing in *Proceedings of the IEEE Symposium on 3D User Interfaces*, March 2008, Reno, Nevada, 8 pages.
- 3/07 **Hill, A.**, Tsoupikova, D., Development of Rutopia 2 VR Artwork Using New Ygdrasil Features, *Proceedings of the 3<sup>rd</sup> International Conference on Computer Graphics Theory and Applications*, Springer, March, 2007, Barcelona, Spain, 4 pages.

## REFEREED JOURNALS

- 3/05 Fischnaller, F., **Hill, A.**: CITYCLUSTER - "From the Renaissance to the Megabyte Networking Age": A Virtual Reality and High-Speed Networking Project, *Presence: Teleoperators & Virtual Environments*, February 1, 2005, Vol. 14, No. 1, Pages 1-19, 18 pages.

# INVITED TALKS

- December 12, 2007: Software Engineering Research Center, Ball State University, Indiana (3D user interfaces)
- September 20 & 27, 2006: Advanced Visualization Seminar, University of Illinois at Chicago (VR programming)
- March 29, 2003: Version Festival 3 Panelist, Museum of Contemporary Art, Chicago (tele-immersive avatars)
- February 19, 2003: Technical Meeting, Electronic Visualization Laboratory, University of Illinois at Chicago (VR art)
- January 30, 2002: Advanced Visualization Seminar, University of Illinois at Chicago (VR programming)

# FELLOWSHIPS & GRANTS

- 01-02 *Graduate Fellows in K-12 Education, University of Illinois at Chicago*

# PUBLIC PRESENTATIONS

## POSTERS

- March 10-11, 2007: Withindows: A Single-Authoring Framework for Desktop and Immersive Interfaces, IEEE Symposium on 3D User Interfaces, Charlotte, North Carolina

## PROJECTS

- August 5-9, 2007: Rutopia 2, SIGGRAPH Art Gallery Installation, California Institute for Telecommunications and Information Technology (Calit2), San Diego, California
- Mar 29-31, 2004: CITYCLUSTER, IEEE VR 2004, Electronic Visualization Laboratory, Chicago, Illinois (tele-collaborative with the School of Art and Design, UIC, Chicago)
- November 20-21, 2003: CITYCLUSTER, Virtual Storytelling '03, Modern and Contemporary Art Museum "Les Abattoirs", Toulouse, France
- September 6-11, 2003: CITYCLUSTER, Ars Electronica Festival, AEC Museum of the Future, Linz, Austria

*February 9-11, 2003: CITYCLUSTER, Museum of Palazzo Medici Riccardi, Florence, Italy  
(tele-collaborative with Electronic Visualization Laboratory, Chicago)*

*February 7, 2003: CITYCLUSTER Opening, Palazzo Vecchio, Florence, Italy  
(tele-collaborative with Electronic Visualization Laboratory, Chicago)*

*October 22-26, 2002: CITYCLUSTER Prototype, X Canarias Mediafest, Elder Museum of Science and Technology,  
Las Palmas de Gran Canaria, Spain*

*July 23-25, 2002: Uzume, SIGGRAPH Art Gallery Installation, Henry B. Gonzalez Convention Center, San Antonio,  
Texas*

*October 21, 2001: Alive on the Grid, Chicago Artists Month, Electronic Visualization Laboratory, Chicago, Illinois  
(tele-collaborative with 4 sites including University of Indiana, USA and Umea, Sweden)*

*September 1-6, 2001: Alive on the Grid, Ars Electronica Festival, AEC Museum of the Future, Linz, Austria  
(tele-collaborative with 6 sites including EVL, Chicago, Umea Institute, Sweden and C3 Institute, Hungary)*

## PROFESSIONAL ACTIVITIES

Student Volunteer, SIGGRAPH 2001, New Orleans, Louisiana

## PROJECT SUMMARIES

### RESEARCH PROJECTS

**Image-Plane Selection** Electronic Visualization Laboratory, submitting to UIST 2008

A user study to evaluate the merits of using image-plane selection on 2D surfaces. A repeated measures ANOVA contrasts image-plane with ray-casting on surfaces placed below the hand and at various distances from the user.

**Withindows** Electronic Visualization Laboratory, IEEE 3DUI Symposium 2008

A theoretical framework designed to single-author applications that operate on the continuum between the desktop and immersion. The framework is based on using image-plane selection on through-the-lens viewing windows.

**Ygdrasil GUI** Electronic Visualization Laboratory, 2007

Proof of concept virtual world builder based on the Withindows framework. Uses image-plane selection on viewing windows for search, selection and manipulation in both desktop and immersive Linux/SGI/Windows environments.

**Simulator II** Electronic Visualization Laboratory/VRCO, 2006

A modernization of the CAVElib simulator interface to improve the usability. Mouse-wand mode moves the hand in a spherical coordinate system under the mouse and the mouse-look mode allows de-coupled navigation and viewing.

**Spatial OSC** Northwestern University, 2006

Replaced the Bergen Sound UDP networking with Open Sound Control and developed a OS X based Max/MSP server that can be used interchangeably instead of the Linux based Bergen sound server.

**AvatArticulate** Electronic Visualization Laboratory, 2005

A reverse kinematics system to articulate user avatars based on simple geometric rules. A component-based system allows users to easily program autonomous arm and leg interactions with simple shapes and complex terrain.

**ratSource** Electronic Visualization Laboratory, 2003

Used Mbus protocol to interject messages into the Rat Audio Tool model-view-controller application. Spatialized and directionalized VOIP sources during tele-immersive virtual reality by adjusting the gain and pan respectively.

**cxxDocumentor** Electronic Visualization Laboratory, 2002

Grammar parsing system to automatically document C++ code. Instead of the more typical comments within header files, the system constructs a pseudo code from comments interspersed throughout code files.

**HazelCrest TOD** College of Urban Planning, 2002

Collaboration with a masters student to create an urban planning application in the CAVE. Used transitions to overview and direct interactions to position, orient and exchange buildings.

**The Field** Electronic Visualization Laboratory, 2001

A portable stereo display application to help students learn about science inquiry. Developed code to automatically generate plant distributions and participated in student observations during my K-12 Education fellowship.

**4 Seasons** Electronic Visualization Laboratory, 2000

A development system using Multigen Creator files for both geometry and scene composition. Instead of forcing the user to reposition scene elements in C++ code, behaviors are added directly to scene contained in an OpenFlight file.

**PARIS Evaluation** Electronic Visualization Laboratory, 2000

The PARIS device attempts to strike a compromise between presenting stereo images on the horizon and at waist level. User study found the setup forced users into reaching and the resulting fatigue discouraged direct hand use.

**Cluster Tracking** Electronic Visualization Laboratory, 2000

Ported and optimized color clustering code developed at UIUC onto the SGI O2 unified memory architecture to increase computational efficiency. Used the software to track hands with the PARIS see-through VR system.

**Mars Explorer** Electronic Visualization Laboratory, 1999

A CAVE application to teach basic scientific inquiry skills related to graphing and clustering. Responsible for conceiving and programming the distribution, placement and composition of rock samples on the Martian surface.

## ARTISTIC PROJECTS

**Nojd** Royal Institute of Technology, 2006

A large screen installation based on the mythological Shaman from Northern Sweden. Combines embedded live video feeds, autonomous characters, particle systems and physics into a robust museum grade interface.

**Fools Paradise** Northwestern University, 2005

Collaboration with Paul Hertz to develop specialized Ygdrasil modules and create an interface to Max/MSP from within scenes. This work later developed into the Spatial OSC project.

**VRML Kenosha** Placevision Incorporated, 2004

Designed and programmed the heads up display and interactive construction of proposed buildings for a VRML model of Kenosha, IL using touchSensors and texture transforms.

**W.O.M.B** University of Konstanz, 2003

A CAVE application focused on balancing the seven major Chakras that implements a physically intuitive user interface. Proprioception and gesture control navigation while voice, gaze and hands create and organize bubbles.

**CITYCLUSTER** Electronic Visualization Laboratory, 2003

The novel user interface for this CAVE art piece based on a co-located Chicago and Florence uses a view rendered texture into the scene. The user interface presented opportunities for complex tele-immersive avatar representations.

**ExCavation** Electronic Visualization Laboratory, 2001

A CAVE art piece, on permanent display at the ARS Museum, allows the user to interactively configure a very large active surface defined terrain. A highly efficient representation scheme allowed the piece to run at full frame rates.

**DressingRoom** Electronic Visualization Laboratory, 2001

A virtual dressing room created for the Alive on the Grid project that represents to image of the avatar in a hall of mirrors effect. Users select avatar head, hand and body by pointing and selecting from parts hanging on the wall.

**DreamBox** Electronic Visualization Laboratory, 2000

A CAVE art project based on psychoanalytic play therapy using a sand tray. Several attributes of each object are affected by relative position to one another. Reflecting different states motivated the development of morphing, texture translation and dynamic surface modules.

## **MEMBERSHIPS**

- Tau Beta Pi Engineering Honor Society
- Phi Kappa Phi National Honor Society
- ACM (Association for Computing Machinery)
- IEEE (Institute of Electrical and Electronics Engineers)

## **LANGUAGES**

- English (native, fluent)
- Spanish (fluent)