Hans Weber

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EDUCATION

Graduate Education (1991-2001)

University of North Carolina (Chapel Hill, NC)
Dissertation: *Predictive Head Tracking Using a Body-Centric Coordinate System*
Status: ABD on Ph.D. degree in Computer Science

Undergraduate Education (1987-1991)

Harvard College (Cambridge, MA)
A.B. in Computer Science, Magna Cum Laude
GRE Scores: Quantitative 800 Analytic 800 Verbal 710 Computer Science 780

Transcripts available upon request.

RESEARCH & TEACHING EXPERIENCE

Computer Science Department, UNC-CH (summer 1997 - fall 2001)

Ph. D. student under the guidance of Professor Gary Bishop.
Conducted dissertation research and writing on predictive head tracking.

Computer Science Department, UNC-CH (summer 1997 - fall 2000)

Research Assistant to Professor Gary Bishop.
Conducted research on optical trackers, hybrid optical-inertial trackers, and techniques to improve the quality of predictive head tracking for virtual environment systems.

SIGGRAPH (summer 1997)

Instructor for Course 29, *Programming Virtual Worlds*.
Updated and taught a section entitled *How Do You Interact with a Virtual Environment?*.

Computer Science Department, UNC-CH (fall 1991 - spring 1997)

Research Assistant to Professor Frederick P. Brooks.
Managed various aspects of the Architectural Walkthrough project as team leader, designed and implemented virtual environment software, and interacted with outside firms to integrate new tools and models into our evolving system.

Computer Science Department, UNC-CH (fall 1993 - fall 1996)

Ph. D. student under the guidance of Professor Frederick P. Brooks.
Conducted dissertation research and writing on wayfinding in virtual environments.

SIGGRAPH (summer 1996)

Instructor for Course 14, *Introduction to Virtual Reality*.
Planned and taught a section entitled *How Do You Interact with a Virtual Environment?*.

Computer Science Department, UNC-CH (summer 1994)

Instructor for Computer Science 4, *Computers: Power Tools for the Mind*.
Planned and taught an introductory Computer Science course.

Computer Science Department, UNC-CH (fall 1992 - spring 1993)

  Doctoral Written Examination Committee Member.
  Helped to create and review the Ph.D. written examination.

Computer Science Department, Harvard College (spring 1991)

  Teaching Assistant to Professor Henry Leitner for CS 1, *Introduction to Computer Science*.
  Performed grading, wrote assignments and solutions, and led a weekly lecture/discussion section
  for a group of 12-15 students.

Computer Science Department, Harvard College (spring 1991)

  Teaching Assistant to Professor Mark Friedell for CS 175/275, *Advanced Computer Graphics*.
  Performed grading and wrote solution sets for projects.

Computer Science Department, Harvard College (fall 1990)

  Teaching Assistant to Professor Mark Friedell for CS 50, *Computer Programming*.
  Performed grading and led a weekly lecture/discussion section for a group of 15-20 students.

Bureau of Study Counsel, Harvard College (fall 1988)

  Tutored students in Computer Science.

WORK EXPERIENCE

Magic Software, Chapel Hill, NC (9/2001 - present)

  Consultant.
  Developing a fully featured OpenGL renderer with support for NVIDIA-specific extensions.

3rdTech, Inc., Chapel Hill, NC (4/2001 - 8/2001)

  Consultant.
  Performed a system-wide analysis of the Hiball 3000 optical ceiling tracking system with a focus
  on calibration and Kalman Filtering. Proposed and implemented improvements to the system.

Research Triangle Institute, Research Triangle Park, NC (5/1993 - 10/1993)

  Consultant.
  Helped bootstrap the virtual environments lab at RTI and worked with IBM's T.J. Watson lab to
  set up the initial virtual environment applications.

Microsoft Corporation, Redmond, WA (summer 1990)

  Software Design Engineer Intern.
  Worked on the WinWorks project.

Microsoft Corporation, Redmond, WA (summer 1989)

  Software Design Engineer Intern.
  Worked on the PC Works project.

Strategic Business Systems, South Bend, IN (summers 1983-88,91)

  Software Design Engineer.
  Wrote applications in C, BASIC, and Lotus Macro Languange and helped develop and refine
  techniques for marketing planning and analysis.

PUBLICATIONS

Taylor, R., T. Hudson, A. Seeger, H. Weber, J. Juliano, and A. Helser (2001). *VRPN: A Device-Independent, Network-Transparent VR Peripheral System*. Proceedings of VRST 2001. (Also available as UNC-CH Computer Science Technical Report No. 01-020).

Weber, H. (1997). *How Do You Interact with a Virtual Environment?* SIGGRAPH 1997 Course Notes: Programming Virtual Worlds, Course 29.

Cohen, J., A. Varshney, D. Manocha, G. Turk, H. Weber, P. Agarwal, F. P. Brooks, Jr., and W. Wright (1996). *Simplification Envelopes*. Computer Graphics (SIGGRAPH '96 Proceedings), pp. 119-128. (Also available as UNC-CH Computer Science Technical Report No. 96-017).

Weber, H. (1996). *How Do You Interact with a Virtual Environment?* SIGGRAPH 1996 Course Notes: Introduction to Virtual Reality, Course 14.

Weber, H. (1996). *A Framework for Investigating Wayfinding in Virtual Environments for Architectural Visualization and Navigation Training*. 1996 Link Foundation Annual Report.

Weber, H. (1996). *Wayfinding in Virtual Environments for Architectural Visualization and Navigation Training (extended abstract)*. SIGCHI Workshop on the Psychological Issues of Virtual Environments, April 1996, Vancouver, British Columbia, Canada.

Varshney, A., P. Agarwal, F. Brooks, W. Wright, and H. Weber (1995). *Generating Levels of Detail for Large-Scale Polygonal Models*. UNC-CH Computer Science Technical Report No. 95-020.

Mine, M., and H. Weber (1995). *Large Models for Virtual Environments: A Review of Work by the Architectural Walkthrough Project at UNC*. Presence, 5(1), pp. 136-145.

Varshney, A., P. Agarwal, F. Brooks, W. Wright, and H. Weber (1995). *Automatic Generation of Multi-Resolution Hierarchies for Polygonal Models (extended abstract)*. First Workshop on Simulation and Interaction in Virtual Environments, July 13-15, 1995, Iowa City, Iowa.

Manocha, D., A. Varshney, and H. Weber (1994). *Evaluating Surface Intersections in Lower Dimensions*. Curves and Surfaces in Geometric Design. A K Peters, Ltd., Wellesley, MA. pp. 327-34.

Brooks, F., J. Airey, J. Alspaugh, A. Bell, R. Brown, C. Hill, U. Nimscheck, P. Rheingans, J. Rohlf, D. Smith, D. Turner, A. Varshney, Y. Wang, H. Weber, X. Yuan (1992). *Six Generations of Building Walkthrough: Final Technical Report to the National Science Foundation*. UNC-CH Computer Science Technical Report No. 92-026.

REFEREE/REVIEWER

ACM SIGGRAPH (courses and papers)
IEEE Virtual Reality
Virtual Reality Annual International Symposium
Graphics Interface
International Symposium on Mixed Reality
Eurographics

HONORS

University of North Carolina Graduate School Fellowship (1997)
Link Foundation Fellowship in Advanced Simulation & Training (1995)
University of North Carolina Merit Assistantship (1991)
John Harvard Scholarship (1990)
Harvard College Scholarship (1989)
Harvard College National Scholar (1987)
Stanford University David Starr Jordan Scholar (1987)
National Merit Scholarship (1987)

SKILLS AND BACKGROUND

I have extensive experience programming in C++, C, and MATLAB. In addition, I am also familiar with Pascal, BASIC, x86 assembly, Lisp, and Tcl/Tk. I work comfortably in a Unix/Linux or Wintel environment using open- or closed-source tools.

The thrust of my research over the last ten years has revolved around developing tools and techniques that improve virtual environments for developers and users. My two research assistantships (under the Walkthrough and Tracker projects) and two dissertation topics (*Wayfinding in Virtual Environments for Architectural Visualization and Navigation Training*, and *Predictive Head Tracking Using a Body-Centric Coordinate System*) have provided me with a great deal of experience in developing graphics software and understanding the system-wide challenges virtual environments pose.

In addition to work on my dissertation topics, I have done some related work outside of my focus areas. I have written low-level device drivers for position and orientation trackers and clock synchronization tools for distributed peripheral management. I have also helped write tools for polygonal simplification, curve and surface intersection, massive model rendering, interactive and non-interactive radiosity, radiosity as texture, and portals.

The infrastructure requirements of my dissertation topics and various research projects have led me to develop an OpenGL C++ graphics and virtual reality library that includes multi-threading support, scene-graph management, and peripheral and display handling. The library is designed and built with a focus on cross-platform compatibility (runs on Suns, HPs, SGIs, Windows PCs, and Linux PCs), rendering efficiency (OpenGL state is intelligently cached for improved run-time performance, the scene-graph is preprocessed as appropriate, etc.), and latency control.

Most of my graphics research and development over the years has made direct use of OpenGL; however, I have had the opportunity to do some work at both higher and lower levels. A good example of the type of higher-level package I have worked with is SGI's Performer library, which I used in helping to implement the Walkthrough team's early visualization tools. On the lower-level side I have developed graphics applications and tools on UNC's PixelPlanes 5 hardware -- a flexible graphics supercomputer comprised of MIMD i860's and custom SIMD renderers and framebuffers all hanging off of a high-speed ring. Examples of code I have written for this platform include a bilinear quadrilateral renderer and a text-as-texture tool for the single-bit SIMD processors as well as an adaptive quad-tree meshing system for the MIMD processors (part of an interactive, real-time radiosity system).

While my graduate school research and consulting work has focused primarily on graphics, my dissertation work has also allowed me to obtain some valuable complementary skills. My first dissertation topic, *Wayfinding in Virtual Environments for Architectural Visualization and Navigation Training*, provided me with a firm grounding in mathematical statistics for user studies and familiarity with SAS's statistical package. My current dissertation topic (*Predictive Head Tracking Using a Body-Centric Coordinate System*) has helped me to add digital signal processing, linear system theory, Kalman Filtering, position and orientation tracking, human motion modeling, and MATLAB programming to my skill set.

REFERENCES

Professor Gary Bishop
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