Adam Seeger

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EDUCATION:

Ph.D. 2004, University of North Carolina at Chapel Hill, Department of Computer Science
Title: "Surface Reconstruction from AFM and SEM Images"
Advisor: Russell M. Taylor II
M.S. 2002, University of North Carolina at Chapel Hill, Computer Science
B.A. 1997, Harvard University, Physics

PUBLICATIONS:

Seeger, A., C. Fretzagias, R. M. Taylor II. "Software Acceleration Techniques for the Simulation of SEM Images." Scanning, 25(5): 264-273

Williams, P. A., P. S.J., M. R. Falvo, A. M. Patel, M. Sinclair, A. Seeger, A. Helser, R. M. Taylor II, S. Washburn and R. Superfine (2002). "Controlled placement of an individual carbon nanotube onto a microelectromechanical structure." Applied Physics Letters 80(14): 2574-2576.

Taylor II, R. M., T. C. Hudson, A. Seeger, H. Weber, J. Juliano and A. T. Helser (2001). "VRPN: A Device-Independent, Network-Transparent VR Peripheral System." Proceedings of ACM Symposium on Virtual Reality Software & Technology 2001, Banff Centre, Canada.

Seeger, A., S. Paulson, M. Falvo, A. Helser, R. M. Taylor, R. Superfine and S. Washburn (2001). "How does it feel to roll a molecule?" Proceedings of 45th International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication.

Seeger, A., S. Paulson, M. Falvo, A. Helser, R. M. Taylor II, R. Superfine and S. Washburn (2001). "Hands-on tools for nanotechnology." Journal of Vacuum Science & Technology B 19: 2717-2722.

Seeger, A., A. Henderson, G. L. Pelli, M. Hollins and R. M. T. II (2000). "Haptic Display of Multiple Scalar Fields on a Surface." Proceedings of Workshop on New Paradigms in Information Visualization and Manipulation, Washington, D.C., ACM Press.

Ph.Foubert, P. Vanoppen, M. Martin, T. Gensch, J. Hofkens, A. Helser, A. Seeger, R.M. Taylor, A.E. Rowan, J.M. Nolte, F.C. De Schryver. Mechanical and Optical Manipulation of Porphyrin Rings at the Submicrometer Scale. Nanotechnology, 11, 16-23 (2000)

Paulson, S., M. R. Falvo, N. Snider, A. Helser, T. Hudson, A. Seeger, R. M. Taylor, R. Superfine and S. Washburn (1999). "In Situ Resistance Measurements of Strained Carbon Nanotubes." Applied Physics Letters 75(19): 2936-2938.

Matthews, W. G., A. Negishi, A. Seeger, R. Taylor, D. M. McCarty, R. J. Samulski and R. Superfine (1999). "Elasticity and binding of adenovirus in air and in liquid." Biophysical Society 43rd annual meeting, Feb. 13-17, 1999, Baltimore, MD; Biophys. J. A27.

CONFERENCE PRESENTATIONS:

New Paradigms in Information Visualization and Manipulation Workshop, 2000
Gave talk on haptic display of multiple scalar fields
Symposium on Haptics Interfaces for Virtual Environment and Teleoperator Systems, 1997
Presented poster on model developed at UNC for simulating adhesive surfaces for haptics
Phantom Users Group Workshop, 1997
Gave talk on displaying virtual surfaces haptically over a network using the VRPN system developed at UNC

WORK EXPERIENCE:

UNC Chapel Hill Computer Science Department, Fall 1997-present

Research Assistant, Nanomanipulator project

- added features to support research including support for new instrumentation (ohmmeter, scanning electron microscope (SEM)), new interactive modes for controlling an atomic force microscope (AFM) (forcecurve, linescan), image processing and analysis (registration and image warping), visualization (displaying images as projective textures, additional haptic display capability), synchronization of control and data acquisition
- demonstrated Nanomanipulator software to visiting researchers and students
- managed software releases and organized meetings as team leader, 2000-2001

Instructor for introductory programming class, Summer 2000

- presented lectures, demonstrations; graded assignments and determined final grades; supervised lab assistants
- developed assignments (based on the Java programming language) and lecture plan

K.U. Leuven Chemistry Department, Leuven, Belgium, Summer 1999

- added new features to nanoManipulator program to support client research (included alignment of multiple datasets, new mode for controlling AFM scanning, ability to read RHK AFM data file format)

TeleType Inc., Brookline, MA, June 1996 - June 1997

Software Engineer

- implemented a PDA-based geographical information system to display global positioning system data in relation to roads and towns
- implemented software to process geographical data from various sources into a compact form for storage in a PDA

Harvard University Physics Department, Cambridge, MA, March 1995- May 1996

Undergraduate Research Assistant

- designed and implemented software to control and acquire data from a CCD camera as part of a spectrometer (included developing features for dark signal subtraction and pixel sensitivity calibration)
- created a general interface that could be adapted to many different cameras
- ported a Fortran program for calculating crystal vibration modes from UNIX to Macintosh

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SOFTWARE TOOLS EXPERIENCE:

C/C++, Pascal, Fortran, Java, MIPS assembly, NewtonScript, LISP, ML
SensAble GHOST library for Phantom force-feedback device, MS Visual Studio, OpenGL, GLUT, GLX, Tcl/Tk, fltk, Xlib, LAPACK, SparseLib, COOOL (CWP Object Oriented Optimization Library), EDAX SEM control software, Intel signal processing library, CVS (concurrent versions system), Purify, Matlab
UNIX, Windows, Macintosh

COURSE WORK:

- independent reading and research in optimization, shape from shading, computing motion information from images, SEM simulation, and other image analysis topics
- took courses at UNC and NC State on computer graphics, computer vision, statistics, and SEM operation

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PROJECTS AND FOCUS AREAS:

SEM - Monte Carlo simulation, 2001-2002

- developed software for simulating SEM images of arbitrary samples describable by a jellium model
- converted MONSEL code from Fortran to C++, optimized and parallelized it
- validated simulation results using an emulator of the Fortran random number generator and making sure the C++ code gave the same answer as the Fortran code

SEM electron beam lithography, 2000-2002

- developed an application for quickly creating prototype devices using e-beam lithography (included pattern drawing, SEM control and exposure calculations); debugged SEM scan generator using an oscilloscope

AFM/Nanomanipulator

- developed algorithm for removing noise from AFM images by identifying contradictory measurements, 2002
- developed algorithm for calibration of a combined AFM-SEM by registration of a surface model with AFM point samples and SEM images using the AFM tip to generate a set of landmarks
- implemented image registration based on maximization of mutual-information, 2001
- added network and user interface for an SEM, 1999-2000
- developed software for synchronizing measurement and control among multiple networked instruments (later used for the AFM-SEM calibration feature), 2000
- added projective texture code for displaying an SEM data overlaid on a 3D surface from an AFM image, 1999
- implemented landmark-based image registration, 1999
- implemented feature to scan an arbitrary line under interactive control, 1999
- learned to use Explorer and Discoverer AFMs, prepare AFM samples and mount tips
- implemented feature to allow user to position an AFM tip interactively for acquiring force curve measurements on adeno viruses, 1998-1999
- added interface to an ohmmeter; translated French source code for a windows program from the manufacturer into a more general purpose driver; implemented user interface, and network interface; created test hardware, 1997-1999

shape from shading, 1998-1999

- developed program to compute the shape of a surface from SEM images using a scale-space tracking method and optimization using a combination of conjugate gradient descent and a genetic algorithm

haptics, 1997-1999

- implemented force and surface intermediate representations and interpolation algorithms for controlling force feedback over a network
- developed algorithms and software to implement dynamically textured surfaces
- developed application for psychophysical experiments

computing a BRDF from an AFM image, 1999

- developed algorithm and software to compute an approximate bidirectional reflectance distribution function (BRDF) for light scattering off of a conducting surface using scalar diffraction theory, acquired AFM images of a compact disk and a brushed metal sample and generated simulated images of both

other:

- Penrose Tiles - developed algorithm and software for mapping an arbitrary point to the tile that contains that point to enable rendering a picture of a tiled surface using RenderMan, 1999
- Lightning Tracker - implemented system for computing the location of lightning using multiple microphones to record and cross-correlate the thunder, 1999
- Virtual Venus Flytrap - created program to generate animated leaves using an L-system and provided a haptic/graphic interface to the resulting model, 1998
- Rigid body simulation - created display program, simulation and collision detection code, 1996
- Genetic Algorithm/Design Gallery application for designing faces, 1996
- Handwritten character recognition using a neural network; implemented back-propagation and a simulation method for generating a training set, 1994