# Computer & Information Science & Engineering



# Engineering

# CISE Workshop for Young Women: Attracting Women to Computer Science & Engineering

The number of women pursuing undergraduate or graduate-level degrees in Computer Science or Computer Engineering has significantly declined over the past several years, and unfortunately, this trend is expected to continue. While the number of incoming college students who plan to major in CSE is about 70% lower than it was in the early 1980s, for women the decrease is even more dramatic: 93% lower! In fact, the overall ratio of women to men in computer science disciplines is the lowest it has been since the 1970s.

What can be done to reverse this trend? CISE created and hosted its second summer workshop to attract young women to the discipline, to teach them about the many current career opportunities, and to provide insight into its very bright future prospects.

The workshop strives to dispel social misconceptions regarding the competence of women in the fields of science and technology and to enlighten young women to the compelling need for their presence, ideas, influence, and perspectives within the computer science and engineering industry. It provides an understanding of the need and the importance of innovation through technology, and challenges participants to become the innovators of their generation.

Organized and managed by CISE Lecturer Rory DeSimone, the workshop offers handson classes, lectures, presentations, small group activities, lab challenges, and field trips. Also included are "cool" projects, competitions, games, speakers, food, and fun. Much emphasis is placed on introducing participants to positive female role models both in industry and in academia. Speakers have included Assoc. Dean Cammy Abernathy of UF's College of Engineering, Dr. Kendall Martin of Montgomery College, D'Arcy Truluck of Barr Engineering, Julia Schuneman of IBM, Kristy Rivero of Lockheed–Martin, and Janice Hill of NASA.

The forty young women attending the 2005 Workshop participated in building and programming robots, writing programs in Alice (an object-oriented language), designing web site pages, performing Internet scavenger hunts, interacting with virtual reality programs, and



# A Letter from Sartaj Sahni, CISE Chair

### Greetings!

The 2005-2006 academic year is now well underway and I would like to welcome our new and returning students, faculty and staff.

When the CSE building opened its doors in 1987, few imagined the growth the Department would experience over the coming years. Today, the CSE building houses the activities of more than 1,000 CISE faculty, staff and students. Expansion of the Department's research and graduate programs, in particular, has necessitated several changes. Recent months have seen a number of labs and student work areas renovated, the Tutoring Center and Association for Computer Machinery (ACM) student chapter offices have been relocated to newly acquired space in the building, and fifty semi-private student cubicles and five discussion areas have been constructed. More changes are forthcoming that will further our effort to provide an invigorating work environment for all.

The past several months have been highlighted by the award-winning achievements of many of our faculty. CISE students continue to excel in their professional and academic activities as well, and as always, I want to encourage them to take advantage of the opportunities and experiences available to them this academic year. These include those afforded by the ACM student chapter and the Association for Digital Arts and Media (ADAM), the Barr Systems Distinguished Lecture Series as well as other talks, presentations, and research group meetings, and the advising, tutoring, and mentoring services provided by the Department.

This newsletter features an article by Mahesh Sreenivas, a Gator alumnus employed by Microsoft Corporation in Redmond, Wash. CISE graduates continue to be employed by major corporations worldwide, and we welcome the opportunity to hear from other alumni in future editions. If you are interested in contributing



an article related to Gator alumni at your workplace, please contact newsletter@cise. ufl.edu.

CISE Alumni now have their very own website: www.cise.ufl.edu/alumni. Launched last spring, the site supports networking with other alumni and the Department. It also gives our current students an opportunity to communicate with alumni now working in the industry or elsewhere. Please note: If you graduated between 1999 and 2002, we need your help in completing a survey on ABET (Accrediting Board for Engineering and Technology) objectives available on the website. Such feedback is necessary for our accreditation effort next spring.

Finally, on behalf of the Department, I want to sincerely thank all of our generous supporters. I also want to encourage anyone considering a donation to the Department to look into gift matching opportunities availiable through his or her employer. Many companies match donations to universities, and it is a great way to increase the value of your contribution. More information on corporate gift matching can be found through your human resources department or at the University of Florida Foundation Web site: www.uff.ufl.edu.

# CISE Faculty member Receives Distinguished Faculty Award

The CISE

Department would like to congratulate Professor Gerhard Ritter, who has been selected as a Florida Blue Key Distinguished Faculty Award recipient. The award is given to faculty who excel



in teaching, research and publication. The Distinguished Faculty Award Winners were honored at the Florida Blue Key Celebration on Wednesday, Sept. 28. Dr. Ritter was also spotlighted at UF's Homecoming Parade on Friday, Oct. 7.

Prof. Ritter, who served as CISE Chair from 1994-2001, has been a professor at the University for 34 years. He came to the University after receiving his Ph.D. from the University of Wisconsin-Madison in 1971. His research interests span the areas of computer vision, artificial neural networks, applied mathematics, and topology.

Prof. Ritter's other awards include the General Ronald W. Yates Award for Excellence in Technology Transfer, AFL in 1998 and the Silver Core Award, International Federation for Information Processing in 1989.

# Attracting Women to Computer & Information Science & Engineering continued from pg. 1

taking a customized behind-the-scenes tour of Disney Quest in Orlando.

Thanks to CISE Professors Helal, Lok, and Peters, the students were also able to observe several research projects in action: DIANA (the Digital Animated Avatar project), which aims to train physicians in improved bedside manner using virtual reality; SurfLab, focusing on the efficient and exact use of computer geometry; and the Gator Tech Smart House, a high-tech house used as a laboratory to design ways to assist older persons in maximizing their independence and maintaining a high quality of life.

CISE expresses its sincere thanks to Lockheed-Martin (Susan Chong), Progress Energy (Martha Barnwell), and Disney (Mike Scott) for their generous donations and support of the workshop. Thanks, too, to Assoc. Dean Jonathan Earle (UF College of Engineering), and all the presenters, students, and staff who participated in this important project. For more information regarding the CISE Workshop for Young Women, see our Web site at: www.cise.ufl.edu/~rjd/ workshop.html or contact Rory J. De Simone at rjd@cise.ufl.edu

# **Barr Systems Distinguished Lecture Series**

The Barr Systems Distinguished Lecture Series, begun in Fall 1994, was designed to appeal to both a lay audience and those who work in the same sub-fields as the speakers. The series is sponsored by Tony Barr, President of Barr Systems, Inc. of Gainesville. Mr. Barr came to appreciate the importance of being exposed to the ideas of prominent technical leaders as a graduate student at North Carolina State University, and hoped that sponsoring the series would serve the UF and Gainesville community similarly.

Since its inception, four to five well known experts in different areas of computer science have been invited to Gainesville annually. The speakers address an audience of students, faculty and the general public, who then have the opportunity to interact with the lecturers. Most are invited to Gainesville for two days and are involved in one-on-one meetings

# Association for Computer Machinery (ACM) Student Chapter

The UF ACM Student Chapter kicked off its 21st year at the University of Florida on Sept. 8 with its annual elections. New officers for 2005-2006 are Patrick Wheeler, President; Scott Slomback, Vice President; Timothy Smith, Treasurer; and Mathew Andrews, Secretary.

Every fall and spring the chapter hosts information sessions with the CISE Industrial Advisory Board to give students an opportunity to interact with technical representatives of several corporations. In the fall, the chapter's programming team, sponsored by Harris Corporation, participates in the International Collegiate Programming Contest. In the spring, the chapter hosts the High School Programming Competition, sponsored by Lockheed-Martin.

The Chapter holds bimonthly meetings and hosts special speakers throughout the academic year. In September, for example, the Chapter hosted Tom Carbone, Technical Director of the Florida Interactive Entertainment Academy at the University of Central Florida and one of the lead programmers on Madden NFL 2005 and 2006. with faculty members and students. Thanks to the annual sponsorship by Barr Systems, an honorarium is provided to each speaker, and one is given a reception on the Barr Systems campus.

Topics of the lectures have included back of the envelope calculations of the computational capacity of the universe, understanding the graphical structure of the Internet, dissolving the distinction between compiled and scripting languages, scale invariant neuronal dynamics, using vision as a tool to help neurosurgery, and studying the effectiveness of virtual environments.

# The 2005-2006 Barr Systems speakers are:

• Harmut Prautzsch

University of Karlsruhe Local corner cutting October 28, 2005

# Association of Digital Arts and Media (ADAM)

From freshman to senior, if you are an engineering or art major interested in the digital arts, then the Association of Digital Art and Media (ADAM) has something to offer. ADAM seeks to engage students in the development and understanding of today's digital culture, as well as share tricks of the trade in media production.

During the 2004-2005 academic year, ADAM hosted lectures by CISE faculty members Paul Fishwick, Ben Lok, and Kristian Damkjer on System Simulation, Virtual Environment Design, and 3-D Modeling with Maya. ADAM also hosted tutorials designed and taught by student members.

ADAM has a newly elected set of officers, with Bobby Bruckart as President and Webmaster, Chris Baker as Vice President, Dianne Austria as Treasurer, and Allison Corey as Publicity Director.

With its acceptance into the Benton Engineering Council, ADAM now has a budget that helps support planned activities throughout the year. This includes hosting speakers with expertise in specific areas of the digital world, including digital music production, website development, and visual programming.

For more information about ADAM, visit Web site at www.cise.ufl.edu/adam.

### • Shi-Kuo Chang

University of Pittsburgh A Chronobot for Time and Knowledge Exchange and Management November 10, 2005

### Jack Dongarra

University of Tennessee An Overview of High Performance Computing and Self Adapting Numerical Software January 24, 2006

### Jerry Prince

Johns Hopkins University Tracking three-dimensional motion in the heart using zHARP February 24, 2006

# **Student News**

Congratulations to the undergraduate recipients of the Lockheed Martin and Boeing scholarships:

### **Lockheed Martin**

Matthew Andrews Stephen Cano Vincent Galluzzo Weston Hutchins Natan Milgram David Nash Michael Seifert Oliver Stamkov Lauren Stana

### Boeing

Jason Blackerby Lauren Caulfield Alicia Cosenza Malachi Jones

# Research

# **Modeling and Computing with Geometry**

By Jorg Peters

Large rendering farms were the crucial ingredient for blockbuster animations such as Toy Story, Ants and Monster Inc.: layer upon layer of sophisticated filters, called Shaders, modify a given raw 3D scene to turn it into an artist's vision.

The recent rapid advance of graphics processing units (GPUs) brings Shaders and increased levels of realism to the commodity PC, with real-time execution to support high quality graphics for serious simulation and gaming. One challenge for graphics research is that massive GPU performance, that has already in some measures overtaken CPU performance, is based on parallel stream processing where memory conflicts are avoided by restrictive memory access. This makes it tricky to map complex representations, such as high-quality surfaces, to the GPU Shaders.

Since such surfaces are generated from a much sparser description, via recursion, it is very desirable to map them to the GPU to avoid the bus bottleneck from main memory to the GPU.

In a recent Siggraph paper, SurfLab researchers showed a general way to bring high-quality surfaces to the GPU, with real-time performance.

This work is complemented by an earlier Eurographics paper that was first to give tight and correct bounding boxes for such high-quality recursive subdivision surfaces. Bounding volumes (that are simpler than the object itself) are crucial for physical modeling, for example collision modeling between objects, and adaptive evaluation and rendering.

In particular, SurfLab distributes a patch to the popular ray-tracing engine pov-ray, that allows efficient rendering of recursive subdivision surfaces.

For more algorithmic and fundamental theoretical results on Subdivision Surfaces, please visit http://www.cise.ufl.edu/ research/SurfLab/papers/index.html.

SurfLab investigates efficient and exact computer geometry. Subdivision Surfaces are just one of several representations in which SurfLab has unique expertise and world-class reputation.

Surface splines were developed as part of an ongoing effort to find least-degree piecewise polynomial constructions that smoothly blend primary surfaces defined by functional constraints. The general challenge is to fill a multi-sided hole



King

Models

Deer







-0.1% e=0.1% (surface)



Cat adaptive



pig



resulting from pairwise joining pairs of primary surfaces. A solution must (i) match data, (ii) provide guaranteed smoothness, say continuity of K derivatives after regular local reparametrization (tangent continuity for K=1, curvature continuity for K=2) and (iii) avoid shape artifacts. In addition, one would like to minimize the polynomial degree to facilitate further processing.

Constructively, by giving an algorithm, we determined a least upper bound on the degree for given continuity, which allows us to gauge the trade-off when using higherdegree for higher-quality surfaces.

At the applied end, we developed, with ATi, a leading supplier of graphics cards, N-patches that are part of Microsoft's DX8 graphics standard. N-patches automatically improve the appearance of characters and models in video games.

SurfLab is collaborating with CISE's Frontier Group to advance techniques for finding solutions to Geometric Constraint Solving (see earlier article Sitharam), with Mechanical & Aerospace Engineering to leverage near-optimal efficient conservative response surface surrogates for structural design, and with the Department of Surgery to provide haptic (force feedback) interfaces for surgery training.

# Research

# **Medical Imaging**

By Anand Rangarajan

One of the central problems in computer vision and image analysis is the fundamental difficulty of automatically determining corresponding locations or counterparts in different 2-D or 3-D imagery. For example, given a database of 2-D grayscale face images which in addition to personal identity may also differ considerably along the dimensions of illumination, camera parameters, reflectance etc., it is often necessary to automatically register the different images such that perceptually meaningful features (eyes, nose etc.) align. This registration step precedes recognition or indexing.

Two dominant approaches exist in the literature for solving this problem. The first approach extracts meaningful features from the images and converts the problem of registering images to one of registering sparse features. The second approach completely eschews feature extraction and instead directly matches the intensity profiles using an illumination invariant information-theoretic measure. In both approaches, an optimization strategy is used to obtain diffeomorphisms - spatial mappings that do not fold - between source and target when performing pairwise registration and between all sources and the atlas - an "average image" - when performing groupwise registration.

The Center for Computer Vision, Graphics and Medical Imaging (CVGMI, Prof. Baba Vemuri, Director) is very active in this sub-field of image analysis. Prof. Rangarajan's recent work focuses on new information-theoretic measures for groupwise registration, new measure theoretic distance measures (collaboration with Prof. Arunava Banerjee), and diffeomorphic matching and atlas creation of hippocampal datasets (collaboration with Prof. Baba Vemuri). The dominant theme underlying all of this recent work is to determine perceptually meaningful correspondences in a set of images by designing image similarity measures that are relatively insensitive to illumination differences. Pairwise and groupwise featureand intensity-based non-rigid registration algorithms have been developed and tested on different imaging modalities.

Left: Face image 1 (Yale 10). Middle: Face image 2 (Yale 7). Right: Left face image automatically warped onto middle face image. In the process of image registration, the left face image gets transformed to look a lot more like the middle face image. Note that the illumination structure of face 1 (but not necessarily the identity of the person) is preserved during the matching process. Yale 10 and Yale 7 Images courtesy of the Yale Face Database.



# **Aesthetic Computing In the Classroom**

Today's teachers are frequently faced with the challenge of reaching students that have little interest in learning. Teaching mathematics is particularly difficult as students often feel the subject is difficult, abstract, and boring.

Prof. Paul Fishwick is working to change these perceptions through the introduction of aesthetic computing in the classroom. Aesthetic computing is the use of artistic design to create algorithms, programs and mathematical models. Prof. Fishwick has spent more than ten years developing his ideas and teaches courses on the subject in the CISE Department.

A National Science Foundation (NSF) grant prompted Prof. Fishwick to introduce the concept to younger students. With the help of secondary school teachers Katie Indarawis and Jodee Rose, he developed a curriculum directed at middle and high school students. The curriculum was presented on Sept. 21 at the event University of Florida: Aesthetic Computing Workshop for Mathematics Teachers, was co-sponsored by CISE, Center for Precollegiate Education and Training (CPET), and the Woodrow Wilson Foundation.

The workshop was designed to teach specific methods for improving student motivation to study algebra and provide students with an opportunity to experience mathematics as an exciting and worthwhile field. It was attended by area middle and high school teachers, many of whom were eager to try the new concepts with their students. Teachers learned how to present mathematical concepts in a more exciting way expressing an abstract idea through drawings, sculptures, and computer graphics.

Prof. Fishwick believes that the use of aesthetic computing in the classroom will result in students learning algebraic operations more effectively, and improve students' overall learning experience.



Representation of the Spiral of Cornu Equation. By Micah Branum.

# Congratulations

### GRANTS

- Shigang Chen, Assistant Professor, awarded an unrestricted \$91,000 career grant entitled "A Global Overlay Service for Distributed Denial-Of-Service Attacks" by Achiema Systems Inc.
- Timothy Davis, Associate Professor, awarded an unrestricted \$15,000 grant entitled "Sparse Matrix Methods for Circuit Simulation" by Berkeley Design Automation.

Alin Dobra, Assistant Professor, awarded a one-year \$65,866 grant entitled "New Technologies for Approximate Query Processing" by the National Science Foundation.

Paul Fishwick, Professor, awarded two "Research Experiences for Teachers (RET) Awards" totaling \$19,406 to support using aesthetic computing as a way to motivate students to learn algebra in middle and high school by the National Science Foundation.

### Paul Gader, Professor

- Awarded a \$452,462 grant entitled "Feature-Based Methods for Landmine Detection with Group Penetrating Radar" by the Army Research Office.
- Awarded an additional \$200,414 grant entitled "Software Analysis/Algorithm Development for GSTAMIDS Mine Detection Systems (IDIQ)" by the United States Army.
- Awarded an additional \$125,242 grant entitled "Land Mine Detection Based on Spectral Signatures" by the United States Army.
- Richard Newman, Assistant Professor, awarded a \$15,000 grant entitled "Wireless Honeypots" by Raytheon Company.
- Jorg Peters, Professor, awarded two grants totaling \$18,000 entitled "High Quality Spline and Subdivision Surfaces" and "Tight Feasibility Constraints in Engineering Design" by the National Science Foundation.
- Anand Rangarajan, Associate Professor, awarded an additional \$72,705 grant entitled "Relational Shape Matching for Registration and Recognition" by the National Science Foundation.

### Gerhard Ritter, Professor

- Awarded a one-year \$148,818 grant entitled "Instrumentation for ATR and Image/Signal Processing Research and Education Laboratory" by the United States Air Force.
- Awarded a nine-month \$24,943 grant entitled "Foundations of Hexagonal Array Processing" by Pyxis Innovation.
- Stanley Su, Distinguished Professor, awarded an additional \$207,113 grant entitled "Digital Government: Transnational Digital Government" by the National Science Foundation.

Baba Vemuri, Associate Professor, awarded a four-year \$1,301,491 grant entitled "Hippocampal Shape Recovery & Analysis in Epileptics" by the National Institutes of Health.

Joseph Wilson, Assistant Professor

- Awarded a one-year \$80,000 grant entitled "Software Algorithm Improvements for Hand Held Land Mine Detection" by the Army Research Office.
- Awarded a \$25,000 grant entitled "Humanitarian Demining Algorithm Improvement" by the United States Army.

### **AWARDS**

- Joachim Hammer, Associate Professor, received the 2005 SIGMOD Test of Time Award for his paper entitled "View Maintenance in a Warehousing Environment" (co-authored with Yue Zhuge, Hector Garcia-Molina, and Jennifer Widom) that appeared in the 1995 SIGMOD Proceedings. This award recognizes the paper from the SIGMOD Proceedings 10 years prior that has had the most impact over the intervening decade.
- Prabhat Mishra, Assistant Professor, received the Outstanding Dissertation Award from the European Design Automation Association in March 2005 for his thesis entitled "Specific-driven Validation of Programmable Embedded Systems."
- **Baba Vemuri**, Professor, received a best poster award at the 19th International Conference on Information Processing in Medical Imaging held in Glenwood Springs, Colo. in July 2005.

## **BOOKS AND EDITORSHIPS**

- Timothy Davis, Associate Professor, appointed Associate Editor of the IEEE journal *Transactions on Parallel and Distributed Systems*.
- Jorg Peters, Associate Professor, appointed Associate Editor of the journal *Applied Numerical Mathematics*.
- **Gerhard Ritter**, Professor, appointed Editor-in-Chief of the journal *Research on Computing Science*.
- Markus Schneider, Assistant Professor, *Moving Objects Databases*, published by Morgan-Kaufman, August 2005.

### **KEYNOTE ADDRESSES:**

- Paul Fishwick, Professor, gave a keynote address on "New Directions in Modeling and Simulation" at the Asia Simulation Conference 2005: Sixth International Conference on System Simulation and Scientific Computing in Beijing, China in Oct. 2005.
- Gerald Ritter, Professor, gave a keynote address at the XIV Congresso Internacional de Computacion at the National Polytechnic Institute of Mexico in Mexico City, Mexico in Sept. 2005.
- **Beverly Sanders**, Associate Professor, gave a keynote address on "Design Patterns for Parallel Programming" at the Southern Appalachian Symposium for Programming Languages and Systems (SASPLAS), East Tennessee State University, in Oct. 2005.
- Baba Vemuri, Professor, gave a keynote address on "Variational Principles for Diffusion Weighted MRI Restoration and Segmentation" at the Canadian Conference on Computers and Robot Vision in Victoria, Canada in May 2005.

# Gators at Microsoft

By Mahesh Sreenivas Software Development Engineer, Microsoft Corporation, Redmond, WA 98052 Mahesh.Sreenivas@microsoft.com

Microsoft started 30 years ago and employs more than 60,000 people worldwide today. The Gator community at Microsoft is fairly small. We have roughly 100 employees who graduated from the University of Florida working in technical and non-technical positions across the company. Over the past few years we have hired about 15 full-time employees and 10 interns from UF.

At Microsoft we focus on building great products, products that empower people and businesses to revolutionize the way they do things. Our product development is also backed up by strong research. Today, the world-renowned scientists of Microsoft Research make up one of the largest, fastest growing and most highly respected software research organizations in the world. In addition to conducting open research in the traditional academic model, its charter also includes processes for transferring technology to product development teams. On the product development side, Microsoft primarily offers three distinct career tracks-Program Management, Software Development in Test, and Software Development.

Program Managers drive the technical vision, design, and implementation of next-generation software solutions; help define strategy and features for all aspects of a product, from systems architecture to user experience; and work with other team members to translate ideas into shipping features.

A Software Design Engineer in Test is a developer who designs, develops, and maintains automated testing systems. Often times these are expandable suites containing multiple automation programs to be used by the development and test teams. They are responsible for utilizing innovative test technologies to develop a product's testing strategy, and for facilitating the creation and execution of automated test suites across a diverse set of technologies.

Software Design Engineers build products from the ground up; write code that turns concepts into new technologies and next-generation services. They work with Program Managers to define and prioritize features. They also closely work with their test counterparts to ensure product quality, evaluate functionality, identify problem areas, create test cases, and investigate bugs.

At Microsoft we are constantly on the lookout for hiring the best talent. Although we are a big company, we do work in small teams. And, there are great opportunities for career growth. As an employee you get to work on technologies that will impact the lives of millions of people in a positive way and help companies change the way they do business today and into the future. If I could send one message across to the students, it would be to please work hard and to the best of your ability, learn as much as possible while

you are at school, and stay ahead of the competition. Should you have any questions you may reach our campus-recruiting representatives for University of Florida at gatorez@microsoft.com.

It is very exciting to see the steps has been taking to position itself among the best in the nation. For our part, we, the Gators at Microsoft, strive hard to build a great reputation for the University. The opportunities are endless and together we can build a stronger relationship. Go Gators!

### **About the Author**

Mahesh Sreenivas graduated from the University of Florida with a Master's degree in Computer Science in December 1998. Microsoft Corporation hired him through its campus-recruiting channel. Since joining Microsoft, he has been a member of the SQL Server product development team. Sreenivas' primary areas of interest are databases, data structures and algorithms.



# **Tiffany Noble, Grants Specialist**

Tiffany Noble has been with CISE as a Grants Specialist since 2003. She assists CISE faculty members with grant proposals in a department with more than \$4 million in annual research expenditures.

Noble is a Gainesville native and has worked for the University of Florida since 1998, when she left the Alachua County Courthouse, Criminal Division. She has held positions in several departments at UF, including Vouchers and Data Control, Payroll Services, and the Institute of Food and Agricultural Science.

When Noble came to CISE she had little experience as a Grants Specialist however, she quickly proved she is able and is willing to do whatever is needed to get the job done. Her cooperative and pleasant attitude is important and appreciated in meeting her responsibilities, maintaining communication with other departments, and meeting last minute deadlines.

The CISE Department is happy to have her on its team!





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