



Dear Friends,

A new academic year is well underway here at UNC, bringing with it all the usual new beginnings, for our faculty, students and staff. After a particularly hot summer, most of us are thankful for the crisp fall air that has finally settled in Chapel Hill.

Many of you may have heard about the doctoral program rankings released early this fall by the National Research Council. Our Ph.D. program ranked well in the NRC assessment, with a strong showing in both overall rankings and in the more specific area of research activity. To see how our program compares to our peers based on key characteristics, PhDs.org has created a useful page at: *http://graduate-school.phds.org/rankings/computer-science*.

We were glad to see so many of you at the retirement reception for Steve Weiss back in May. To those of you who were able to attend, you made the occasion that much more memorable.

We are proud to have so many faculty members receive awards this year. Congratulations to Fred Brooks, Ming Lin, David Plaisted and Steve Pizer on their respective honors, which you can read more about on pages 3-4.

Congratulations also to Rahul Narain, this year's alumni fellowship winner. You can read about his dissertation research on page 7. Thanks to those of you who donate to support the alumni fellowship - it really makes a huge difference for the students who receive it. If you have never donated, please consider doing so, whether to the alumni fellowship or in another way that speaks to you. All donations to the department are very much appreciated!

Please stop by and say hi when you are in the area. We look forward to seeing you all!

Carelmo Josha

BUILDING ROME ON A CLOUDLESS DAY

Who says Rome wasn't built in a day? Researchers in the computer vision group, led by Jan-Michael Frahm, research assistant professor in the department of computer science at UNC, are showing that Rome, Berlin and other major cities can, indeed, be "built" in a day, on a single PC. Their technique uses the millions of images available for each major city on earth through Internet photo sharing sites like Flickr® to automatically create 3D models of landmarks and geographical locations. The models could be embedded into applications such as Google Earth or Bing Maps, allowing users to explore the cities of the world from the comfort of their homes.

The method is the first to deal with the true scale of Internet photo collections. The system used the three million images available for Rome and commodity graphics hardware to reconstruct all major landmarks of the city in less than 24 hours on a single PC, a method known as "cloudless." Researchers also reconstructed the landmarks of Berlin in the same manner. This is an improvement of more than a factor of one thousand over commercial systems available today, like Microsoft PhotoSynth, and alternative techniques published in the research literature, which allows for the true utilization of the millions of images that are uploaded to the Internet every day.

The advantage of using Internet photo collections, rather than video of a landmark, to create the 3D models is that the photo collections show the landmark at continued on page 2

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different times, under different lighting and weather conditions. The variety of photos can in the future be used to create a richer experience for the user viewing the 3D model.

If video is available, however, the technology can utilize it as well, and using video shortens the processing time needed for reconstruction of the models. This would be important if the technology was used, for example, as a building block for disaster response software. If an aircraft could be sent to take video of the aftermath of a hurricane, then the resulting 3D model could be used to assess damage from a remote location, saving both time and money.

The technology may also one day be used to create a synthetic copy of the real world that could allow users to virtually visit nearly anywhere. You might be able to watch a Tar Heel basketball game from any perspective, whether courtside or higher up, as it's happening, from models created using cell phone video. Or you might take a picture with your cell phone of a monument that would not only give you information about that monument, identifying it from the image, but could also tell you your location more precisely than even GPS.

Frahm collaborated with **Marc Pollefeys**, professor of computer science at ETH-Zurich and adjunct professor at UNC, and **Svetlana Lazebnik**, assistant professor of computer science at UNC, on this project. A paper with the title "Building Rome on a Cloudless Day" presenting the research was recently presented at the 11th European Conference on Computer Vision (for more details please see *www.cs.unc.edu/~jmf/rome_on_a_cloudless_day*).



UNC LAUNCHES 5-YEAR BS-MS COMPUTER SCIENCE PROGRAM

UNC's Department of Computer Science has launched a combined Bachelor's-Master's degree program, which will enable students to complete the requirements for both degrees in as little as five years.

While the requirements for both degrees remain the same, the program will significantly simplify and expedite the admissions process for current B.S. students into the M.S. program. Students will typically apply for the program in the spring of their junior year. The program is designed to attract students who intend to go into the information technology industry and need the in-depth knowledge that a master's degree can provide, according to Ming Lin, John R. and Louise S. Parker Distinguished Professor of Computer Science, who is one of the driving forces behind the program.

"With this dual-degree program, students can chart a faster, simpler path to pursue these opportunities," Lin said. Currently, the vast majority of students seeking advanced degrees in computer science at UNC are international students, while not as many domestic students are choosing that path. Lin said one goal of the program is to draw greater numbers of capable domestic students into the ever-expanding field, though not at the expense of squeezing out talented international students.

Students from other countries will continue to be recruited aggressively continued on page 4

PIZER NAMED MICCAI FELLOW



Stephen Pizer was recognized by an international computing organization for his contributions to the field of medical image computing.

Pizer, Kenan Professor of Computer Science and Adjunct Professor in the departments of Radiation Oncology, Biomedical Engineering and Radiology, has been named a Fellow of the Medical Image Computing and Computer-Assisted In-

tervention (MICCAI) Society. MICCAI is the premier society in the field of medical image computing.

Medical image computing involves extracting and presenting information from medical images, to be used, for example, in radiation treatment planning and minimally invasive surgical procedures. Pizer is a pioneer in the field, having written the first dissertation on medical image computing in 1967. His research led the way for international standards on electronic display of medical images and the routine clinical use of 3D display of medical images. In addition, Pizer invented methods of improving contrast in medical images that are now standard in clinical software and methods of extracting objects from CT that have led to a successful clinical product to help plan radiotherapy of prostate cancer. Pizer, who joined the UNC faculty in 1967, is most proud of his contributions to the field through the advising of Ph.D. students. He has lead-advised 44 students who successfully defended their dissertations, and he continues to advise students today.

Among his other accomplishments, Pizer is one of the founding members of the MICCAI Society. He has authored or co-authored 287 papers and book chapters throughout his career, authored two textbooks on numerical computing, and co-authored, with Kaleem Siddiqi, the only book on the widely used medial representation of objects. He also founded the Medical Image Display and Analysis Group (MIDAG) at UNC.

Pizer is the second UNC faculty member to be named a Fellow of the MICCAI Society. Guido Gerig, Professor in the School of Computing at the University of Utah, who is currently Adjunct Professor in the Department of Computer Science at UNC, was named a fellow in 2009. Gerig held a joint professorship in the Departments of Computer Science and Psychiatry at UNC until 2008.

MICCAI named 3 new fellows in 2010. The fellows were chosen from among senior MICCAI members, in recognition of substantial scientific contributions to the MIC-CAI research field and service to the MICCAI community. They were announced on September 24 at the 2010 MIC-CAI Society conference in Beijing.

PLAISTED RECOGNIZED FOR WORK IN THEOREM PROVING

David Plaisted was recognized by an international organization for his contributions to automated reasoning in the field of computer science.

Plaisted, Professor of Computer Science, received the 2010 Herbrand Award, given by the trustees of the International Conference on Automated Deduction (CADE) in a ceremony on July 19, 2010, in Edinburgh, Scotland. CADE is the major international forum at which research on all aspects of automated deduction is presented.

Plaisted was honored in recognition of his numerous seminal contributions to several areas of automated reasoning, including first-order theorem proving, term rewriting, completion, orderings, inductive reasoning, and pioneering research on abstraction, instance-based methods and search complexity in theorem proving.

Established in 1992, the Herbrand Award honors an individual or group of individuals for exceptional contributions to the field of Automated Deduction. The award is given once a year and is the highest award in the field of theorem proving. Plaisted, who joined the department in 1984, earned a bachelor's degree in mathematics from the University of Chicago in 1970 and a Ph.D. in computer science from Stanford University in 1976.



President of CADE, Maria Paola Bonacina, presents David Plaisted with the Herbrand Award.

BROOKS AND LIN HONORED FOR WORK IN VIRTUAL REALITY

Fred Brooks and **Ming Lin** won awards for their virtual reality research at the IEEE Virtual Reality conference, held 20-24 March 2010 in Waltham, Mass.

Brooks, Kenan Professor of Computer Science, received the 2010 Virtual Reality Career Award. The award honors his lifetime contributions to virtual reality research and practice.

Lin, John R. and Louise S. Parker Distinguished Professor of Computer Science, received the 2010 Virtual Reality Technical Achievement Award. The award recognizes seminal technical achievements in virtual and augmented reality.

For more than 30 years, Brooks has led a laboratory that fosters scientific and technical advances in virtual reality, providing effective solutions to real user problems. His work in molecular modeling and docking applications led to many innovations in 3D interaction, especially in developing and using haptic feedback. His recent research has contributed to the understanding of design tradeoffs in immersive virtual reality systems that affect the quality of the user's experience.

His team's research at Carolina has been in interactive computer graphics: molecular graphics, 1965-1999; scientific visualization and manipulation, 1965-present; and virtual environments, 1970-present in collaboration with **Henry Fuchs**, **Dinesh Mano**-

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because of the intense competition for the best students among other top computer science programs in the country.

But the University's primary charge, as the first public university in the

cha, and Mary C. Whitton. The team has done extensive study of both active and passive haptic displays. They developed the quite compelling "Pit" demo; and for some years have used it to study quantitatively the relative effectiveness of various illusion factors on presence measures. (For example, latency matters a lot; photorealism very little.) Driving applications have been design of structures and submarines, scientific visualization, military training, and rehabilitation of patients with asymmetric gaits.

Lin has been working on physics-based interaction and geometric modeling for virtual reality, computer graphics, haptics, sound rendering and robotics for more than 20 years. She is a leader and innovator in the virtual reality research community who has led the development of over a dozen software systems in these areas and made them available for public download over the web. These software systems have more 100,000 downloads worldwide and have been widely adopted in commercial CAD/CAM, VR, robotics and computer gaming systems.

Inspired by early research on applications of force feedback to scientific exploration at UNC, Lin and her students have developed haptic software technologies, including perceptuallymotivated, real-time algorithms for haptic rendering and touch-enabled 3D modeling and painting systems. More recently, Lin and collaborators have been developing new techniques for interactive sound synthesis and



propagation for computer gaming and VR applications. Her research group is also enhancing the realism of virtual cityscapes by incorporating interactive, large-scale crowd and traffic simulation. In addition, she is amongst the first few researchers to design parallel algorithms for physically-based simulation that exploit commodity multi-/many-core CPUs and GPUs for interactive applications.

The IEEE VGTC Virtual Reality Career and Virtual Reality Technical Achievement awards were established in 2005. IEEE Computer Society is the world's leading organization of computing professionals.

country, has been to serve North Carolina by educating its sons and daughters. And too many of them are simply not taking advantage of the advanced education in computer science that Carolina offers, Lin said.

"I am hopeful that with time it will

begin to entice more domestic students to sharpen their talents in computing to meet the needs of the growing IT industry in the United States that now serves our society is so many different ways," she said.

CHANGING THE WAY WE FLY - DANETTE ALLEN (Ph.D. 2007)

The Space Shuttle Challenger tragedy in 1986 spurred Danette Allen's interest in working for the National Aeronautics and Space Administration (NASA). In 1991, she joined NASA's Langley Research Center in Hampton, Va., where she became a member of the team that put the first civilian laser in space as primary payload (LITE) on shuttle mission STS-64. For this, she was awarded NASA's Silver Snoopy award for outstanding achievements related to human flight safety or mission success. She's been at NASA ever since, and her transition from engineering spaceflight systems to research culminated with the completion of her Ph.D. in computer science at UNC in 2007. Today, Allen is research team lead for Air Traffic Management Concepts and Operations, working on the NextGen AirSpace Program.

NextGen is an effort by the Federal Aviation Administration (FAA) to address the impact of air traffic growth by transforming the National Airspace System (NAS) in the United States. The goal of NextGen is to increase the safety, efficiency and dependability of air travel through greater automation of air traffic management.

Currently, air traffic management is human-centric with a great deal of voice communication between air traffic controllers and pilots. Information comes to the air traffic controller, and the controller makes decisions from the ground, relaying the information to the pilots. With NextGen, pilots would be brought more into the decision-making loop, through the use of Automatic Dependent Surveillance-Broadcast (ADS-B) technology, flight-deck decision support tools and trajectory-based operations.

ADS-B technology allows aircraft to communicate via satellite directly with each other in addition to the ground, providing both pilots and air traffic controllers with more accurate information about the locations and trajectories of aircraft. This will make for even safer flights, and will enable more direct and closely spaced flight paths and runways, saving time, money and fuel, cutting carbon emissions and reducing congestion both at airports and in the air.

"It's very important to feel like the work that I'm doing is contributing to society in a positive way," Allen says. "NextGen will modernize the NAS by 2025, an improvement that we will see and benefit from in our lifetime."

Allen was part of the team that developed ADS-B

technology, for which they won a Collier Trophy from the National Aeronautic Association in 2007. The Collier Trophy is awarded "for the greatest achievement in aeronautics or astronautics in America, with respect to improving the performance, efficiency, and safety of air or space vehicles, the value of which has been thoroughly demonstrated by actual use during the preceding year."

Allen says her dissertation research, which focused on estimating the performance of human motion tracking systems, ties in closely with the air traffic management environment. Sensor accuracy and error, data fusion and trajectory prediction are fundamental to both human motion tracking and air traffic management.

Along with modeling and simulation, she uses virtual environments (VE) in her current work, running an environment similar to the "Pit" at UNC. The goal is to make people understand what VE can do and to further its use in her research. For example, her team is looking into putting in a virtual control tower. Real control towers are expensive to build and maintain, so a virtual control



Danette Allen sits in the Research Flight Deck (RFD) in the Cockpit Motion Facility, one of many Flight Simulation Facilities at NASA Langley Research Center used in NextGen research.

tower could allow researchers to place controllers in a virtual or augmented reality environment to simulate different air traffic control configurations. The hope is that by providing current-day out-the-window information in addition to enhanced information from onboard and remote sensors, air traffic control could be further automated.

"We are trying to transfer some of the decisions from the ground to the aircraft, increasing the pilot's role in decision making with onboard technologies and increased situational awareness," she says. This also means changing the role of the human air traffic controller and Allen says she realizes that a big challenge her team is facing is that humans can be resistant to change.

"Our research focuses on functional allocation - determining the right balance between distributed and centralized control, air and ground responsibility, as well as human and automation tasking," Allen says. "The goal is to show that this new multi-faceted functional allocation is a safe, efficient path to increased capacity in the NAS."

ALUMNI NEWS

M.S. and Ph.D. Alumni

Rodger Blair (M.S. 1969) and his wife Charlene are pleased to announce they have purchased a home in Las Cruces, N.M., and will be moving there in summer 2011. They are both reaching the age of retirement although Rodger plans to consult part-time. Charlene has one more year of teaching at Shady Side Academy in Pittsburgh, Pa. Rodger works as a Technical/Management Consultant for the McKesson Corporation also in Pittsburgh where they design and develop mail order pharmacy software systems. His role is more of improving the software development process they use to develop their software products. Rodger will leave McKesson when they sell their home in Pittsburgh. (Rodger.Blair@mckesson. com)

Steven Bellovin (Ph.D. 1982) has been appointed to the Computer Science and Telecommunications Board of the National Academies. (*smb@cs.columbia.edu*)

Tom Williams (Ph.D. 1982) and his wife Julie and have sold their house in the US and currently live in NW China where they work with handicapped children. (*julieandtom@fastmail.fm*)

Gopal Gupta (Ph.D. 1991), professor of computer science at the University of Texas at Dallas, was recently appointed the President of the Association for Logic Programming. (*gupta@utdallas.edu*)

Jeff Hultquist (Ph.D. 1994) is now a member of the Maps team in the iOS Division of Apple. (*jhultquist@ mac.com*)

Dr. Michael Capps (M.S. 1996), President of Epic Games, was on stage with Steve Jobs at the "Apple Special Event" on 1 September 2010 to introduce their new iOS game "Project Sword." It is based on Epic's Unreal Engine 3 game technology, and uses Apple's new Game Center. (*mike.capps@epicgames.com*)

Dave Luebke (Ph.D. 1998) was promoted to Director of Research at NVIDIA Corporation. (*dave@luebke.us*)

Aditi Majumder (Ph.D. 2003), associate professor of computer science at the University of California at Irvine, together with Behzad Sajadi, won the Best Paper Award at IEEE Virtual Reality 2010 for the paper titled, "Auto-Calibration of CylindricalMulti-ProjectorDisplays." (majumder@ics.uci.edu)

Jun (Luke) Huan (Ph.D. 2006), assistant professor in the department electrical engineering of and computer science at the University of Kansas, is the recipient of a National Science Foundation CAREER Award (IIS 0845951, 2009 - 2014). He also led a team to secure a \$4.7 M NIH G20 grant to renovate KU's Information and Telecommunication Technology Center's Bioinformatics Computational Facility. (jhuan@) ku.edu)

Aaron Block (Ph.D. 2008) is now an assistant professor of Math and Computer Science at Austin College in Sherman, Texas. (*adblock@gmail.com*)

John Menges (Ph.D. 2009) has moved to Seattle and is working at Microsoft on SharePoint. (*johnmenges@gmail.com*)

Undergraduate Alumni

Aaron Fulkerson (B.S. 2004), CEO of MindTouch, is proud to announce the release of their latest product version: MindTouch 2010. You can find out more about MindTouch 2010 and download a free trial at *www.mindtouch. com.* (*aaronf@mindtouch.com*) **Brad Davis** (B.S. 2005) was promoted to Program Manager of Amentra, a subsidiary of Red Hat, at the beginning of July. He began working for Amentra after graduation. (*bradsdavis@gmail.com*)

Michael Stewart (B.S. 2007) was selected as part of the 2010-2011 cohort of the College of Engineering Graduate Teaching Fellows at Virginia Tech. (tgm@thegreatmichael.com)

Friends and Collaborators

Neil Dodgson, a visiting researcher in spring 2001, has been promoted to full professor at the University of Cambridge's Faculty of Computer Science & Technology. (*nad10@cam. ac.uk*)

Jane Richardson's pre-computergraphics ribbon drawing of triose phosphate isomerase was selected as the Wikipedia Picture-Of-The-Day for November 19, 2009. David Richardson was awarded the 2009 Gordon Hammes Teaching & Mentoring Award from Duke University Medical School. The Richardsons are professors of biochemistry in the Duke University School of Medicine and head the Richardson Lab. (*dcrjsr@kinemage. biochem.duke.edu*)

ALUMNI PUBLICATIONS

Frank Geoffrey (Ph.D. 1979) is co-author of a book chapter to be published soon: Blandin, B., G. Frank, K. Hirata, and S. Laughton. "Interoperability Issues for Systems Managing Competency Information: A Preliminary Study." To appear in Handbook of Research on E-Learning Standards and Interoperability: Frameworks and Issues. Edited by F. Lazarinis. IGI Global: Hershey, Pa. (gafi@rti.org)

Pawan Kumar (M.S. 1998) is the author of *Documentum 6.5 Content Management Foundations*, published in June 2010 by PACKT Publishing. (*pk@doquent.com*)

A WAY TO GIVE BACK - DR. JOHN GLOTZER (M.S. 2000)

When **Dr. John Glotzer** finished his master's degree in 2000, he felt very appreciative for the education he had received in the Department of Computer Science at UNC-Chapel Hill, and he wanted a unique way to give back.

"Something is special about the department, in part because of the way Fred Brooks has nurtured it since its inception," Glotzer said. "I wanted to do something in return for the great education I received there."

He had read in the Daily Tar Heel about the university-wide teaching assistant awards, but said he figured a computer science teaching assistant probably wouldn't receive the award because not enough people take the classes. That's when he came up with the idea of funding a departmentlevel Teaching Assistant of the Year award for computer science. Each year since its beginning, one or two teaching assistants in computer science are selected to receive the award from nominations made by faculty members and students. Those making nominations are asked to describe the specific ways in which the teaching assistant excelled in a paragraph or two, and the winners are announced at the spring department commencement ceremony. Winners receive a \$500 cash prize, a certificate, and have their names added to a plaque that hangs in the Sitterson Hall lobby.

One of the 2010 recipients, Belinda Kerchmar, said that receiving the Teaching Assistant of the Year award was very meaningful for her.

"I think that with so much valuable research going on, teaching can be left by the wayside," she said. "This award is a great way to show that our department also values the education of future computer scientists."

Glotzer said he thinks the award provides a dual benefit for both teaching assistants and students, making the overall level of teaching better.

Today Glotzer works for Cisco as a software developer in a group that develops the ASR 1000 family of routers. He was a physician in his previous career and said that getting a degree in computer science was a dream come true, and that UNC prepared him well for his current career.

"The three years I spent there were a very fun part of my life," he said. "It's a special place, and I felt that from the very beginning."

ALUMNI FELLOWSHIP RECIPIENT

Rahul Narain is the recipient of the 2010-2011 Computer Science Alumni Fellowship. This fellowship is awarded annually to a Ph.D. candidate in his or her final year of study, allowing the student to work full time on dissertation research. Generous contributions by alumni and friends help to make this fellowship possible.

Rahul is investigating computational models for phenomena that show complex behavior on different scales. In many physical and social phenomena, the interactions between the constituent entities at small scales give rise to emergent large-scale behavior that is computationally expensive to reproduce directly. Rahul is developing techniques for combining separate large-scale and fine-scale models to enable efficient, detailed simulation of such phenomena. He has developed such methods for simulating turbulent fluids, human crowds, and granular materials. Rahul is working on his dissertation under Professor Ming C. Lin.



Some examples of simulated large, dense crowds. (a) 100,000 pilgrims moving through a campsite. (b) 80,000 people on a trade show floor. (c) 25,000 pilgrims with heterogeneous goals in a mosque.

DEPARTMENT NEWS

WELCOME New Staff

Anna Snyder, administrative support to faculty, joined the department full-time in September 2010.

Visiting Researchers

Sandra Batista is a postdoctoral research associate working with Wei Wang in the Computational Genetics Lab.

Fazhi He is a visiting scholar working with Prasun Dewan. He joins us from the School of Computer Science and Technology at Wuhan University, China, where he is a professor.

Sara Schvartzman is a visiting scholar working with Ming Lin. She is visiting from the Universidad Rey Juan Carlos in Madrid, Spain, where she is a Ph.D. advisee of alumnus Miguel Otaduy (Ph.D. 2004).

Jur van den Berg is a postdoctoral research associate working with the GAM-MA research group.

Ross Whitaker (Ph.D. 1993) is a visiting faculty member working with Steve Pizer. He is an associate professor in the School of Computing at the University of Utah.

THANKS AND FAREWELL

Courtney Ferriter, administrative support to faculty, left the department in May 2010 to pursue graduate studies in English at Auburn University.

Tricia Robinson, undergraduate student services manager, left the department in October 2010.

Stephen F. Weiss, professor and former chairman, who retired from the department at the end of June 2010.

CONGRATULATIONS Faculty and Staff

Ron Alterovitz and **Don Smith** were the recipients of the 2009-2010 Computer Science Student Association awards for excellence in teaching. Kevin Jeffay was the recipient of the 2010 Women's Advocacy Award from the Carolina Women's Center. The award recognizes UNC faculty, staff, postdoctoral scholars or students who have made a substantial contribution through leadership in advocating for women. Jeffay was also the recipient of the 2009-2010 Computer Science Club undergraduate teaching award.

Graduate Students

Kelli Bacon and Belinda Kerchmar were named the 2009-2010 Teaching Assistants of the Year.

Luv Kohli won the best poster award at the IEEE Symposium on 3D User Interfaces.

August 2009 M.S. recipients: Michael Damein Elder, Vishnu Vardhan Reddy Konda, Gifford D. Ransom, Shun (Christine) Xu.

August 2009 Ph.D. recipients:

John M. Calandrino. On the Design and Implementation of a Cache-Aware Soft Real-Time Scheduler for Multicore Platforms. Advisor: James Anderson.

John Edward Menges. Concur: An Investigation of Lightweight Migration in Support of Centralized Synchronous Distributed Collaboration. Advisor: Kevin Jeffay.

Feng Pan. Efficient Algorithms in Analyzing Genomic Data. Advisor: Wei Wang.

Sudipta Narayan Sinha. Silhouettes for Calibration and Reconstruction from Multiple Views. Advisor: Marc Pollefeys.

Jeffrey S. Terrell. Passive, automatic detection of network server performance anomalies in large networks. Advisor: Kevin Jeffay.

Qi Zhang. *Mining Massive Scientific Sequence Data using Block-wise Decomposition Methods.* Advisor: Wei Wang.

December 2009 M.S. recipients: Anish Chandak, Gennette Delaine Gill, Ram Krishnan Kumar, Christopher John Sheldahl, Tao Yu.

December 2009 Ph.D. recipients: Brian Stewart Eastwood. Multiple Layer Image Analysis for Video Microscopy. Advisor: Russell M. Taylor II.

George Todd Gamblin. Scalable Performance Measurement and Analysis. Advisor: Dan Reed.

Karl Anders Gyllstrom. Enriching personal information management with document interaction histories. Advisor: David Stotts.

Jason J. Jerald. Scene-Motion Thresholds and Latency Thresholds for Head-Mounted Displays. Advisors: Frederick P. Brooks, Jr. and Mary Whitton

Tyler Michael Johnson. A Cooperative Approach to Continuous Calibration in Multiprojector Displays. Advisor: Henry Fuchs.

Paul Clark Merrell. *Model Synthesis.* Advisor: Dinesh Manocha.

Ipek Oguz. *Groupwise Shape Correspondence with Local Features.* Advisor: Stephen Pizer.

Abhishek Singh. Co-scheduling Realtime Tasks and Non Real-time Tasks Using Empirical Probability Distribution of Real-time Execution Requirements. Advisor: Kevin Jeffay.

Jingyu Yan. Articulated Non-Rigid Shape, Motion and Kinematic Chain Recovery from Video. Advisor: Marc Pollefeys.

Liangjun Zhang. Efficient Motion Planning using Generalized Penetration Depth Computation. Advisor: Dinesh Manocha.

May 2010 M.S. recipients:

Kelli Bacon, Sami Riad Benzaid, Nicolai Dragan, Gabriel Lincoln Hart, Lisa Ann Lyons, Richard Thomas Skarbez, Joseph P. Tighe, Sooseob Won, Talha Zaman.

May 2010 Ph.D. recipients:

Thomas Russell Gayle. *Physics-based Sampling for Motion Planning*. Advisor: Dinesh Manocha.

Gennette Delaine Gill. Analysis and Optimization for Pipelined Asynchronous Systems. Advisor: Montek Singh.

Li Guan. Multi-view Dynamic Scene Modeling. Advisor: Marc Pollefeys. **Sasa Junuzovic.** Towards Self-Optimizing Frameworks for Collaborative Systems. Advisor: Prasun Dewan.

Hennadiy Leontyev. Compositional Analysis Techniques For Multiprocessor Soft Real-Time Scheduling. Advisor: James Anderson.

Derek L. Merck. *Model Guided Rendering for Medical Images.* Advisors: Stephen Pizer and Julian Rosenman.

Andrew Reid Nashel. Rendering and Display for Multi-Viewer Tele-Immersion. Advisor: Henry Fuchs.

August 2010 M.S. recipients:

Timothy Johnson, Ritesh Kumar, Huai-Ping Lee, Yi Liu, Avery Elliott Smith, Joseph P. Tighe, Yilin Wang.

August 2010 Ph.D. recipients:

Tabitha Peck. Redirected Free Exploration with Distractors: A Large-Scale Real-Walking Locomotion Interface. Advisors: Mary Whitton and Henry Fuchs.

Nikunj Raghuvanshi. Interactive Physically-based Sound Simulation. Advisor: Ming C. Lin.

Jeremy Daniel Wendt. Real-Walking Models Improve Walking-In-Place Systems. Advisors: Frederick P. Brooks, Jr. and Mary Whitton

Undergraduate Students

Max Beckman-Harned was the recipient of the Stephen F. Weiss Award for Outstanding Achievement in Computer Science.

Calvin Young was selected as a 2010 Public Service Scholar by the Carolina Center for Public Service.

August 2009 B.S. recipient: Robert Christopher Rogers.

December 2009 B.S. recipients:

Jared Taylor Blashka, Andrew Scott Branscomb, Wing-Soon Wilson Lian*, Brian Christopher Louden, James D. Uhing*, Gabriel Yeung. May 2010 B.S. recipients: Andrew Tanner Allison, Austin Payne Allshouse, Stephanie Lynn Barlock, David Lee Brandl, James Michael Chan, Sean Chaney, Eric Gregory Daniel, James Bennett Freeman, Eric Thomas Harmon, Shaddi Husein Hasan*, Brian Keith Jenkins, Nicholas Tristan Kyger, William Thomas Lahti, Kimberly Renea Poston, Marc Q. Ryan, Carl Henry Schissler, John Matthew Schweighardt, Joseph Ross Thompson, Andrew David Trumbull, Ashwin Vaidyanathan, William Eric Vogler, Michael Xu, Calvin W. Young*, Jiemin Zeng.

*With Honors

RECENT SPONSORED RESEARCH AWARDS

AF: Small: Degree-driven design of geometric algorithms. PI: Jack Snoeyink. National Science Foundation.

ARRA - Adding Deconvolution Algorithms to ITK. PI: Marc Niethammer. Co-PI: Russell Taylor. National Library of Medicine.

CSR: Small: Formal Foundations of Certifiable Mixed-criticality Systems. PI: Sanjoy Baruah. Co-PI: James Anderson. National Science Foundation.

Deformable Knee Atlas with Probabilistic Weight Bearing Cartilage Regions. PI: Marc Niethammer. Duke University/Murdock.

Developmental Brain Atlas Tools and

Data Applied to Humans and Macaques. Pis: Martin Styner, Marc Niethammer. National Institutes of Health.

Feasibility Study for Street side Image Capture and Visualization from Cell Phones. PI: Jan-Michael Frahm. Atterasys LLC.

FIA: Collaborative Research: MobilityFirst: A Robust and Trustworthy Architecture. PI: Michael Reiter. National Science Foundation.

Genome Dynamics: Evolution, Organization. PI: Wei Wang. Co-PI: Leonard McMillan. Jackson Laboratory.

GOALI: Digital Layout and Assembly of Large CAD Structures. PI: Dinesh Manocha. Co-PI: Ming Lin. National Science Foundation.

NeTS: Small: The Packet-Scale Paradigm: Realizing End-to-end Congestion-control for Terabit Networks. PI: Jasleen Sahni. National Science Foundation.

Reaching inaccessible anatomy percutaneously via multi-lumen steerable needles. PI: Ron Alterovitz. Vanderbilt University/National Institute of Biomedical Imaging and Bioengineering.

TC:Small: Exploring Privacy Breaches in Encrypted VoIP Communications. PI: Fabian Monrose. Co-PI: Kevin Jeffay. National Science Foundation.

2010-2011 Graduate Fellowship Recipients Elizabeth Barnes – Naval Fellowship Bjoern Brandenburg – UNC Graduate School Dissertation Completion Fellowship Luv Kohli – Link Fellowship David Millman – Department of Energy Rickover Fellowship Mac Mollison – N.C. Space Grant Graduate Research Fellowship Christian Orellana – Bicentennial Becas Chile Scholarship Chih-hao Sun – Graduate Merit Fellowship Teryl Taylor – NSERC PGS D Scholarship Xiang Zhang – Microsoft Fellowship Patrick Zongo – UNC STEM Fellowship

FAMILY MATTERS

Courtney McCarthy Ramey (B.S.M.Sci. 2002) and her husband, John, welcomed a beautiful baby girl, Anna Grace, on 25 January 2010. (*courtney.ramey@* gmail.com)

Andrew Zaferakis (M.S. 2001) and his wife, Zemina, are happy to announce the birth of their first child, Zoe Isabella Zaferakis, born 9 February 2010. They are doing very well and Zoe is keeping them very busy. (andrew.zaferakis@gmail.com)

Karin Boes (M.S. 1993) and her husband Erik Yujuico welcomed their son, Fen, on 10 February 2010. He joins big sister, Cedar (3). (*karinboes@yahoo.com*)

Dave Luebke (Ph.D. 1998) and his wife, Emily, welcomed Cyrus Tate Luebke into their family on 16 April 2010. Cyrus was born at 5:52 a.m. in an unplanned home delivery with Dad as midwife and the doctor on speakerphone. The whole family is doing well, and Owen (6) and Edwin (4) are extremely excited about their new baby brother. (*dave@luebke.us*, *emily@luebke.us*)

Nico Galoppo (Ph.D. 2008) married Allison Littlepage Knowles on a very sunny (and hot) 20 June 2010 in Williamsburg, Virginia. (ngaloppo@gmail.com, allison.knowles@gmail.com)

Alan Forrest, Windows Systems Administrator, and his wife, Julie, welcomed son Andrew Wilson on 22 July 2010 in Durham, N.C. Andrew joins big brothers Patrick (7) and Alex (3). (forrest@cs.unc.edu)

Michele (Ph.D. 2003) and Chris (Ph.D. 2006) Weigle celebrated their 10th wedding anniversary this summer on 22 July 2010. They have a son, Nathan, who was born in March 2009. (*weiglemc@gmail.com*, *ccweigle@gmail.com*)

Aaron Block (Ph.D. 2008) and his wife, Nicolle, welcomed a son, Adam Conrad, on 25 September 2010. (*adblock@gmail.com*)

Montek Singh, associate professor, and Mary Lindsley were married on 24 July 2010 in Chapel Hill. (*montek@cs.unc.edu*)

Brad Davis (B.S. 2005) was married 7 August 2010 in Charlotte, N.C., to Kelly Pasour. Kelly graduated from UNC in 1995 with a degree in elementary education, and has since received her master's of public administration from N.C. State. They currently live in Charlotte and are extremely excited about their future together! (*bradsdavis@gmail.com*)

HAVE YOU RESPONDED?



A big THANKS! to those of you who have responded to our request for your updated contact information and email vs. paper preference for *News* \Leftrightarrow *Notes*.

If you haven't yet responded, it's never too late! Just send an email to *pubs@cs.unc.edu* and let us know if we're mailing to your preferred address, if we have your correct email address, and how you'd like to receive the department newsletter (either as an email or via snail mail).

We look forward to hearing from you!



Recognize anyone? A group of UNC CS folks attended Michele and Chris Weigle's wedding in Louisiana, the week before SIGGRAPH was held in New Orleans in July 2000.

RECENT PUBLICATIONS

Antani L., A. Chandak, M. Taylor, D. Manocha. "Direct-to-Indirect Acoustic Radiance Transfer," Technical Report: TR10-012, 2010.

Antani, L., A. Chandak, M. Taylor and D. Manocha. "Fast Geometric Sound Propagation with Finite Edge Diffraction," Technical Report: TR10-011, 2010.

Bastoni, A., B. Brandenburg and J. Anderson. "Cache-Related Preemption and Migration Delays: Empirical Approximation and Impact on Schedulability," *Proc. of the Sixth International Workshop on Operating Systems Platforms for Embedded Real-Time Applications*, Brussels, Belgium, July 2010, pp. 33-44.

Chandak, A., L.Antani, M. Taylor and D. Manocha. "Fast and Accurate Geometric Sound Propagation using Visibility Computations," *International Symposium on Room Acoustics*, ISRA, 2010.

Duindam, V., J. Xu, R. Alterovitz, S. Sastry and K. Goldberg. "Three-dimensional Motion Planning Algorithms for Steerable Needles Using Inverse Kinematics," *International Journal of Robotics Research*, June 2010, 29(7):789-800.

Guy, S.J., J. Chhugani, S. Curtis, P. Dubey, M.C. Lin and D. Manocha. "PLEdestrians: A Least-effort Approach to Crowd Simulation," ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), 2010.

Guy, S.J., M.C. Lin and D. Manocha. "Modeling Collision Avoidance Behavior for Virtual Humans," *International Conference* on Autonomous Agents and Multiagent Systems (AAMAS), 2010, 2:575-582.

Hou, Q., X. Sun, K. Zhou, C. Lauterbach and Dinesh Manocha. "Memory-scalable GPU Spatial Hierarchy Construction," *IEEE Transactions on Visualization and Computer Graphics* (TVCG), 2010.

Liu C., and J. Anderson. "Improving the Schedulability of Sporadic Self-Suspending Soft Real-Time Multiprocessor Task Systems," *Proc. of the 16th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications*, Macau, China, Aug. 2010. Merrell, P., and D. Manocha. "Examplebased Curve Synthesis," *Computers and Graphics* (Special Issue on Procedural Modeling), 2010.

Merrell, P., and D. Manocha. "Model Synthesis: A General Procedural Modeling Algorithm," *IEEE Transactions on Visualization and Computer Graphics* (TVCG), 2010.

Mollison, M., J. Erickson, J. Anderson, S. Baruah and J. Scoredos. "Mixed Criticality Real-Time Scheduling for Multicore Systems," *Proc. of the 7th IEEE International Conference on Embedded Software and Systems*, IEEE Computer Society Press, Bradford, U.K., June 2010.

Moss, W., H. Yeh, J.-M. Hong, M.C. Lin and D. Manocha. "Sounding Liquids: Automatic Sound Synthesis from Fluid Simulation," *ACM Transactions on Graphics* (Proc ACM SIGGRAPH), 2010.

Pan, J., C. Lauterbach and D. Manocha. "Efficient Nearest-neighbor Computation for GPU-based Motion Planning," *IEEE*/ *RSJ International Conference on Intelligent Robots* and Systems (IROS), 2010.

Pan, J., C. Lauterbach and D. Manocha "g-Planner: Real-time Motion Planning and Global Navigation using GPUs," *AAAI Conference on Artificial Intelligence* (AAAI), 2010.

Pan, J., L. Zhang, M.C. Lin and D. Manocha. "A Hybrid Approach for Simulating Human Motion in Constrained Environments," *International Conference on Computer Animation and Social Agents* (CASA), 2010.

Pan, J., L. Zhang and D. Manocha. "Retraction-based RRT Planner for Articulated Models," *IEEE International Conference on Robotics and Automation* (ICRA), 2010.

Raghuvanshi, N., J.Snyder, R. Mehra, M.C. Lin and N.K. Govindaraju. "Precomputed Wave Simulation for Real-time Sound Propagation of Dynamic Sources in Complex Scenes," *Proc. Of ACM Transactions on Graphics* (ACM SIGGRAPH), 2010.

Ren, Z., H. Yeh and M.C. Lin. "Synthesizing Contact Sounds Between Textured Models," *IEEE Virtual Reality Conference* (VR), 2010, pp. 139-146. Savioja, L., D. Manocha and M.C. Lin. "Use of GPUs in room acoustic modeling and auralization," *International Symposium on Room Acoustics*, ISRA, 2010.

Snape, J., J. van den Berg, S.J. Guy and D. Manocha. "Smooth and Collision-free Navigation for Multiple Robots Under Differential-drive Constraints," *IEEE/RSJ International Conference on Intelligent Robots and Systems* (IROS), 2010.

Tang, M., Y.J. Kim and D. Manocha. "Continuous Collision Detection for Non-rigid Contact Computations Using Local Advancement," *IEEE International Conference on Robotics and Automation* (ICRA), 2010.

Taylor, M., A. Chandak, L. Antani and D. Manocha. "Interactive Geometric Sound Propagation and Rendering," *Intel Software Network Communities*, 2010.

Taylor, M., Q. Mo, A. Chandak, C. Schissler, D.Manocha. "i-Sound: Interactive GPUbased Sound Auralization in Dynamic Scenes," Technical Report: TR10-006, 2010.

Zhang, J., G.Welch and G. Bishop. "Observability and Estimation Uncertainty Analysis for PMU Placement Alternatives," *Proc. of the 2010 North American Power Symposium* (NAPS 2010), Arlington, TX, U.S.A., September 26–28, 2010.

Zhang, J., G. Welch, G. Bishop and Z. Huang. "Optimal PMU Placement Evaluation for Power System Dynamic State Estimation," *Proc. of IEEE PES Conference on Innovative Smart Grid Technologies Europe* (ISGT 2010), Chalmers Lindholmen, Göteborg, Sweden, October 10–13, 2010.

Zheng, Y., M.C. Lin and D. Manocha. "A Fast n-dimensional Ray-shooting Algorithm for Grasping Force Optimization," *IEEE International Conference on Robotics and Automation* (ICRA), 2010.

Zheng, Y., M.C. Lin, D. Manocha, A.H. Adiwahono and C.-H. Chew. "A Walking Pattern Generator for Biped Robots on Uneven Terrains," *IEEE/RSJ International Conference on Intelligent Robots and Systems* (IROS), 2010.

Zheng, Y., M.C. Lin and D. Manocha. "Efficient Simplex Computation for Fixture Layout Design," *ACM Symposium of Solid and Physical Modeling* (SPM), 2010.

News Notes

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Throughout News & Notes, we list degree information for all our B.S., M.S., and Ph.D. Computer Science and Math Sciences alumni.



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Undergraduate Max Beckman-Harned shakes hands with Steve Weiss after being named the first recipient of the Stephen F. Weiss Award for Outstanding Achievement in Computer Science at Weiss' retirement celebration on 7 May 2010.