News & Notes

Fall 2012 ◆ Issue Fifty

CompSci @ Carolina

Dear Friends,

Another fall semester is well underway here in the Department of Computer Science. As usual, it has been a busy one so far!

This fall we opened the Entrepreneurs' Lounge in the zero level of Sitterson Hall. The lounge is a place for budding entrepreneurs to hold business meetings and brainstorming sessions and features displays representing the eight CS department spin-off companies. Entrepreneurship has become a hot topic at UNC and elsewhere these days, and the computer science department is an ideal place for the generation of new technologies and the outgrowth of new companies. With the Entrepreneurs' Lounge, we're hoping to help foster the innovation that in part defines us as a department.

Speaking of entrepreneurship, this summer Morphormics, Inc., became the first of the CS spin-offs to be purchased by a publicly traded company. Congratulations to founders Steve Pizer, Ed Chaney, and Sarang Joshi, as well as all of the UNC-affiliated folks who work for Morphormics. You can read more about the deal on page 2.

Congratuations to this year's two alumni fellowship recipients, Chen-Rui Chou and Haohan Li. You can read more about their research on page 3. Your gifts to the department help support the alumni fellowship, and each donation is especially appreciated.

We hope to see you soon in Chapel Hill!

Anselmo Lastra

COMPUTING IN REAL TIME

Real-time systems are everywhere these days. Whether you're flying in an airplane, driving a car, or checking email on your smartphone, you're interacting in some way with real-time systems. For example, high-end modern cars often contain around 100 processors, many of which require precise timing of the operations in order to work properly.

The focus of the research of the Real-Time Systems group at UNC is on supporting real-time applications on multicore platforms. The group, led by professors Jim Anderson and Sanjoy Baruah, is currently working with the global security company Northrop Grumman Corporation on a project involving unmanned aerial vehicles. The goal of the project is to determine the viability of using multicore platforms in real-time control systems in such aircraft. The major challenge lies in devising techniques for isolating different system components so that the real-time correctness of different components can be validated independently. Certifying an aircraft design requires validating real-time correctness. This process becomes much simpler if smaller sub-systems can be analyzed independently. Two graduate students in the Real-Time Systems group, Mac Mollison and Jeremy Erickson, have held internships with Northrop Grumman, working on the unmanned aerial vehicle project.

A long-running project of the Real-Time Systems group is LITMUS^{RT}. The name of the project stands for "Linux Testbed for Multiprocessor Scheduling in Real-Time Systems." The project is an extension of the Linux kernel produced at UNC. The

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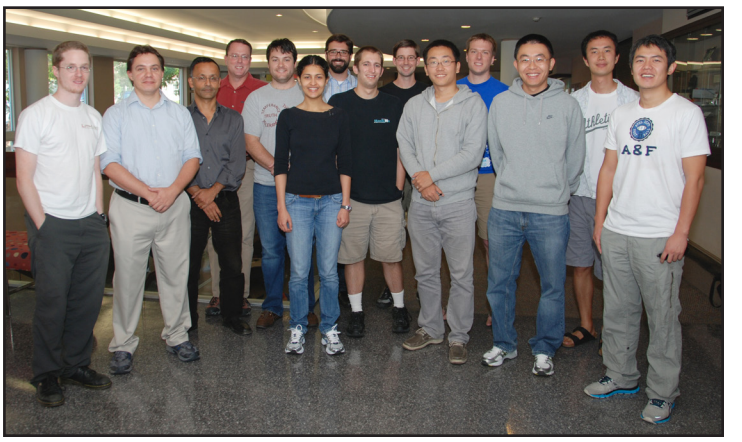
purpose of LITMUS^{RT} is to serve as a testbed for prototyping advanced multiprocessor real-time scheduling and synchronization algorithms. It allows researchers to investigate real world limitations and the impact of overheads on system performance, which is difficult to do with just theory.

Work on LITMUS^{RT} started in 2006, and a number of graduate students have contributed to the project over the years. Because of the work being done at UNC on LITMUS^{RT}, the department hosted the 14th Real Time Linux Workshop here in Chapel Hill on October 18-20.

LITMUS^{RT} is publicly available at *www.cs.unc.edu/~anderson/litmus-rt/*. Research funding for the project comes from IBM, Intel Corporation, Northrop Grumman Corporation, NSF, the U.S. Air Force, and the U.S. Army Research Office.



Real-Time Systems Group, from left to right: Mac Mollison, Ben Casses, Sanjoy Baruah, Jim Anderson, Bryan Ward, Bipasa Chattopadhyay, Glenn Elliott, Jeremy Erickson, Chris Kenna, Zhishan Guo, Jonathan Herman, Haohan Li, Hiroyuki Chishiro, Cong Liu.

FIRST-OF-ITS-KIND WAVEMAKER TO BE BUILT AT UNC

Leandra Vicci, lecturer and director of the UNC computer science Applied Engineering Lab, is co-PI on an NSF Major Research Instrumentation grant to build a wavemaker for the 13,500-gallon-capacity wave tank located in the UNC Joint Fluids Lab in Chapman Hall. The PI for the grant is Roberto Camassa of the department of mathematics, and other co-PIs are Richard McLaughlin, also of the department of mathematics, and Brian White of the department of marine sciences.

The wave tank is being used to study fluid dynamics, and once constructed, the wavemaker will allow for the study of such phenomena as rogue waves, formation and development of Tsunamis, and the effects of internal waves on mixing stratified salt and fresh water layers, which affects the ecological health of estuaries.

Currently, the state-of-the-art among wavemakers has a number of different ways of generating precisely tailored waves, but each can only generate one kind of wave. A wavemaker designed at ENS-Lyon is currently the most flexible wavemaker in existence and uses stacked plates that slide in different ways relative to each other to create waves. However, the way the plates slide is controlled by camshafts with cams that have to be changed out in order to change the waves significantly.

The wavemaker conceived of by Vicci, on the other hand, uses no mechanical moving parts. Instead, a multiplicity of programmable pneumatic pressure sources are used to force water flow through apertures tiling one end of the wave tank. This generates waves controllable in both time and space over this end boundary of the wave tank, enabling a high degree of flexibility in generating a broad family of surface and internal waves.

The grant was funded in the amount of $655,401 over three years.

CS SPIN-OFF MORPHORMICS, INC., SOLD TO ACCURAY FOR $5.7 MILLION

Accuray, a publicly traded radiation oncology company, announced in July the acquisition of UNC computer science spin-off Morphormics, Inc., for approximately $5.7 million.

Morphormics develops medical imaging software systems that automatically recognize and extract anatomical structures from 2D, 3D and 4D medical images.

Accuray began licensing Morphormics' autocontouring technology in 2008. The technology automatically identifies and draws the boundaries of the prostate and surrounding critical structures, which allows treatment planning software to focus the radiation dose on the prostate and minimize the delivery of radiation to the surrounding structures.

With the acquisition of Morphormics, Accuray plans to extend autocontouring capabilities for their products, the CyberKnife® Robotic Radiosurgery System and the TomoTherapy® System.

Morphormics was founded in 2001 by Kenan Professor of Computer Science Stephen Pizer, UNC Radiation Oncology Professor Ed Chaney, and former UNC Assistant Professor of Computer Science, Sarang Joshi, who is now at the University of Utah. Morphormics' formation was also facilitated by Adjunct Research Professor Nick England, president of 3rdTech, a company founded specifically to incubate spin-offs that commercialize technology developed in the computer science department at UNC.

ALUMNUS RECEIVES 2012 COMPUTER GRAPHICS ACHIEVEMENT AWARD

UNC Computer science alumnus Greg Turk (Ph.D. 1992) was the recipient of the 2012 Computer Graphics Achievement Award from ACM SIGGRAPH at its annual conference in August. The award recognizes Turk for his contributions to physically-inspired mathematical application in graphics, particularly his work on texture synthesis, geometric modeling, and physical simulation involving thin structures.

Much of Turk's work on textures stems from his dissertation research, in which he showed how using a cascade of reaction-diffusion systems could generate realistic-looking patterns, like leopard spots or zebra stripes.

Turk is also well known for the "Stanford bunny," one of the most popular test models in computer graphics, which has been used in hundreds of SIGGRAPH papers. He created the bunny using a technique called "zippered meshes," developed with Marc Levoy (Ph.D. 1989), to create polygonal models from several range scans. His current research is in the area of simulation of biological systems, including evolution, animal locomotion, and plant growth.

Turk is currently a professor at the Georgia Institute of Technology, where he is a member of the School of Interactive Computing and the Graphics, Visualization and Usability Center. His Ph.D. advisor was Henry Fuchs, the Federico Gil Distinguished Professor of Computer Science at UNC.

The original "Stanford bunny" (picture courtesy Marc Levoy)

ALUMNI FELLOWSHIP RECIPIENTS - CHEN-RUI CHOU AND HAOHAN LI

Chen-Rui Chou and **Haohan Li** are the joint recipients of the 2012-2013 Computer Science Alumni Fellowship. This fellowship is awarded annually to Ph.D. candidates in their final year of study, allowing the students to work full time on dissertation research. Generous contributions by alumni and friends help to make this fellowship possible.

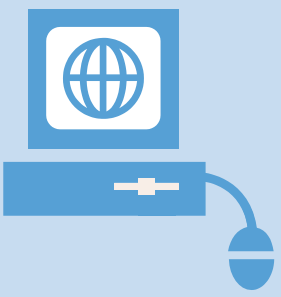
Chen-Rui has been investigating machine learning techniques for real-time radiation therapy guidance. In a radiation therapy situation, the patient's continuous rigid and respiratory motion imposes high uncertainty for tumor localization. Chen-Rui has developed image registration methods that use machine learning strategies to reduce this uncertainty. His methods support real-time 3D motion estimation and have been evaluated for head-and-neck, lung and abdominal radiation therapy. Chen-Rui is working on his dissertation under Professor Stephen M. Pizer.

Haohan's research interests are in the design and analysis of real-time systems, with a focus on the scheduling theory in safety-critical embedded systems. Classic real-time systems are aimed at the scheduling of tasks on certain platforms such that the temporal constraints of those tasks are assured by analytic verification. However, the increasing trend in embedded systems towards integrating multiple functionalities on a common platform is making the scheduling problem on such platforms become a challenge when some of the tasks are subject to certification under severely conservative specifications while the others are not. Such systems are called mixed-criticality real-time systems. The goal of Haohan's research explores the essence of mixed-criticality real-time systems, to establish a formal model with reasonable assumptions, to describe the behavior of such systems, and to develop effective and efficient methods to schedule those tasks with certifiable and quantitative temporal guarantees. Haohan is working on his dissertation under Professor Sanjoy K. Baruah.

MORE ONLINE!

Check out *News & Notes* online for additional content that didn't make it into the printed version of the newsletter. *www.cs.unc.edu/cms/publications/news-and-notes*

While you're at it, be sure to "like" us on Facebook! *www.facebook.com/unccompsci*



DEPARTMENT NEWS

WELCOME

New Staff

Nathan Otterness is a software engineer working with Fabian Monrose.

Sandy Staley is an accounting assistant. Previously she worked for the UNC School of Nursing.

Xinyu Zhang is a part-time research scientist working with the GAMMA group.

Visiting Researchers

Hiroyuki Chishiro is a visiting scholar working with Jim Anderson. He is visiting the department from Keio University in Japan.

Jingwen Dai is a postdoctoral researcher working with the BeingThere Centre for Telepresence and Telecollaboration. He will be at UNC from November 2012 – April 2013, and then in Singapore at Nanyang Technological University (NTU).

Cedric Fleury is a postdoctoral researcher also working with the BeingThere Centre for Telepresence and Telecollaboration. He will be at NTU in Singapore until April 2013, and then at UNC.

Jae-Ho Nah is a visiting scholar working with Dinesh Manocha. He is visiting the department from South Korea.

Armel Ulrich Kemloh Wagoum is a visiting scholar working with Dinesh Manocha. He is visiting the department from Forschungszentrum Jülich GmbH, Germany.

THANKS AND FAREWELL

Yun Fan, research engineer working with the security group, left the department in August 2012 to accept a position with the UNC School of Pharmacy.

Anna Snyder, assistant to faculty, left the department in August 2012 to attend graduate school.

John Thomas, research associate and laboratory manager for the Applied Engineering Laboratory, retired on October 31, 2012, after 31.5 years with the department.

Dorothy Turner, assistant to the chair and department registrar, left the department in October 2012 to accept a position at Duke University.

Crystal Walker, proposal and outreach coordinator, left the department in October 2012 to accept a position with the UNC School of Medicine.

Wei Wang, professor, left the department in July 2012 to accept a professor position at UCLA in the department of computer science. She maintains an adjunct professor position at UNC.

CONGRATULATIONS

Faculty and Staff

Gary Bishop (Ph.D. 1984) was the recipient of the 2011-2012 Computer Science Club Undergraduate Teaching Award.

Fred Brooks and Jim Anderson were the recipients of the 2011-2012 Computer Science Student Association awards for excellence in teaching.

Sandra Neely was promoted to Accounting Manager in April 2012.

Graduate Students

Jeremy Erickson and Jim Anderson won a best paper award for the paper "Fair Lateness Scheduling: Reducing Maximum Lateness in G-EDF-like Scheduling," at the 23rd Euromicro Conference on Real-Time Systems.

Anna Derbakova (M.S. 2012) was named the Teaching Assistant of the Year for 2011-2012.

Bryan Ward, a graduate student working with the Real-Time Systems group, was awarded an NSF Fellowship.

Graduate students Andrew White and Kevin Snow, Austin Matthews (B.S. 2011), and professor Fabian Monrose were the recipients of the 2012 Award for Outstanding Research in Privacy Enhancing Technologies (PET Award) for their paper, "Phonotactic Reconstruction of Encrypted VoIP Conversions: Hookt on fon-iks." For this work, the authors also received the Best Paper Award at the 32nd IEEE Symposium on Security and Privacy in May 2011, and the NYU-Poly AT&T Best Applied Security Paper Award for 2011.

Undergraduate Students

Zach Cross, senior computer science major, was the recipient of the 2012-2013 Stephen F. Weiss Award for Outstanding Achievement in Computer Science.

Gautam Sanka, junior computer science major, was a recipient of the 2012 Burch Fellowship. You can read more about Gautam's award on page 8.

RECENT SPONSORED RESEARCH AWARDS

CC-NIE Network Infrastructure: Enabling data-driven research. PI: Jay Aikat. NSF.

CSR: Small: Real-time Computing Using GPUs. PIs: Sanjoy Baruah, James Anderson. NSF – Research.

EAGER: Automatic Classification of Programming Difficulties by Mining Programming Events. PI: Prasun Dewan. NSF – Research.

EAGER: Data Association and Exploitation for Large Scale 3-D Modeling from Visual Imagery. PI: Jan-Michael Frahm. Co-PI: Enrique Dunn. NSF.

EAGER: Interactive Reconstruction and Visualization of Metropolitan-Scale Traffic. PI: Ming Lin. NSF.

Efficient Tracking, Logging, and Blocking of Accesses to Digital Objects. PI: Fabian Monrose. Department of Homeland Security Advanced Projects Research Agency.

REU supplement for UNC Project. PI: Kevin Jeffay. Raytheon Company (Prime: NSF).

STTR-Scalable Communication and Scheduling for Many-Core Systems. PI: James Anderson. Real-Time Innovations (Prime: Department of Defense).

TWCSBES: Medium: Collaborative: Crowdsourcing Security. PI: Michael Reiter. NSF – Research.

Ultra-Vis Phase 3. PI: Jan-Michael Frahm. Applied Research Associates Inc. (Prime: DARPA).

Unlocking Transcript Diversity via Differential Analyses of Splice Graphs. PI: Jan Prins. NIH National Human Genome Research Institute.

VMR TA2. PI: Jan-Michael Frahm. SRI International (Prime: DARPA).

WALDO. PI: Jan-Michael Frahm. Applied Research Associates Inc. (Prime: DARPA).

ALUMNI NEWS

M.S. and Ph.D. Alumni

David McAllister (Ph.D. 1972) and his wife Nancy recently sold their Raleigh-based e-book publishing business, Boson Books, to startup company Bitingduck Press. The press publishes fiction, narrative nonfiction, and technical books using the latest e-book formats. Boson Books was established in 1994. (*david@cmonline.com*)

Craig Mudge (Ph.D. 1973) was recently inducted into the Pearcey Hall of Fame 2012 for "Distinguished lifetime achievement and contribution to the development and growth of the Australian Information and Communications Technology industry." The award is named after Trevor Pearcey, the CSIRO scientist who designed Australia's first digital computer, CSIRAC. The fourth stored program computer in the world, CSIRAC ran its first program in 1949. Following work in industry and academia in the U.S. and Australia, Craig has rejoined CSIRO where he leads the charge in Big Data, building on his several years' work in cloud computing. Craig's Ph.D. advisor was Fred Brooks. (*craig.mudge@gmail.com*)

Steve Bellovin (M.S. 1977, Ph.D. 1982) was appointed Chief Technologist of the Federal Trade Commission for the 2012-2013 academic year. Steve will advise the agency on evolving technology and policy issues. (*smb@cs.columbia.edu*)

Mark Surles (Ph.D. 1992) is running a company, ScienceMedia (*www.sciencemedia.com*), that 20 years ago was started to use computational chemistry to teach college biochemistry. Today the company focuses on scientific training for pharmaceutical scientists and Mark is developing an online video library. (*surles.mark@gmail.com*)

Ronald Azuma (Ph.D. 1995) joined Intel's Interaction and Experience Research Lab, a division of Intel Labs, in June 2012. He now works at the Intel HQ building in Santa Clara, Calif., and has relocated to Silicon Valley. In addition, his paper, "A Survey of Augmented Reality," was selected as one of 50 influential journal articles by MIT Press. These were selected from over 80 MIT Press journals from 1969-2011, covering all academic fields. A link to the paper can be found at: *www.mitpressjournals.org/page/50articles*. (*ronald.azuma@gmail.com*)

Noel Llopis (M.S. 1997) recently sold his most recent game, Casey's Contraptions, to Rovio, the makers of Angry Birds. The game was re-released this summer as Amazing Alex (*www.rovio.com/en/our-work/games/view/45/amazing-alex*) for several platforms. Expect to see Alex alongside Angry Birds everywhere you go. Noel remains an independent game developer and is already working on his next title. (*llopis@gmail.com*)

Alex Blate (B.S.M.Sci. 1999, M.S. 2000) says he is moving back to Chapel Hill to complete his Ph.D. and is elated to be headed back to the Department. Alex will be making a presentation at an upcoming Systems Tea, likely in November 2012. (*blate@blate.net*)

Tom Lassanske (M.S. 2002) has a new job as Principal Software Engineer at IPKeys Technologies, a defense contractor in the New York City area. He serves as Lead Programmer of the team that makes video game simulations for the purpose of training soldiers to find and react to Improvised Explosive Devices (IED), using various counter-IED devices and techniques. (*tlassanske@gmail.com*)

Michele Weigle (Ph.D. 2003) was approved for promotion and tenure at Old Dominion University in April 2012. (*mweigle@cs.odu.edu*)

Tom Hudson (M.S. 1997, Ph.D. 2004) says he is excited to be in London for a year with his family, working with Google's Chrome-on-Android team to make the mobile web's graphics faster. Drop him a line if you're in England! (*hudson@alumni.unc.edu*)

Michael Rosenthal, M.D. (Ph.D. 2005) writes that he has finally finished his medical training and has joined the faculty of Dana-Farber Cancer Institute and Harvard Medical School in Boston as a radiologist. He says that he misses all of his friends back in Chapel Hill. (*mhrosenthal@partners.org*)

Jason McC. Smith (Ph.D. 2005) authored a book, *Elemental Design Patterns*, which was published in April 2012 by Addison-Wesley Professional Publishing. The book was named a finalist in the Jolt Awards: The Best Books from *drdobbs.com*. (*jason@ncpod.org*)

Chad Spensky (M.S. 2010) is living in Cambridge, Mass., working for MIT Lincoln Laboratory in Group 69 (Cyber System Assessments) as a computer security researcher on the low-level systems team. (*cspensky@gmail.com*)

Undergraduate Alumni

Joseph Barnes (B.S. 2002) completed his Ph.D. in Philosophy at UC Berkeley. He has an ongoing teaching post for fall semesters, but is open to suggestions for employment near Berkeley the other eight months of the year. (*jabarnes@socrates.berkeley.edu*)

Shayne Miel (formerly O'Neill) (B.S. 2002) runs the AI Scoring Department for Measurement Incorporated, located in Durham, N.C. They have built a product, Project Essay Grade (PEG), that automatically assigns grades to student essays for use in both practice writing and end-of-year testing. Earlier this year, the company took part in a competition, funded by the Hewlett Foundation, in which nine of the top vendors in essay scoring competed to see whose automated scoring engines produced the most accurate scores (as judged by their proximity to human scores). Measurement, Inc.'s scoring engine outperformed all of the other vendors, including Pearson, Vantage and ETS, on both the essay scoring and the more challenging short answer scoring competitions. (*smiel@measinc.com*)

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Alumni News, continued from page 5

On February 28, 2012, the email marketing company iContact, founded by **Aaron Houghton** (B.S. 2003) while he was a junior at UNC, was sold to Vocus, a publicly traded software company on the NASDAQ. You can read more about the deal at *techcrunch.com/2012/02/28/vocus-buys-email-marketing-company-icontact-for-169-million/*. Since the acquisition, Aaron has begun building a new startup, *BoostSuite.com*, in downtown Durham. They launched the BoostSuite product in beta version on June 5, 2012, and began selling the full version on August 15, 2012. (*aaron1@preation.com*)

Friends of the Department

Dan Pitt, adjunct professor from 1986-1990, is executive director of the Open Networking Foundation, the year-old nonprofit industry consortium that is standardizing the OpenFlow protocol and promoting Software-Defined Networking in all its aspects. Dan and ONF are based in Palo Alto, Calif. (*dan.pitt@mac.com*)

In Memoriam

Cloyd Smith Goodrum III (M.S. 1991) of Charlotte, N.C., passed away peacefully at home on August 16, 2012. Cloyd was born in Davidson, N.C., and graduated with a B.S. in mathematics from UNC-Charlotte before attending UNC-Chapel Hill for his master's degree. He was a professor of computer science in the College of Computing and Informatics at UNC-Charlotte and a coach of the CCI Programming Team.

Comp Sci Gmail Accounts Available for Alumni

The Computer Science department provides alumnus accounts, including accounts in the department's Google Apps domain, to graduates of this department who either received a Masters or PhD degree from this department, or received a Bachelor's degree from this department and have worked for the department for at least two semesters.

Having an alumnus account allows you to log in and see how things are going on our systems and to maintain a small web page, perhaps with pointers to another site. These accounts are limited to 400 MB of home directory space. The accounts do not include cvs, playpen, or ftp space. Optionally, they can include an account on the department's Google Apps domain, including an email account. These include a 25 GB email quota and the ability to control your email forwarding.

Graduate alumni from previous years who are interested in setting up an alumnus account or adding Google to their existing alumnus account should send email to *help@cs.unc.edu*. Graduate alumni from the current year will simply keep their Google mail account, with no changes.

Undergraduate alumni from previous years who are interested in setting up an alumnus account or adding a department Google account, including Google mail, to their existing alumnus account, should send email to *help@cs.unc.edu*. Undergraduate alumni from the current year who wish to have Google mail enabled for their account should send email to *help@cs.unc.edu*.

FAMILY MATTERS

Noel Llopis (M.S. 1997) and his wife, Amy Shamansky, welcomed Adria Elisa in October 2011. (*llopis@gmail.com*)

Ben Wilde (M.S. 2004) and his wife, Allicyn, welcomed Catherine (Catie) Elizabeth in January 2012.

Alex Blate (B.S.M.Sci. 1999, M.S. 2000) married Jennifer "Yani" Copas on February 18, 2012. They are expecting a daughter in March 2013. (*blate@blate.net*)

Claire (O'Shea) Walsh (M.S. 2006) and her husband, Edward, welcomed Anna Ruth in March 2012. Anna joins big brother Sean, 2 ½.

Riley Roberts (B.S. 2005) and his wife, Megan, welcomed Thaddius Riley Roberts IV in April 2012. (*trroberts@gmail.com*)

Russell Gayle (Ph.D. 2006) and his wife, Sarita, welcomed Lucas Rohan in May 2012. (*russ.gayle@gmail.com*)

Joseph Walters (B.S.M.Sci. 2003) married Shannon Renee Brewer on June 16, 2012, in Nags Head. (*joewalters@gmail.com*)

Jasleen Kaur, associate professor, and her husband, graduate student **Darshan Singh**, welcomed a daughter, Bismäd Kaur, in June 2012. Bismäd joins big sister GurMeher, age 6. (*jasleen@cs.unc.edu, darshan@cs.unc.edu*)

Courtney (McCarthy) Ramey (B.S.M.Sci. 2002) and her husband, John, welcomed Miles David in June 2012. Miles joins big sister Anna Grace, 2 ½. (*courtney.ramey@gmail.com*)

Shayne Miel (formerly O'Neill) (B.S. 2002) and his wife, Rebekah, welcomed twins Emeline and Harper in July 2012. (*smiel@measinc.com*)

Joe Tighe, graduate student, and his wife, Marie, welcomed Vivian Felicity in July 2012. Vivian joins big brother, Dylan Joseph, 2 ½. (*jtighe@cs.unc.edu*)

Montek Singh, associate professor, and his wife, Mary Lindsley, became the proud parents of a daughter, Laali, in September 2012. (*montek@cs.unc.edu*)

RECENT PUBLICATIONS

Aikat, J., and K. Jeffay. "Introduction to Network Experiments using the GENI Cyber-Infrastructure (Tutorial)," *Proc. of the ACM SIGMETRICS/Performance Joint International Conference on Measurement and Modeling of Computer Systems*, London, UK, June 2012.

Aikat, J., S. Hasan, K. Jeffay, and F. D. Smith. "Discrete-Approximation of Measured Round Trip Time Distributions: A Model for Network Emulation," *GENI Research and Education Experiment Workshop 2012 (GREE12)*, Los Angeles, CA, March 2012.

Aikat, J., S. Hasan, K. Jeffay, and F. D. Smith. "Towards Traffic Benchmarks for Empirical Networking Research: The Role of Connection Structure in Traffic Workload Modeling," *IEEE MASCOTS (Modeling, Analysis, and Simulation of Computer and Telecommunication Systems)*, Washington D.C., August 2012.

Antani, L., A. Chandak, L. Savioja, and D. Manocha. "Interactive Sound Propagation Using Compact Acoustic Transfer Operators," *ACM Transactions on Graphics*, vol. 31, p. 7, 2012.

Bass, S. A., H. Petersen, C. Quammen, H. Canary, C. G. Healey, and R. M. Taylor II. "Probing the QCD Critical Point with Relativistic Heavy-Ion Collisions," *Central European Journal of Physics*. In press. 2012.

Curtis, S., and D. Manocha. "Pedestrian Simulation using Geometric Reasoning in Velocity Space," *Proc. of Pedestrian and Evacuation Dynamics*, 2012.

Curtis, S., J. Snape, and D. Manocha. "Way Portals: Efficient Multi-agent Navigation with Line-segment Goals," *ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games* (I3D), pp. 15-22, 2012.

Elliott, G., and J. Anderson. "Robust Real-Time Multiprocessor Interrupt Handling Motivated by GPUs," *Proc. of the 23rd Euromicro Conference on Real-Time Systems*, IEEE Computer Society Press, pp. 267-276, July 2012.

Erickson, J., G. Coombe, and J. Anderson. "Soft Real-Time Scheduling in Google Earth," *Proc. of the 18th IEEE Real-Time and Embedded Technology and Applications Symposium*, IEEE Computer Society Press, pp. 141-150, April 2012.

Erickson, J., and J. Anderson. "Fair Lateness Scheduling: Reducing Maximum Lateness in G-EDF-like Scheduling," *Proc. of the 23rd Euromicro Conference on Real-Time Systems*, IEEE Computer Society Press, pp. 3-11, July 2012.

Golas, A., R. Narain, J. Sewall, P. Krajcevski, P. Dubey, and M. C. Lin. "Large-Scale Fluid Simulation using Velocity-Vorticity Domain Decomposition," *SIGGRAPH Asia 2012*, vol. 31, 2012.

Guy, S. J., J. van den Berg, W. Liu, R. Lau, M. C. Lin, and D. Manocha. "A Statistical Similarity Measure for Aggregate Crowd Dynamics," *ACM Trans. on Graphics (Proc. of SIGGRAPH Asia)*, 2012.

Guy, S. J., S. Curtis, M. C. Lin, and D. Manocha. "Least-effort Trajectories Lead to Emergent Crowd Behaviors," *Physical Review E*, vol. 85, p. 16110, 2012.

Herman, J., C. Kenna, M. Mollison, J. Anderson, and D. Johnson. "RTOS Support for Multicore Mixed-Criticality Systems," *Proc. of the 18th IEEE Real-Time and Embedded Technology and Applications Symposium*, IEEE Computer Society Press, pp. 197-208, April 2012.

Kim, S., S. J. Guy, M. C. Lin, and D. Manocha. "Predicting Pedestrian Trajectories Using Velocity-space Reasoning," *Algorithmic Foundations of Robotics X: the Tenth International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2012.

Liu, C., and J. Anderson. "An O(m) Analysis Technique for Supporting Real-Time Self-Suspending Task Systems," *Proc. of the 33rd IEEE Real-Time Systems Symposium*, IEEE Computer Society Press, December 2012, to appear.

Liu, C., and J. Anderson. "Supporting Soft Real-Time Parallel Applications on Multicore Processors," *Proc. of the 18th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications*, IEEE Computer Society Press, August 2012.

Manocha, D. "Technical Perspective: Building Robust Dynamical Simulation Systems," *Communications of the ACM (CACM)*, vol. 55, p. 101, 2012.

Pan, J., and D. Manocha. "Bi-level Locality Sensitive Hashing for K-nearest Neighbor Computation," *IEEE International Conference on Data Engineering (ICDE)*, pp. 378-389, 2012.

Pan, J., L. Zhang, and D. Manocha. "Collision-free and Smooth Trajectory Computation in Cluttered Environments," *International Journal of Robotics Research (IJRR)*, vol. 31, pp. 1155-1175, 2012.

Pan, J., S. Chitta, and D. Manocha. "FCL: A General Purpose Library for Collision and Proximity Queries," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3859-3866, 2012.

Park, C., J. Pan, and D. Manocha. "ITOMP: Incremental Trajectory Optimization for Real-time Replanning in Dynamic Environments," *International Conference on Automated Planning and Scheduling (ICAPS)*, pp. 207-215, 2012.

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THE UNIVERSITY OF NORTH CAROLINA
CB# 3175, BROOKS COMPUTER SCIENCE BUILDING
CHAPEL HILL, NC 27599–3175

EDITOR
KELLI GASKILL
gaskill@cs.unc.edu

GENERAL INFORMATION
VOICE: (919) 962-1700
FAX: (919) 962-1799
E-MAIL: info@cs.unc.edu
WEB: www.cs.unc.edu

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UNC COLLEGE OF ARTS & SCIENCES

Junior computer science major Gautam Sanka (above, center) is an aspiring doctor and recipient of a 2012 Burch Fellowship from UNC. The fellowship provided him with funds to travel to India in summer 2012 to work with a nonprofit organization that provides healthcare to rural populations. The organization sends a physician to the villages it serves three out of five days a week, and operates a remote diagnostic service two days a week. Gautam worked with the nonprofit to create a mobile app that would enable the healthcare providers to track patients in real time and provide better diagnostic services. The app also allows for improved record keeping for the organization.

In addition, Gautam created a mobile app for insurance vendors in India working with one of the hospitals there. The app allows for an electronic insurance card for patients that the insurance companies could easily create, upload to a database, and view.