WiCS: Celebrating Women in Computer Science

In October 2004, four members of the Department of Computer Science's Women in Computer Science (WiCS) group — Sarah Bell, Sara Hillenmeyer, Danielle Karr, and Stacy Wong — traveled to Chicago to attend the 2004 Grace Hopper Celebration of Women in Computing entitled "Making History."

From the press kit, the Grace Hopper Celebration of Women in Computing is "a world class technical conference for women in the field of Computer Science providing a forum to inspire, educate, encourage and create awareness of opportunities for women in the field of computing and to celebrate the considerable achievement of women in the field." The celebration is named for Admiral Grace

photo by d.karr

Danielle Karr, Sara Hillenmeyer, Stacy Wong, and Sarah Bell celebrate in Chicago.

Murray Hopper, one of the pioneers of computer science. She joined the Navy WAVES (Women Accepted for Voluntary Emergency Service) in 1943 during World War II and was charged with the programming of the Mark I electromechanical computing machine. She went on to invent the compiler in 1953. The most well-known image of Hopper is her warning her students to "remember your nanoseconds" while brandishing twelve-inch lengths of wire, indicating how far an electron can travel along the wire in a nanosecond. Her vivid push for coding efficiency – and general excellence – embodies the positive spirit associated with the Grace Hopper Celebration.

In addition to touring the lovely city of Chicago, Sarah, Danielle, Stacy, and Sara attended a variety of panels, lectures, and presentations organized by the conference. Notably, three events featured Brown alumnae. Sarah Allen ('90.5) of Laszlo Systems gave a talk on "Designing the Next-Generation Web UI in a Declarative XML Framework." Seema Ramchandani '02, Sc.M. '03 moderated the panel "Choosing Industry and Still Studying: Recent Graduates Share Insight into the Reality of the First Years of a Corporate Career," and Katrina Ligett '04 and Rachel Weinstein '02 participated in the panel "The Role of Mentoring in Recruiting and Retaining Female Undergraduate Students in Computer Science."

The Grace Hopper Celebration also included opportunities to meet representatives from Microsoft, IBM, Google, and other top companies, something welcomed by the three seniors in the group, Sarah, Danielle, and Stacy. All attendees made sure to participate in the social events, dances, and party that made the conference a true "celebration."

The Grace Hopper Celebration is held every two years, the next one to be held in October 2006 in San Diego, CA. More information can be found at www.gracehopper.org.

Other WiCS events over the past year have included lunches with Google engineers, our very own Jen Rosenbaum '04 from Teach for America, and new department member Chad Jenkins. Most recently, WiCS sponsored "Kabob and Jobs," a dinner during which current seniors (and alums Kit Colbert '03 and Miriam Goldberg '04) shared insights about the job search and interviewing process. Future events include a bagel lunch with department newcomer Meinolf Sellmann, as well as a meeting to discuss course registration. The semester's events will culminate with the annual senior brunch.

If you have questions, ideas, or want to get involved with WiCS, please e-mail wics_coord@cs.brown.edu.

– Danielle Karr '05

Robert Redford is (Like) a Robot

In "Sneakers", Martin Bishop (Robert Redford) gets thrown in the trunk of a car and taken to meet his best-friend-turned-nemesis Cosmo. Later, he tries to figure out where the meeting took place. He doesn't know where it was because he was in the trunk of a car and didn't see where they went. He did, however, hear what was going on during the ride. With the help of his friend Whistler (a blind man), he successfully recreates his journey based on what he heard, and goes on to save the day and win the girl.

Put another way, Bishop uses his sense of hearing to recreate a path through physical space. He is able to separate out the important sensory input from all the background and assign them to real-world places. This skill turned out to be quite useful for him, as it would for a robot as well.

"But Dan!" you cry, "Robots don't get kidnapped and driven around in the trunk of a car!" Quite right, but they do have to make sense of a lot of sensor input to maneuver in the world.

One of the areas of robotics research that deals with this issue is simultaneous localization and mapping (SLAM). In SLAM, a robot tries to make a map and locate itself in it at the same time. Maps usually take one of two different forms. Metric maps record the locations of everything in a space but take up a lot of memory. Topological maps simply record connections between different subsets of the space, taking up less memory but still allowing useful things like path-planning. Think of the maps near the elevators of the CIT: these are topological maps since they show the different regions of the floor and how they are connected.

To create a topological map, the world needs to be divided into regions. Every space in the world thus needs to be assigned to a region class. This is equivalent to answering the question "What kind of space am I in?" For humans, answers may include such classes as "Room", "Hallway", "Closet", and "Atrium."

Robots, however, can have different answers because robots have different sensors. Humans have five senses that they use to figure out the space class they are in. Robots, instead, must use such things as sonar, lasers, radiation and chemical detectors. These sensors react to different signals in the environment, so that robots perceive the world differently. Robot space classes, then, must be distinguishable to these sensors.

Robots are often taught to classify space in the same way as humans. That is, humans try to describe how a specific class, such as "Room", would look to the robot. I think it is better to let the robot develop its own space classes, based on its own sensor capabilities.

To do this, we view the robot's sensor input as a high-dimensional space, with each set of readings a point in that space. So, for a robot with 24 sonar sensors, each set of readings is a point in 24D space. Given a set of readings, we use nonlinear dimension reduction to find a lower (5-10) dimensional manifold that fits this data. This embedding is a transform of the data that captures almost all the pertinent information. We then use Bayesian clustering to discover sensor data classes in this space. That is, we take physical space classes to correspond to a Gaussian distribution of sensor readings in the embedded space.

Once we have these classes, it is a simple matter to decide the class of space from which new readings come. New sensor data is taken from the high-dimensional input space into the embedded space and then classified according to the Gaussian model we learned.

These classes need not correspond to the human classes for the same space. As an example, we ran our system on sonar and infrared readings from a section of the CIT's fourth floor. While we break the area up into two basic classes, our method shows that the robot can actually distinguish six distinct types of space. As a test of utility, we took new readings from the same places and reclassified them using the classes we learned from the first data set. We're pleased to say that readings from the same physical space were classified the same, showing that the robot can answer the question "What kind of space am I in?"

– Dan Grollman is a current Ph.D. candidate

An Internship at Pixar is Truly "Incredible"

This winter break, I received word from Pixar Animation Studios that I had been accepted for their technical director internship program. I began the internship on January 24th and so far have been at Pixar for about two months.

As a technical director intern, I've been placed to work on Pixar's film due in 2007 (after "Cars") in the Global Technology department. Global Technology works on developing technology specific to a film (whereas the Tools department might work on technology used on several or all projects). My work has primarily consisted of developing and optimizing the character models the animators will be working with. Pixar is doing lot of interesting things with the character models in this film that will make the characters appear to react more with each other and their environment. It's been very interesting to see the system of defining deformations in a character and building the models for animation.

Everyone I've met at Pixar has been very friendly and very smart. It's sometimes intimidating to walk down the halls and realize that a lot of the names by the doors are names I've seen on many papers in computer graphics. Even so, there's little pretentiousness and everyone is very open if I come to them for advice or help.

photo by e.chang

Jack-Jack joins in the celebration for the two Oscars awarded to 'The Incredibles'.

I usually work with other technical directors but have also had the chance to work with some animators as well. The technology my department develops is usually to the needs and requests of the animators. The animators provide regular feedback on the tools they use and as a result the tools become tailored specifically for what they need. Collaboration between both the technical and artistic sides of computer animation is key, and both sides meet frequently.

Aside from work, I've also had the opportunity to take a class in figure sculpture in Pixar's "Pixar University" program. Classes are offered in art and film as well as technical training, allowing employees to expand beyond their own fields. After sitting in front of a computer screen all week, it's nice to be able to exercise yourself artistically.

Part of the fun of being at Pixar has also been being here for the Oscar celebrations. After "The Incredibles" won two Oscars, Pixar celebrated by having champagne for all of its employees in the atrium while Brad Bird and John Lasseter recounted their stories from Hollywood. It was great to be part of the celebrations and be there when all 800 employees lifted their glasses to congratulate one another on their success.

Pixar has been a great place to work at; being here makes clear how its unique environment has made of each of its films such a success.

– Edwin Chang '05.5