■ WPI COMPUTER SCIENCE NEWSLETTER ■

SIGNIFICANT BITS

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HEAD'S REMARKS

by Prof. Bob Kinicki

This is our second issue of Significant Bits. Our goal is to provide CS alumni with an update on our activities and peak your curiosity enough to get you to return to Worcester this fall for our 25th Birthday Party.

In the first issue I spoke of life in the WPI CS Dept. moving at warp speed. Well, those were the good old days! New technologies such as the World Wide Web have expanded the dimensions and accelerated the speed of information transfer in the CS community. The department's faculty are continually challenged to keep pace with the new innovations provided by the computer industry while furthering their knowledge of specific research niches.

When CS moved into Fuller Labs in January 1990, the department had 165 CS undergraduate majors. Current estimates that include the Class of 1999, show that number reaching 275.

This spring CS completed a 4 year cycle of undergraduate curriculum adjustments. The latest changes focused on moving computer science theory down into a 3000-level course while adjusting our 4000-level concentration areas. The changes coincided with a Computer Science Accreditation Board site visit, and we believe that they improve our chances for re-accreditation.

Although we currently teach C++ in a sophomore course, Paradigms of Computation, we are debating where and how to introduce C++ earlier in the curriculum. This issue is complicated by the fact that most WPI students now take the Introductory Programming in C course.

The most significant trend in CS at WPI is the movement of the faculty interests into interface areas which involve other departments. Recent years have seen CS faculty involvement in Computer Music, AI in Manufacturing, Electronic Documents, Information Technology, Fire Protection Engineering, and Computer and Communication Networks.

These interests have spawned student projects in Virtual Reality, animation, robot putting, and network management. With the addition of Dr. Jeff McWhirter to the CS faculty this fall, the Department will have additional capabilities in user interfaces and visual languages.

Graduate level research opportunities continue to expand. Prof. Brown's AI in Design work has received international recognition, the Gaea project on spatio-temporal databases has broken new ground and the Computer and Communication Networks program offers grad students 5 courses in the networks area.

We hope you enjoy this issue of Significant Bits. Please let us know your reaction and update us on your careers. We intend to maintain a CS alumni e-mail database, so send us your email address and those of your WPI CS classmates.

CS Department Advisory Board

by Prof. Matt Ward

An Advisory Board is selected from industry, academia, and government to provide guidance to a department, about curricular, research, and resource issues, as well as strategies for enhancing our reputation with industry, universities, and funding agencies. Advisory Boards usually include successful departmental alumni who understand the current state and future directions of CS, and who can advise and promote our department.

The CS Department feels that an Advisory Board will be of great benefit and has started to select an initial group of members. If you would like to nominate someone (including yourself) to be considered for Board membership, please contact Prof. Kinicki.

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DEPARTMENT'S 25th BIRTHDAY

by Prof. Dave Brown

WPI CS is 25 years old! or 26, or 27! The undergrad program started in 1970, the grad program in 1969, the first faculty member in 1968.

We will have a celebration on **Saturday 30th September, 10-noon, Fuller Labs,** during the Homecoming weekend. You are ALL invited--all 2000 of you! If you are in contact with other CS alumni then *please* contact them to let them know about this event. We'll have cake, balloons, open labs, and family fun. **We look forward to seeing you here!**

CCN

by Prof. David Finkel

The CS Dept. and the Electrical and Computer Engineering Dept. have established a new graduate specialization in Computer and Communications Networks (CCN). Students enrolled in this program fulfill all requirements for either the MS in Computer Science or the MS in Electrical Engineering. In addition, they take a sequence of electives in the CCN area and complete a six-credit practice-oriented internship.

The objective of this program is to prepare graduates for technical leadership positions in the design and implementation of computer and communications networks, including local and wide-area computer networking, distributed computation, telecommunications (including voice, data, and video services), wireless networking, and personal mobile communications.

On a full-time basis, the degree may be obtained in 12 months. A part-time option is available with cooperating corporations, with completion in 2 years. Five new courses are being offered for CCN, including Local Area Networks, and Telecommunications Public Policy.

The internship project is a high-level network engineering experience, tailored to the specific interests of the student. Each project must be carried out in cooperation with a sponsoring organization. To date, 5 internship have been completed or are in progress. Sponsoring companies include Digital Equipment Corporation, Chipcom and Cabletron. Internship topics include Network Management Protocols, Sampling-Based Network Management, and the Design of an Inexpensive Ethernet Switch.

A new CCN lab in Atwater Kent with several workstations and a network analyzer, runs as part of the campus network or isolated. CCN students have already used the lab for course project work. Our goal is to improve the lab through purchases and corporate donations, to provide our students with access to a wide variety of up-to-date networking hardware and software.

TEACHING USING THE WEB

by Prof. Karen Lemone

Introduction: On May 8th, I met with the 15 students who had responded to a posting about my summer Web-based Electronic Documents course. Halfway through the course, all 15 remain, and are doing great!

The Electronic Documents course has been taught for the last few summers in the traditional mode, but it seemed to me to be an ideal course to try to teach using distance learning on the Web. The first and last class are on-campus, with everyone required to attend. The remaining weeks are all done as Web lectures.

The Students: The students have a wide range of backgrounds. There are undergraduates, graduates, and WPI staff members enrolled.

The Course: In many ways, the course is traditional. There are weekly readings -- usually a few pages written by me, and a few appropriate Web references. I "post" the lecture at the beginning of the week as web pages. Homework, based on the reading, is due at the end of the week.

There is also an evolving project -- so far, a document specification and an introduction have been due. Each week, they will produce and revise their document. Many of the projects are Web documents with topics such as Violin Concertos, Rock Bands, a Robot Language Tutorial, and numerous pages relating to work-related projects. A few students are doing Web research. One student is creating a Web server at work, another is creating a test site for his Ph.D. thesis.

Evaluations: The students filled out evaluations at the end of each week. The first week's comments showed that a few students were experiencing problems with system issues, and wished that WPI had more help available. In some cases, it was difficult to help them over the telephone or by EMail. By the fourth week, even these students indicated that they didn't really need extra help anymore.

More than half the class has indicated that they feel somewhat isolated from both the instructor and their classmates, but more than 3/4 of them have said that they would take a course this way again. Students vary in the amount of time they have been spending, with some as low as 3-4 hours, some much higher (especially the first two weeks). The average seems to be around 8 hours per week.

The instructor, however, has been spending virtually (pun intended) her whole life on the course -- preparing lectures, reading projects and homework, and responding to EMail. A second-time through will surely take less time. Much time has been spent on-line, over long-distance phone lines with an Internet provider.

Conclusions: The students morale is high -- much higher than I expected. I am really surprised that everyone has stayed in the course. Preliminary analysis seems to indicate that students are willing to take a course this way when it is not possible or easy to get to a class on campus. It appears that this way of learning is sufficient, but not optimal.

Would I do this again? Yes, I think so. That's if the telephone company doesn't shut off my phone because I was unable to pay my bill from this first version of the course!

PEER LEARNING ASSISTANTS

by Prof. Craig Wills & David Finkel

CS 2005, covering data structures and advanced programming in C, is taught twice a year to about 130 students each time. They are a diverse group--majors and non-majors, with varying experience. This student diversity and the large class sizes making teaching the course a challenge. Our approach uses programming projects performed in groups, to create a sense of group solidarity and to have the students accept more responsibility for their own learning and for helping their group members. The approach allows students to work on larger programs than they could individually, so as to learn first-hand lessons about organizing, programming, and integrating large-scale programs.

To facilitate intra-group interaction we used advanced undergraduate students as Peer Learning Assistants (PLAs), a technique used successfully in other courses at WPI. Each group was assigned a PLA, who has front-line responsibility for dealing with intra-group dynamics problems and for providing preliminary programming help. Thus, the role of the PLA was not the chief designer, but an advisor, answering student questions and keeping them focused on the task. As the project progressed, the student groups met regularly to review each student's progress, and to modify the previous design. The PLA was expected to keep track of the groups' progress by attending occasional meetings and communicating via e-mail.

A weekly staff meeting was held with the instructor, graduate Teaching Assistants and PLAs involved in the course. In the meeting we discussed problems and plans for the coming week. The PLAs' main input to the staff meeting was to discuss their group's problems. The meetings also allowed the PLAs to share experiences and offer each other advice. Meetings provided feedback to the instructor about student problems with the course material or the assignments.

The use of PLAs was a tremendous success. The group projects taught the students valuable lessons about dealing with large programs and a team approach to programming. Without the PLAs, the burden of dealing with group problems as well as the usual student questions about the course material would have been overwhelming. Surveys of the PLAs involved in the course also indicated that being a PLA was a positive experience for them.

CURRICULUM CHANGES

by Prof. Nabil Hachem

Over the past 2 years, the department's undergraduate curriculum has undergone several major modifications. The changes were driven by the need to:

- present an integrated sequence of sophomore level courses that cover the areas of programming languages and techniques, computer organization, data structures, and analysis of algorithms;
- introduce theoretical aspects of computer science at an early stage, so that concepts such as automata and grammars can serve as a foundation for advanced courses;
- establish multi-disciplinary programs in a fast-changing technological field;
- provide additional flexibility for students majoring in other areas to acquire CS knowledge.

The changes that occurred include:

- at the Freshman-Sophomore level, the 2000-level courses were revamped by:
    - the introduction of a 2-course sequence on programming language concepts that introduces students to fundamentals and then advanced concepts, such as functional programming, object-oriented programming and logic programming;
    - the consolidation of computer organization into one course and the offering of a new algorithms course.
- at the Junior-Senior level:
    - the creation of a new "foundations of computer science" course and the subsequent consolidation of the 3000-level sequence into the areas of operating systems, human computer interactions, social implications, software engineering, and theoretical foundations;
    - the re-alignment of the area requirements of the CS degree distribution requirements.

Currently, the department is seriously considering the addition of a computer engineering specialization degree and a minor in computer science. The objective of the specialization will be to enable students to graduate with a concentration on the interaction of hardware and software; while the objective of the minor will be to let students, majoring in other fields, acquire essential knowledge in computer science that they can apply to their major area of studies.

FACULTY PROFILES

Please welcome...Jeff McWhirter

I received a B.S. in Computer Science from Oakland University in Rochester, Michigan in 1986. I worked for Electronic Data Systems (EDS) for a short time in Detroit and then went out to Boulder, Colorado for graduate school. I received my Ph.D. in Computer Science in May, 1995.

My research and teaching interests are centered around software tools and systems, specifically including user interfaces, visual languages, application generation, simulation, performance tools, distributed systems and object oriented frameworks. In my dissertation research I have focused on visualization by defining a conceptual model for describing the appearance and behavior of a large class of visual languages and interfaces.

Based on this model, we have constructed an application development environment, called Escalante, that supports the high level specification and generation of visual language applications. Escalante has been used to con-

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struct approximately 40 applications in such domains as discrete event simulation, parallel program performance visualization, computer supported cooperative work, interactive games, and educational technology.

My future research will explore the use of visual languages to facilitate the construction, manipulation and understanding of complex information structures and processes. An example of this effort is the construction of a suite of interactive visual learning tools to aid in undergraduate education in the areas of formal languages, data structures and program semantics.

My wife MaryAnn and daughters Amanda and Laura are looking forward to our new home (our first) in Rutland, MA. We have been in Boulder for the past seven years so it will be hard to leave our friends and the mountains but we are excited about coming to a new part of the country.

FACULTY NEWS

Prof. Michael Gennert's sabbatical.

Since last July I have been at the Visualization and Intelligent Systems Laboratory, Univ. of California, Riverside (UCR). I have been researching, writing papers and proposals, attending seminars, and exploring new areas of Computer Science. And, of course, enjoying Southern California with my family!

For me, the sabbatical actually began at WPI in January, 1994, when I offered a course on Denotational Semantics (DS), a methodology for understanding the meaning of computer programs. I had wanted to learn DS to tackle problems in the semantics of data and metadata in databases.

More recently, I have been studying Category Theory (CT), an abstract branch of Mathematics dealing with objects and relations among them -- sort of a mathematical theory-of-everything. CT provides a context for understanding DS.

Both DS and CT have been useful in my research, and I will be incorporating select elements into my classes (Programming Language Concepts and Discrete Mathematics) and into projects as well.

UCR has been an exciting place to work. Being a state school has advantages, such as billing the taxpayers for a new College of Engineering building, and disadvantages, such as voters rejecting funding a sorely needed engineering library.

We had a minor earthquake. The weather is mostly excellent; what Californians call a cold, wet winter would pass for hot and dry in New England, although summer's heat and smog were brutal. Rush hour in Greater Los Angeles is Hell paved over, but I ride a bicycle and it only takes 6 minutes, so what do I care?!

Although it has been a great experience, I am looking forward to returning to Massachusetts and WPI. But I'll miss the hot tub!

Prof. Stanley Selkow's sabbatical

While on sabbatical leave, Stanley Selkow was an invited professor at the Universite de Marne-la-Vallee in Paris. Aside from teaching, he did research on graphical enumeration and computational geometry.

ALUMNI

Let us hear from you!

We are interested in email from alumni. We can't include full messages in the newsletter, but we'll try to include selected information. Contact us via email or real mail. Let us know your web home page URL too. We'd like to add pointers from our pages to yours.

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