

Computer Science Department 2004-2009 Plan

Executive Summary

First and foremost, the department continues to be committed to maintaining and improving its existing undergraduate programs in computer science and MIS as well as its Masters program in computer science. It is also committed to improving its PhD program and externally funded research programs. During the past five years, the department has taken on a number of important activities outside of our core with an expectation of increased resources. Since these resources have not materialized, the effect of these new activities has been detrimental to quality of our core programs. Hence, in the next five years, we will discontinue or significantly streamline these extra-core activities and focus on rebuilding our core. While we have not achieved all of our research goals over the last five years, we have had important successes such as significantly increased international visibility for our applied Formal Methods research. We plan to continue building our research programs in a way that also benefits our core instructional programs.

Progress on 1999 Plan Action Items

One of the chief accomplishments for Computer Science in the last five years was our move to the College of Engineering. The result of this has been to move us to a modern facility with state-of-the-art computing for our faculty and students at all levels. It has also moved us into a more supportive atmosphere. Moving into Engineering has also resulted in some resource savings that have been achieved by combining courses between Electrical and Computer Engineering and Computer Science.

A goal of our previous five-year plan was to increase our faculty number from 8 tenured or tenure-track, 2 APLs, and 2 lecturers in order to better support our programs. Unfortunately, our current effective man power situation is worse than it was five years ago. We currently have ten tenured or tenure-track positions with one dedicated to Health Science. We have two APLs dedicated to teaching and no lecturers. Further, we are spread more thinly than we were five years ago since we now support the eBusiness Masters program in which we teach 15 credit hours per year. Hence, we have failed to achieve this goal.

Another goal of our previous five-year plan was to build an international reputation in applied Formal Methods. We hired two replacement faculty to bring the number of faculty in this area to five. We won several grants in this area between 1999 and 2003 and have substantially increased our international visibility. Hence, we have made significant progress on this goal.

Another goal of our previous plan was to increase the quality and student numbers in our Ph.D. in Computer Science. Five years ago, we had 1-2 Ph.D. students and in 1999 the one student to take the Ph.D. qualifier failed it. This past academic year, we had ten Ph.D.

students, with four taking and passing the Ph.D. qualifier. One student graduated with his Ph.D. this year. Hence, we have made significant progress on this goal.

Curriculum

Computer science and Management Information Systems education changes rapidly. As a result, we have made many changes to our course content over the last five years and will continue to do so for the next five years. The changes to our undergraduate programs have been to align them with the Association for Computer Machinery's 2001 Curriculum. Among other things, this curriculum describes specific outcomes for each course. Not only will these outcomes assist us in further standardizing our courses between instructors, but it is also a first step in improving our assessment activities. Some of the changes over the last five years include:

1. A redesign of our introductory programming sequence that included the addition of a new first-semester course.
2. A redesign of our LISP course into a functional programming course. This redesign involved moving the course from two to three credits and from the 2000 to the 3000 level.
3. Complete redesign of our MIS program in coordination with COB to include courses from their Management Information Sequence.
4. The addition of a 4000-level course in Enterprise Computing. This is an entirely new area of computer science and teaching this material gives our students a significant advantage in the job market.

Assessment

Our undergraduate Computer Science program is accredited by the Computer Science Advisory Board (CSAB). We have been accredited since 1999. Since then, the CSAB has become an accreditation commission of the Accreditation Board for Engineering and Technology (ABET). As a result, computer science accreditation now requires a more significant assessment component than in the past. In preparation for our AY2003-2004 visit from ABET, we have begun to increase our assessment activities.

1. We have formed a committee of our introductory sequence instructors. This committee meets once a semester to discuss issues that occur between the introductory sequence courses such as expected preparation was not adequate in a prerequisite course.
2. We now survey our graduating majors and our fifth-year graduates.
3. We formed the first ever Computer Science Department Advisory Board which had its first meeting April 28 2003. A written report from the board is expected this summer.

We plan a number of additional assessment activities in the next five years (see Action Items below).

Areas of Distinction

The department has three areas of research strength:

1. Applied Formal Methods and Automated Software Engineering - This research is focused on mathematical theory and methods needed to increase the quality and

reliability of software. Several federal agencies and industrial concerns have recognized that correctness of software systems is an increasingly critical problem.

2. Spatial and Geographical Databases - This research is focused on techniques to increase the effectiveness and efficiency of storage and access to Spatial and Geographical data.
3. Robotic Swarms and Sensor networks - This research is focused on the design and analysis of physics-based control algorithms for robotic swarms. The methods are being applied to address important tasks related to Homeland Security, such as chemical plume tracing, surveillance, and perimeter defense.

All three of the areas have the potential for exciting interdisciplinary efforts with other University departments. In fact, the work in Spatial and Geographical Databases is already a joint activity with SDVC and the Robotic Swarm and sensor network effort is already joint with Mechanical Engineering, Electrical and Computer Engineering, Physics, and Chemistry. We intend to strengthen the interdisciplinary aspects of all three research areas in the next five years.

The success of the department in strengthening our research programs is of critical importance to the University and State and will also have a positive effect on our core programs. Strengthening our research program in applied Formal Method and automated software engineering contributes to the distinctiveness of UW in "Critical areas of science and technology" as put forth in Moving Forward III (page 8). Software engineering is at the foundation of all principled software development. The work of our Formal Methods group contributes to the science and engineering of correct and reliable software.

Strengthening our programs in the other two areas contributes to the distinctiveness of UW in "Environment and Natural Resources" (page 6). For example, the purpose of the chemical plume tracing task is to recover from accidental or intentional release of toxic chemicals. This same technology has application to atmospheric science and the monitoring of complex natural systems. As another example, the spatial and geographical database work has application to a number of geographical information sciences initiatives mentioned on Moving Forward III (page 7).

All three of these programs contribute to the goal of creating a robust community of computational scientists at UW (MFIII page 8) They also contribute to the "Professions and issues critical to the region" area of distinction put forth in Moving Forward III (page 8) by creating expertise at UW of interest to various business concerns.

Departmental Issues

Our ability to increase our faculty numbers as we planned has been curtailed by lack of expected resources. As a result, our core programs are currently at risk. We have developed goals for the next five years under the assumption of no faculty resource growth.

Another important issue is that we must be vigilant in maintaining our state-of-the-art facilities. Equipment should have at most a three year lifetime. This includes not only our desktop machines, but also our servers and networking equipment. We need to replace and modernize our general undergraduate lab, expand and modernize our graduate student lab, expand and modernize our teaching lab, expand our networking lab, and modernize all faculty computers. In addition, all of our PhD students should have machines on their desks.

Action Items for 2004-2009

We plan to better align our faculty resources with student demand for our core programs. We will accomplish this as follows:

1. We will discontinue our role in the eBusiness program but will participate in a dialog with COB to determine how to combine resources that are currently devoted to our MIS program and COB Information Management Sequence to improve those programs and reincarnate the eBusiness program in some form.
2. We will discontinue our role in Health Sciences.
3. We will expand and reorganize our course offerings in our undergraduate Computer Science program, offering two new undergraduate courses per year.
4. We will reorganize and update our course offerings in MIS and increase our interaction with the COB in delivering this program (as per item 1 above). We will also consider changing the MIS major to a Computer Science major with a Business emphasis.
5. We will eliminate the Professional Masters program but expand our graduate-level course offerings in our regular Masters and Ph.D. programs by two courses per year. The freeing up of our existing faculty to teach more graduate-level courses and the recruiting of new faculty is essential to our introducing new and valuable graduate-level courses.
6. We will increase our efforts to obtain external funding for research. To do this, will we focus on joint proposals between faculty in our college and on proposals with external entities that we believe will increase our chances of success in obtaining such funding.
7. {Assessment action items.}

We plan to continue building in the Formal Methods area. Specifically, our goal is to increase the external funding level in this area to \$500K per year. To accomplish this does not require hiring additional faculty in applied Formal Methods, rather the principal impediment is the general lack of faculty resources discussed in the last section. Hence, our goal is to realign faculty resources in order to focus on our core research and educational programs.