Science Masters Program in CS
(Pre-Proposal by S. G. Kobourov and R. Leiva)

1 Introduction

The Department of Computer Science is developing a Science Masters Program (SMP) degree. While our current MS program (in place since 1974) has a long and successful history with several hundred graduates, a SMP degree will address new and specific needs. Several of the traditional employers of our MS graduates (e.g., IBM, Raytheon) expect more than a solid education in the foundations of our field. Specifically, employers of our MS graduates expect knowledge of business practices, employee management and ethics – something that our traditional MS program does not provide. Furthermore, current employees of BS graduates would like to have their employees work towards a MS degree as full time workers – once again, something that our traditional MS program does not provide. Our proposed SMP program will solve both problems with an innovative curriculum which includes practical experience and core business coursework and by offering online and web-content coursework for those working full time. As NSF requires "readiness to start the program expeditiously" we will first extend our current MS program into a SMP program that would begin in the fall of 2010. In the next year or two we would match growth of SISTA and the accreditation of SISTA degrees and offer new SMP tracks (e.g., BioInformatics SMP in the fall of 2011).

2 Recruitment, Mentoring, Retention and Graduation

The department actively works to recruit students for the traditional MS and PhD programs. We also work actively on attracting underrepresented groups and minorities to our programs. For example, the department sponsors the Women in Computer Science club and the ACM club on campus. In the fall of 2009 the annual meeting focused on issues of Women in Computer Science, the Grace Murray Hopper Convention, will take place in Tucson. Our field has had historical problems with very low female representation and this event will put us in touch with over 700 female students in the field. We are confident that we will be successful in attracting many attendees to our current programs. We will build on such recruiting efforts in advertising our new SMP program. We expect that in the following years, the multi-disciplinary tracks of the SMP program (e.g., BioInformatics) would also serve to attract students.

The department has a very successful retention rate of over 80% in the current MS program and we believe this will also be the case for the SMP program. Each graduate student is matched with a faculty mentor and a senior graduate student mentor. We have found this helps the students acclimate to the department and become participating members of the community immediately upon commencing their program of study. There is an active CS graduate student council that all CS grad students are encouraged to be a part of to build a stronger department/student relationship.

3 Needs Assessment

We have heard from several local employers that they would like our graduates to have some knowledge of business and management. We have also heard from many employees with BS degrees that they would like to be able to take our MS program without losing their full-time employment status. Local businesses have also encouraged their employees to return to school and earn their MS degree from our department. The employers value the education our department imparts to our students. The collaboration between CS and industry shows the strength of our MS program and the quality of students we are able to recruit and graduate. We are currently discussing details of the proposed SMP program with representatives from IBM (Gail Spear, Distinguished Engineer in Storage Architecture, IBM) and Raytheon (George Ball, Advanced Information Technology, Raytheon). We expect active involvement on the part of local industry on the SISTA board of directors which would also help guide the development of relevant tracks of our SMP program.

4 Workforce Need

The department also offers a dual degree in partnership with the Eller College of Management. We have successfully graduated three dual degree MBA/CS students (two were IBM employees; the third was highly

recruited and upon graduation was employed by Google). While the dual degree program is an excellent collaboration tool between CS, Eller, and industry, the length of time (3 years) it takes for the students in the program to earn their degree can be prohibitive to an employer. Therefore the SMP with the online component will better meet industry and student needs. The SMP will allow employees to return to school and take classes as they fit into their work schedules, therefore limiting their time away from work.

5 Curriculum

Initially building on our existing MS program, we would expand the course requirements by adding business coursework and practical training. Specifically, the SMP curriculum will consist of 6 core computer science courses, 2 business courses, and 2 semesters of internship/co-op work. The computer science courses are divided into areas (Theory and Algorithms, Software Systems, Computing Systems) and SMP students will take two courses from each core area. There will be several business courses offered (e.g., business practices, employee management, ethics) and SMP students will take two of these courses. Summer internships will be reviewed by the SMP program coordinator.

6 Innovative Education

All the CS coursework is taught by active research members of the department. In addition to the traditional in-person lectures, all the SMP coursework will be available online. Building on the experience gained in delivering online coursework for undergraduate program, as a part of the SISTA project, we are confident that we can immediately make all necessary coursework available online. The NSF CFP makes it clear the "readiness to start the program expeditiously" is critical – we are confident that we can hit the ground running in less than 12 months, in time for the 2010-11 academic year.

7 Research Experience

We will build on already strong ties with local industry (about 74% of our recent MS graduates spent at least one semester as interns in IT companies). In the SMP program all the enrolled students will gain research experience through summer internship work in AZ businesses, utilizing the skills they are learning in their courses. As we add tracks to the SMP programs, we expect to expand the number of local companies who would offer internships and eventually hire our SMP students.

8 Assessment of Project Effectiveness

The SMP will utilize internal assessment methods such as curriculum review, student surveys, and alumni surveys. Students will be assessed at the end of each course based on their performance and mastery of the material. Graduate faculty will review course content and student grades (including drop, withdraw, and fail rates) on a regular basis and make adjustments to specific courses and the curriculum as needed. Students will provide feedback on courses and the programs at various times throughout their academic progression. Faculty and academic professionals will use this input to adjust the curriculum as needed, as well as track graduate trends in employment and higher education. After graduation, alumni will be contacted for updates on employment demographics, as well as their input on the curriculum and any suggestions for improvement. This information will be used to evaluate current SMP curriculum and as input for its adjustment.

9 Administrative Plan and Organizational Structure

The SMP program will be administered by a program coordinator and the principal investigator. As per NSF instructions, most of the requested funds will cover student stipends and tuition costs. We anticipate to fund 10-12 SMP students in the first two years of the program. Additional funds will cover a portion of the salary for the SMP program coordinator, and one month per year of salary support for the Principal Investigator.