Bachelor of Computer Science
Robotics Stream

School of Computer Science

April 14, 2011

1 Objectives

The primary objective of the Robotics stream for the Bachelor of Computer Science Honours degree is recruiting high school students. A secondary, but important, objective is to provide an engaging supplement to core Computer Science studies, giving students an opportunity to apply their knowledge to areas they find interesting.

Robotics is a well-established area both in Computer Science and in Engineering, with a wealth of subject matter appropriate for university studies. The courses to be added for this stream will have academic content that meets the School’s and University’s standards.

In addition to the learning objectives of the BCS, the Robotics stream will give students an understanding of some of the fundamental software problems in the area, with a particular emphasis on autonomous mobile robots.

2 Description

The BCS Honours program comprises a number of streams, all of which share a common core which is accredited as a Computer Science program by the Canadian Information Processing Society. The new stream adds three new courses to the common core, and requires a fourth course that is in the calendar but is not currently required in any stream.

- COMP 1807, Introduction to Robotics. An introduction to the field of mobile robots and their applications, from a computer science perspec-
The course will be lab based and will involve programming small robots, e.g. LEGO Mindstorms.

- **COMP 2807, Fundamentals of Mobile Robot Programming.** This course is a continuation of COMP 1807, focusing on some particular techniques for developing software for mobile robots.

- **COMP 3807, Computational Geometry.** Computational Geometry is the area of Computer Science dealing with algorithms for geometric objects. One of its main application areas has been robotics. The topics in this course were selected for their relevance to robotics.

- **COMP 4106, Artificial Intelligence.** This is the School’s general course in artificial intelligence. Since almost all of the topics taught in it are relevant to programming autonomous mobile robots, it is being included in the stream.

3 Academic Merit and Program Delivery

There are no additional admission requirements for this stream. We will continue to have the co-op option available for all BCS Honours students no matter what stream.

The first two courses (1807 and 2807) will be lab based. The lectures will take place in one of our teaching labs. The lab will have a cleared area where students can experiment with their robots. The lectures will partly have a tutorial flavor. Students will learn the course material by solving robot programming problems and implementing their solutions on actual robots.

Mark Lanthier, Assistant Professor with tenure, will teach the first two courses. Robotics is one of his research areas, and he has taught COMP 4807, Mobile Robot Programming, for several years. Likely COMP 4807 will be deleted once the stream progresses, but for now we are leaving it in the calendar.

The School has an internationally recognized research group in Computational Geometry. There are currently four faculty in the group: Bose (Professor), Smid (Professor), Morin (Associate Professor) and Maheshwari (Professor). All are eminently qualified to teach COMP 3807.

The fourth course, COMP 4106, is an existing course that is offered every
year. It can be taught by four faculty: Oommen (Professor), White (Associate Professor), Corriveau (Associate Professor) and Oppacher (Professor).

4 Demand and Impact

Following are some indicators of student interest in the subject.

- Robotics is a top choice for outreach efforts of universities trying to draw more students into computer science, science, technology, engineering and mathematics. The School of Computer Science at Carnegie Mellon University has a major project, funded in part by a $7 million DARPA grant, whose mission is to “use the motivational effects of robotics to excite students about science and technology”. The Carnegie Mellon Robotics Academy website\(^1\) has details.

- Robotics competitions. There are a number of these at different levels. Acadia has been organizing a major competition for many years. The Ottawa-Carleton School District has had regular competitions for elementary school students. There are also high-profile international competitions at the university level, e.g. Robocup.

- Robotics clubs. Many (most?) universities have student robotics clubs. Carleton has a very active one (carletonrobotics.com) with some impressive accomplishments.

- Our own recruiting experiences. We have featured robots in some of our high school visits. Student reaction is obvious and immediate: fascination.

We are requesting no courses from other programs other than what is entailed by any increases in BCS enrollment. There are no robotics programs on campus to compete with. There is competition at the degree level with the BIT and the B.Eng in Software Engineering, and so any increase in the attractiveness of the BCS might impact intake for those degrees. However, the three degrees are quite distinct in many ways and experience indicates that the level of competition is not high. Because of this, and likelihood of only modest increases in BCS intake, the impact on the two other degrees should be minimal.

\(^1\)www.education.rec.ri.cmu.edu
5 Consultation

The program has no impact on other units. We have not consulted with Admissions or the Registrar since the stream strongly resembles an existing stream, with merely some course-name changes, so we don’t expect there to be any issues. We do not need any resources from the Library.

6 Resource Requirements and Availability, Financial Implications

The new stream requires no new resources other than the robotic equipment for the first two courses, and funding for contract instructors to make up for staffing the three new courses with regular faculty. This resource request was approved by APPIC.

If the program succeeds, we will be requesting new faculty positions commensurate with the growth in undergraduate intake.