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GLOBAL LOOK AT ROBOTICS EDUCATION

BY

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The use of robotics as a motivating theme in engineering education has grown widely around the world during the last decade. This special issue addresses the need to disseminate best practices in robotics education from a broad, international perspective, presenting contributions of experts who have developed robotics laboratories, courses and curricula; instructional hardware and software systems; and large-scale programs and robot competitions.

We group the papers into three broad subject categories: (1) project-based courses and curricula; (2) novel robotics projects including educational outreach; (3) educational theory, environments and tools.

In the first category, the paper by Pack and Klayton considers the sequence of three junior and two senior robotics courses integrated in the electrical and computer engineering curricula at the United States Air Force Academy. This paper also focuses on educational objectives and outcomes of the courses related to learning fundamental concepts, development of systems thinking and teamwork skills. Also in that category, Hall and Barker’s paper presents a sequence of three robotics courses at Louisiana Tech University that involve freshmen students in project based learning, introduce different aspects of engineering design, stimulate creativity and self-directed learning, and impart technical and practical skills. The paper of Friesel discusses the fourth-semester undergraduate Interdisciplinary Project course at the Copenhagen University which is part of the Electronics and Information Technology curriculum. Students in the course work in teams, develop autonomous robots, and participate in robot competitions.

In the second category, the contribution of Bowman and co-authors displays the impressive scope of school outreach and academic programs in the area of robotics education conducted and supported by the National Aeronautics and Space Administration (NASA). In his paper, Michaud describes robotics initiatives at the University of Sherbrooke; these include a first-year design course in which students develop robot toys for disabled children, a step-climbing robot for home environments designed by a team of undergraduate students, and a service robot project developed by graduate and undergraduate students.

In the third category, educational theory, environments and tools, Verner and Ahlgren propose an education design experiment methodology in which robot development goes hand in hand with curriculum development. The methodology is applied to upgrading the rules of the Trinity College Fire-Fighting Robot Contest and developing new contest-oriented projects. The paper by Martin of the University of Massachusetts Lowell argues, through three design examples, that learning and successful design are optimized in learning environments that enable teamwork and positive social interactions. Also in this category, the paper of Gerecke and Wagner describes the Modular Educational Robotic Toolbox kit developed at the L3S Research Center, University of Hannover, Germany. The Toolbox, related undergraduate robotics assignments, and Master thesis projects are documented as open web sources integrated in the European Robotics Research Network (EURON). The paper by Bruder and Wedeward presents an electronic textbook for a mechanics of robotic manipulators course developed at the New Mexico Institute of Mining and Technology. The e-book enables theoretical studies and interactive practice in performing robot manipulations in a graphic simulation mode.
We believe that this Special Issue of the International Journal on Intelligent Automation and Soft Computing will be a resource for engineering educators interested in methodological and practical aspects of robotics education. We thank Brad Bishop of the United States Naval Academy and the authors and for their contributions, insight and effort.

Guest Editors
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