Introduction to Special Issue on Robotics in Undergraduate Education

In the mid 1990s the availability of small, low-cost, programmable robot platforms led to their widespread use in the undergraduate computer science and engineering curricula. Initially, many computer science departments equipped themselves with LEGO-based robot kits, but their use was more or less restricted to laboratory assignments in the junior/senior-level artificial intelligence courses. Small mobile robots could be easily assembled by students using basic LEGO pieces, with motors and sensors controlled by a programmable controller card that used a subset of the C programming language or, in some cases, LOGO or Scheme. As our experience with this new constructionist technology improved, the use of these platforms expanded to many other computer science courses. Simultaneous with the proliferation of robots in the curriculum, a new area of research and development, called *educational robotics*, has also emerged. In the last decade this has led to the development of a diverse range of robot platforms with capabilities that far exceed those of the simple LEGO-based vehicles. The two volumes (JERIC Volume 4, issue 2 and JERIC Volume 4, issue 3) include a representative sampling of the lessons learned and the collective experience gained in this endeavor over the last decade.

Volume 4, issue 2 contains articles by **I. M. Verner** and **D. J. Ahlgren** (Robot Contest as a Laboratory for Experimental Engineering Education); **C. Kitts** and **N. Quinn** (An Interdisciplinary Field Robotics Program for Undergraduate Computer Science and Engineering Education); and **E. Sklar, S. Parsons**, and **P Stone** (Using RoboCup in University-Level Computer Science Education). These submissions present results from evaluations and observations collected in environments where the overall goals, besides robotics education, were to engage students in a competition-like settings. The papers in this volume represent several years and iterations of the use of robots combined with a diverse set of pedagogical goals. The authors have also taken a keen interest in evaluating the effectiveness of the use of robots in such settings, and present their results in these papers.

Volume 4, issue 3 contains papers by **A. N. Kumar** (Three Years of Using Robots in the Artificial Inteligence Course: Lessons Learned); **S. P. Imberman** (An Intelligent Agent Approach for Teaching Neural Networks Using LEGO^{R} Handy Board Robots); and **D. Blank, D. Kumar, L. Meeden**, and **D. Yanco** (Pyro: A Python-Based Versatile Programming Environment for Teaching Robotics). These papers focus on specific curricular issues and those relating to the development of robot platforms, including a detailed analysis of robot use in an undergraduate AI course, and of a specific topic (neural networks) on a robot-based platform. The last paper presents a new programming environment that attempts to simplify a diverse set of robot platforms via a single coherent conceptual framework.

Not too long ago, the very idea of robots evoked science fiction-like fantasies. However, it is now clear that with advancing technology, the use of robots and robotic devices will continue to grow. By introducing robots into the curriculum, educators are hopeful that there will be a proliferation in the number of minds that will, in the future, engage in furthering the development of robots and robotic technology. In the spirit of

this journal, it is hoped that this collection of papers represents a valuable repository of materials, experiences, and challenges in the study of robots in under-graduate education.

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