Mechatronics Education

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In recent years, the concept of "mechatronics" is more frequently encountered in industry, academia, and in the general public as well, but it is always coupled with the question: "Is this a new concept?" In this special issue dedicated to mechatronics education, articles from a wide range of education styles have been assembled, starting with Craig who challenges this question in the framework of mechatronics in university and professional education.

A blend of mechanics and electronics, mechatronics has come to mean the synergistic use of precision engineering, control theory, computer science, and sensor/actuator technology to design improved products and processes. Wikander, Törngren, and Hanson discuss the current understanding of mechatronics as an interdisciplinary subject from both the education and research perspectives.

Realization of the growing need to educate mechanical and other nonelectrical engineering students in the application of electronics, microprocessors, and software has led to the creation of mechatronics courses, and in some cases, degree programs at many universities around the world. These programs aim to produce engineers capable of successfully applying these ever-evolving technologies to the design of mechatronic systems. "Learning by doing" and "learning while doing" programs are aimed at enhancing collaborative design activities between departments, ultimately leading to multidisciplinary creative solutions to open-ended problems tackled by a team. Within this framework, Siegwart introduces hands-on mechatronic and micromechatronic education programs implemented at two technical universities in Switzerland.

Though there is not a universally accepted definition of mechatronics, most definitions refer in some way to the integration of electronics and software into mechanical systems. Alciatore and Histand present a systematic restructuring of a traditional mechanical engineering curriculum with a mechatronic theme

Many researchers refer to mechatronics as the integration of the different disciplines involved throughout the entire design process. Daniel and Hewit [1] describe mechatronics as a ground-breaking union between electrical and mechanical design. Our understanding of mechatronics matches more closely the definition given by Dinsdale and Yamazaki and later used by J. Edward Carryer, "the synergistic integration of fine mechanical engineering with electronics and intelligent computer control in the design of products and manufacturing processes" [2]. Among the many products defined as "mechatronic," robots are the most dominant, so much so that robotics and mechatronics can be mistakenly confused in many application problems. Two articles on robots offer insights into teaching mechatronics. Practical education of robotics as presented by Nagai is also an aspect of "learning while doing." Engineering ingenuity and efficiency can be exercised when competitions for producing mechatronic products exist. Murphy presents an overview of a taxonomy of major robot competitions and develops a strategy for incorporating competitions into courses to foster intellectual maturation with engineering aesthetics.

References

[1] J.R. Hewitt, "Mechatronics—The contributions of advanced control," in *Proc. 2nd Conf. Mechatronics and Robotics*, Duisburg, Moers, Germany, Sep. 1993

[2] J.E. Carryer, "The design of laboratory experiments and projects for mechatronics courses," presented at Workshop on Mechatronic Curriculum Development, San Jose, CA, Jun. 1996.

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