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SELECTED PAPERS FROM
ICOM'01, ICOM'05 AND
ICOM'08

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Asan G. A. Muthalif
Amir A. Shafie
Momoh J.E. Salami



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The Role of Intelligent Systems in Mechatronics Engineering

Nahrul Khair Alang Md Rashid

Department of Mechatronics Engineering, Faculty of Engineering
International Islamic University Malaysia, Jalan Gombak, 53100 Kuala Lumpur, Malaysia
nahrul@iiu.edu.my

ABSTRACT

Mechatronics can be viewed as a confluence of many disciplines fused synergistically to form an integrated or system approach in the design of products and manufacturing processes. Mechatronics sometimes are mistakenly seen as a pure combination of mechanical and electronics engineering. The infusion of control, computer engineering, communication, digital systems into it provides the glue or the enzyme, if we can look at it that way, for the formation of Mechatronics. The rapid growth of expert system and intelligent system further provides the unifying elements that characterize Mechatronics as a discipline. This paper looks at the role of intelligent system in Mechatronics.

1. INTRODUCTION

Mechatronics is a branch of engineering with many definitions, as many of those defining it. For example The University of Washington, USA defines it as "the integrated study of the design of systems and products in which computation, mechanization, actuation, sensing, and control are designed together to achieve improved product quality and performance;" The University of California at Berkeley, USA defines it as "a flexible, multi-technological approach in the integration of Mechanical Engineering, Computer Engineering, Electronics, and Information Sciences;" and The Journal of Mechatronics defines it as "the synergistic combination of precision mechanical engineering, electronic control and systems thinking in the design of products and manufacturing processes." [1]

This is typical of any new disciplines that are progressing towards molding a strong identity and a discipline in its own right. In Malaysia for instance there are currently less than ten institutions of higher learning that are offering a degree program in this area.

Common to all those definitions is the concept that it is a multidisciplinary discipline resulting from the confluence or merging of many disciplines to synergistically form an integrated or system approach in the design of products and manufacturing processes.

The birth of Mechatronics can also be seen as a natural evolution of knowledge that grows either by the splitting of established disciplines into branches or merging such disciplines to form new ones. Branching process is largely the mode of formation of disciplines such as bio-physics, radiation chemistry, and communication engineering. In this process, the new discipline takes with it a little aspect of its 'parent' discipline.

Fusion or merging of disciplines can be said to be the opposite process. New disciplines are formed through the coming into significance of the neighboring disciplines the peripheries of which sometimes overlap with one another. Electromechanical has its roots in electrical and mechanical engineering. Mechatronics sometimes are mistakenly seen as a pure combination of mechanical and electronics engineering. That is not so, for if that was, then the question would be how much electronics should mechanical be and how much mechanical should electronics be for either one to be transformed into Mechatronics?

The infusion of control, computer engineering, communication, and digital systems into this confluence of disciplines provides the glue or the enzyme, if we can look at it that way, for the formation of Mechatronics. As can be seen from the many definitions given earlier the number of discipline that is called upon to constitute Mechatronics are plenty; and it is not expected to stop there. The first refereed journal on Mechatronics, IEEE/ASME Transaction on Mechatronics, suggested in 1996 that modeling and design, system integration, actuators and sensors, intelligent control, robotics,