NEW PERSPECTIVES OF MECHATRONICS WITH THE MICRO-ELECTROMECHANICAL SYSTEMS (MEMS)

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Micro-electro-mechanical systems (MEMS) have been identified as one of the most promising technologies and will continue to revolutionize the industry as well as the industrial and consumer products by combining silicon-based microelectronics with micro-machining technology. All the spheres of industrial application including robots conception and development will be impacted by this new technology. If semiconductor micro-fabrication is contemplated as the first micro-manufacturing revolution, MEMS will be the second one. The paper reflects the results of a study about the state of the art of this technology and its influence in the development of mechatronics. The addressed issues are : technical and economical effects of MEMS application in the industry and analysis of their use in Japan, Europe, and the USA. Also several examples of MEMS applications are presented.

Key words : *MEMS, mechatronics, sensors, automation*

1. Introduction

The integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro-fabrication technology leads to what is known as micro-electro-mechanical systems (MEMS). These devices permit unprecedented levels of functionality, reliability, portability, and ruggedness at low prices. Their properties open new possibilities for the use in many branches of technology, including construction process. MEMS have the potential to leverage microelectronics into important areas that could be revolutionized by low-cost electronic signal processing, computing, and control. These microsystems could have a profound effect on the way robots and automation systems function, but will require synergy among many different disciplines.

MEMS are small, integrated devices or systems that combine electrical and mechanical components. They range in size from the sub micrometer (or sub micron) level to the millimeter level, and there can be any number, from a few to millions, in a particular system. These systems can sense, control, and activate mechanical processes on the micro scale, and function individually or in arrays to generate effects on the macro scale. They are a fabrication approach that conveys the advantages of miniaturization, multiple components, and microelectronics to the design and construction of integrated electromechanical systems. MEMS are not only about miniaturization of mechanical systems; they are also a new paradigm for designing mechanical devices and systems [1].

In [2] an analysis has been made, presenting the main advantages obtained with this technology. They are presented in a concise form as :

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