Is The Name 'Mechatronics' Passé?

Mechatronics practice is so much more than just electro-mechanical

I just returned from the ISMA '09 Mechatronics Conference, a regional conference held at the American University of Sharjah in the United Arab Emirates. The Mechatronics Graduate Program there is the most advanced in the Arab world and it was an honor for me to be a keynote speaker, along with two pioneers in robotics, Professor Ron Arkin of Georgia Tech University and Professor Oussama Khatib of Stanford University. It was my first visit to the region and it was uplifting to see young men and women there with a passion for mechatronics. I felt very much at home among the students and professors; after all, real engineers are the same worldwide. While part of my address was technical, my main message was the need for human-centered engineering, that is, identifying and solving problems to help people in the world most in need. For engineers, it is the prime directive! I also spoke about mechatronics education, undergraduate and graduate, and how it is time for a reassessment of the field of mechatronics, both its name and definition, and how we teach it, both academically and professionally. This resonated with my co-keynote speakers, as well as with the conference participants, and led to lively discussions over the three-day event.

The history of modern engineering can be divided into phases. The Scientific Revolution in the 16th and 17th centuries was characterized by systematic approaches to learning why systems and devices worked. It adopted a scientific approach to practical problems and started to use mathematical models to help understand the behavior of physical events. In the 18th-century First Industrial Revolution, machines, increasingly powered by steam engines, started to replace muscles in production. Practical thinking became scientific in addition to intuitive, as engineers developed mathematical analyses and conducted controlled experiments. Technical training shifted from apprenticeship to university education. The 19th-century Second Industrial Revolution, symbolized by the advent of electricity and mass production, was driven by many branches of engineering, all working together to solve problems – a systems approach. After World War II, research and development boomed in all fields of science and technology; but even so, a systems approach to problem solving was pervasive. Simultaneously, the need for specialists grew stimulated by new technologies and materials, and college engineering curricula responded with specialized programs which were more mathematics and science focused. Unfortunately, engineers became more isolated and lost the system's view of engineering. In response to this trend, in Japan around 1970, the word *mechatronics* appeared to describe the integration of mechanical and electronic components in consumer products. Mechanical and electrical engineers collaborated and integrated their components from the start of the design. This field has grown over the past 40 years to mean multidisciplinary engineering system integration and innovation in response to the multidisciplinary nature of the problems faced, but only to those who practice it. Shouldn't the name reflect the practice?

The diagram shows the changes in engineering over the decades – from systems engineering to more specialization to now the need for a balanced combination of the two. Systems engineering gave us major contributions throughout our history, the most notable took us to the moon and back. The goal of mechatronics is to become a balance and integration of the discipline-specific, in-depth specialization that leads to breakthroughs with the systems-engineering, problem-

solving approach. What should this be called and how do we teach it, academically and professionally? Let me know your suggestions for a new name. In the next article I will report the results and I will talk about a new approach in mechatronics education.