

IEEE-CSS 2005 President Prof. Mark Spong on Control Engineering

Excerpts from an Interview

Dr Mark W. Spong is currently, Professor and head, Department of General Engineering, and research professor in Coordinated Science Laboratory, University of Illinois at Urbana-Champaign. He is elected as the IEEE Control Systems Society (CSS) president for the year 2005. The following passages are excerpts from an interview he has given to IEEE Control Systems Magazine, December 2004.

- **In this 50th anniversary year, there is a lot of talk about the future of our field. What advice would you give to an undergraduate who is thinking about control as an employment specialization or graduate school major?**

– I'm very positive about the future of our field. First of all, engineering problems are becoming increasingly more complex and large scale. As a result, employers are seeking engineering graduates who not only have technical skills but who also have a broad multidisciplinary perspective that enables them to work in teams on systems integration problems. I think a background in systems and control provides excellent training for such jobs. Second, control is ubiquitous. Inside the modern automobile, airplane, ship, train, factory, refinery, indeed inside almost any modern engineered system, is an interconnected network of microprocessors, sensors, and actuators controlling dozens of processes and variables. Of course, I realize that I am preaching to the choir here. As we know, control is the hidden enabling technology underlying many high-tech applications. We are now seeing control principles applied in new areas such as Internet congestion control, wireless communications, and biomedical applications. And, while I believe that no amount of technology can secure us from the threat of terrorism (this goal requires political as well as technical solutions), it is clear that control technology is greatly needed in applications, such as securing supervisory control and data acquisition (SCADA) systems from hackers, employing sensors to detect biological or radiological hazards, and of course in military surveillance and weapons systems. The bottom line is that I believe control engineers will be increasingly in demand, and I would not hesitate to advise a student to choose control as a field of study.

- ... **Do you have any thoughts about the future of control education?**

- Well, I've been teaching control courses for 25 years and, while we have made great advances in the hands-on laboratory experiences we give our students, I think that the changes to the textbook and lecture material have not been as significant. For the most part we still teach the same tools (root locus, Routh-Hurwitz) and simply supplement them with MATLAB routines to aid in the computation. Perhaps it is time to think of bringing into the undergraduate classroom more of the computational advances that researchers have brought to bear on control research problems. I'm thinking of convex optimization and LMIs, randomized algorithms, neural networks, and the like that take advantage of the tremendous advances in computational power. Or perhaps a first course in control ought to be a course in mechatronics that focuses more on control technology and less on theory. Analysis tools could then be covered in a second course. I'm not advocating that we abandon fundamentals. I'm merely thinking out loud that perhaps fundamental analysis and design tools are better learned after one has had exposure to their applications. Of course, I have the luxury of teaching in a department that has two required control courses in the undergraduate curriculum. Most engineering programs these days do not require a course in control, which is unfortunate.