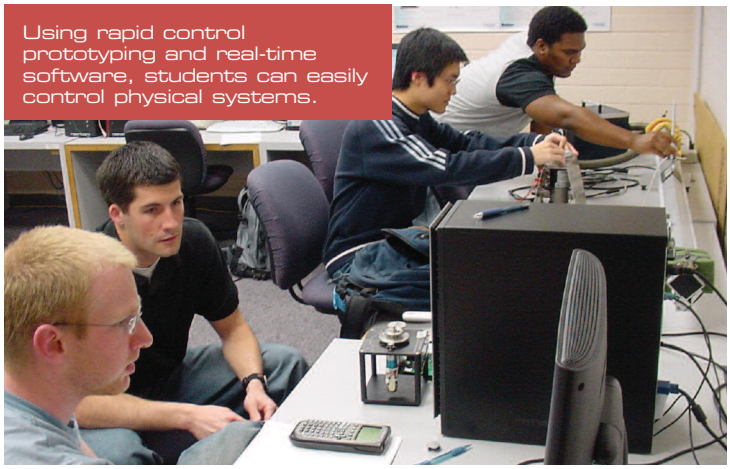
QUANSER
INNOVATE. EDUCATE.

UTAH STATE UNIVERSITY:

How to attract more engineering students through systematic lab expansion.

Utah State University boasts its location in one of the most beautiful valleys in the Rocky Mountains. But that is definitely not the main reason why this 120 years old institution captivates students. Rather than the beauty of surrounding nature, Utah State University relies on its reputation of intellectual and technological leadership and progressive teaching and research – represented for example by the Department of Electrical and Computer Engineering (ECE).



Using rapid control prototyping and real-time software, students can easily control physical systems.

WORLD-CLASS HANDS-ON EXPERIENCE FOR STUDENTS.

Back in early 2000's, faculty of ECE started to understand the value of teaching its students multidisciplinary skills, combining mechanical, electronic, control systems and computer engineering in one subject - Mechatronics. In 2002, they started to build a lab dedicated to the subject, which now, in 2008, offers world-class hands-on experience to the undergraduate and graduate students. How did they achieve it? "Definitely not overnight," laughs Dr. YangQuan Chen, Assistant Professor at the department, "and we are still not done."

ECE started to build the Mechatronics laboratory utilizing the Quanser lab equipment the department already had and added new modules every year. "The department has a steady flow of the State of Utah Engineering Initiative funds for teaching improvement, targeting undergraduate education," explains Dr. Chen. "That allows us to buy few experiments every year. We did not get any large funding to equip my Mechatronics Lab."

MODULAR EQUIPMENT IS KEY.

Building the lab over an extended period of time, compatibility of all components becomes vital. "The modularity of Quanser equipment was very nice for us, we could build a sophisticated lab from scratch incrementally," continues Dr. Chen. "The environment remained the same - now we have the Ball and Beam experiment, Flexible Link, Flexible Joint, Rotary Inverted Pendulum, 2DOF Robot Arm, Solar Tracker to name just a few and it is all 'plug and play' – nothing really changed. We are pretty happy with that."

Access to a wider range of experiments acquired over the years is not the only advantage the Mechatronics lab can offer students. "At the beginning, when we had only a few stations in the lab, students

Students can get hands-on experience working on assignments in small groups or individually.

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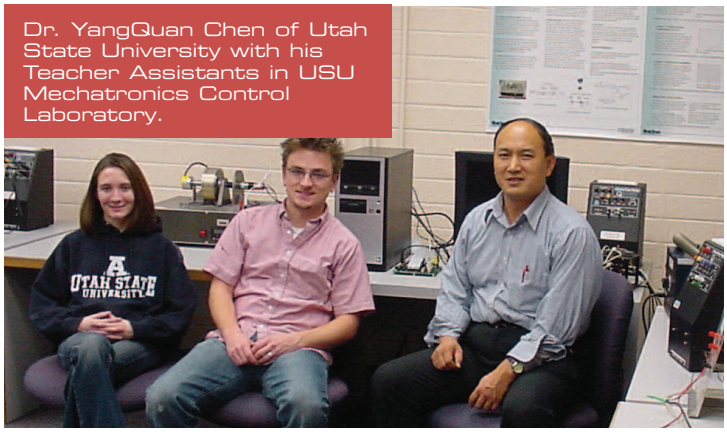
worked in larger groups," notes Dr. Chen. "Eventually we achieved our goal, having one student per station." That for sure increases the attractiveness of the Mechatronics course. "Yes," agrees Dr. Chen, "our Mechatronics course is very lab-intensive. We attract students who previously did not get enough on-hands experience, which is a very important factor in why they select this course."

REAL TIME IN NO TIME.

"Students like to work with Quanser equipment," Dr. Chen goes on. "It is easy for them to get started. They just follow the wiring procedure and everything else is just mouse-clicking. Using Quanser rapid control prototyping and real-time software they can control physical systems in no time. As I say – 'go to the real time in no time!' That's really exciting and the students are impressed." Dr. Chen and his colleagues have also developed several in-house mechatronic plants such as liquid level control system, fractional horsepower dynamometer, fan-and-plate. "They can be easily hooked up to the Quanser real-time control toolbox to experiment with real-time closed-loop controls," explains Dr. Chen. "This rapid prototyping of real-time control system enabled by Quanser products is really attractive to both undergraduate and graduate students."



Dr. YangQuan Chen of Utah State University with his Teacher Assistants in USU Mechatronics Control Laboratory.

REACHING OUT GLOBALLY.

In the future Dr. Chen plans to continue adding new experiments to the Mechatronics laboratory. He gets really excited hearing about a 2DOF Ball Balancer, a new Rotary Family experiment that Quanser released in 2008. But he would also like to make his lab accessible to more students. "Even education is getting global. I am really looking forward to making my laboratory available to all the students in the world who want to get Mechatronics hands-on learning, here at Utah State University," says Dr. Chen enthusiastically.

Dr. YangQuan Chen joined Utah State University in 2002 and has been an Assistant Professor in the Department of Electrical and Computer Engineering. Since 2004 he has been Acting Director of Center for Self-Organizing and Intelligent Systems (CSOIS). He is teaching graduate and upper level undergraduate courses. His current areas of research interests include distributed measurement and distributed control of distributed parameter systems using mobile actuator and sensor networks, mechatronics and controls (intelligent, optimal, robust, nonlinear and adaptive) and fractional order controller tuning. He holds 13 granted and pending U.S. patents. He co-authored two research monographs (Springer 1999, 2007), 5 textbooks (Tsinghua University Press 2002, 2004, 2004, 2007, SIAM 2007, CRS 2008) and authored over 200 refereed journal and conference papers.

Quanser modular control lab equipment allows the students to explore various control issues using a wide range of Quanser experiments and integrate seamlessly with common control design tools. It helps educators at both the undergraduate and graduate levels to teach an integrated approach to product design, touching on a variety of engineering disciplines. The company's turn-key laboratories focus especially on the control engineering aspect of mechatronic design, which includes software, control boards and power amplifiers that provide for more than 50 Quanser-designed experiments.