Educator's Corner : Teacher's Tools

Campus Happenings

Competitions Challenge and Motivate Engineering Students

During timed trials, the rhythmic pounding of feet fills the air. Between events, students huddle, dissecting their team's performance and analyzing the competition. Snippets of English, Spanish and French waft through the foyer. An international track meet, perhaps?

It is a track meet, of sorts, but a very specialized one where the participants are not human. In the Walking Machine Decathlon 2000, sponsored by the Society of Automotive Engineers (SAE), undergraduate engineering students from several countries bring their walking machines — robots they've designed and built themselves — to vie for prizes in 10 events.

Jonathan Hurst, a third-year student at Carnegie Mellon University, makes a final adjustment to his team's walking machine, Jim2, which placed first overall in this year's decathlon. Jim2 walks using five actuators moving two independent frames so the main mass of the body is in continuous motion. This allows Jim2 to conserve energy and attain high speeds.

How competitions help

Dr. Fred Smith, PE, mechanical engineering professor at Colorado State University, organizer of this year's decathlon, explained the value of competitions. "Engineering students learn a lot of fundamentals in a wide variety of fields. One of the most essential aspects of their education is learning to synthesize all of that information into something that is useful, practical and applicable to real-world problems.

"Competitions provide an almost perfect simulation of real-world engineering, in the sense that students have to produce a working product, on a schedule, within a budget, and with all of those constraints that are a part of real-world engineering," said Smith. "They also emphasize communication and cooperation in a team setting, and give students a taste of the competitive pressures typical in the marketplace."

Competitions vs. industry problems

If the goal is to provide an experience as much like those found in industry as possible, why not have students participate in solving real industry problems, instead of competing in events that have little or no practical value?

"We've done industry projects in the past," said Smith, "and typically, that doesn't work very well for us. Industry deadlines don't match our schedule of semesters and academic years, and industry deadlines also change. We've had some situations where suddenly our student projects get

cancelled in the middle of a semester."

On the other hand, the organizations running student competitions are typically professional societies that are chartered to support engineering education. According to Smith, that means their competitions are more amenable to university environments.

Student perspective
Some of the students participating in the walking machine contest received class credit for their involvement. For many others, however, participation was extra curricular. When you consider the fact that each member of a student team typically spends close to 1000 hours designing, building, programming and troubleshooting his/her entry, you begin to understand the dedication required for this "just for fun" effort.

Ernesto Martinez-Villalpando, a third-year electronics engineering major from the Universidad Bonaterra in Aguascalientes, Mexico, put it this way: "When you love something, you don't care how many hours you work at it. You do it for the personal satisfaction."

This robot, designed by a team from the University of Quebec at Rimouski, sports a whimsical grin as it completes the "dash" event. The remote-controlled walking machine features eight independent legs that operate pneumatically.

The downside of student competitions
If there's a downside to the kind of dedication expressed by Martinez-Villalpando, it's that some students neglect their other courses and activities — even opting to go without sleep — when they are preparing for a competition.

Another downside of competitions mentioned by Larry Carlson, co-director of the Integrated Teaching and Learning Lab at the University of Colorado, is the very fact that they are competitions. "If you have winners, then you have 'losers,'" he said. "We try to emphasize that if you don't win, it doesn't mean you are a loser, but our society certainly interprets it that way. Sometimes, competitions can be divisive and sometimes, they can cause negative feelings."

A negative reaction was not a problem for Simon Dube, a senior engineering student from the University of Quebec at Rimouski, whose team placed third overall in this year's competition. "We didn't come here just to win," he said. "I came here because I love mechanical and electrical engineering. I love to solve problems. I came here because it's fun."

Students are motivated

According to Professor Smith, there's no question that the students are more motivated because they are competing. "I've watched different teams over the years," he said. "As the competition approaches and the deadline gets close, the spirit builds up, the effort level goes up and the commitment to it goes up. There's no question that the competitive nature of these projects has a positive impact."