Impact of Control

A few newsworthy items have come to maturity since the writing of my last presidential message prior to the 2013 IEEE Conference on Decision and Control (CDC) in Florence, Italy. Please join me in thanking the IEEE Control Systems Society (CSS) volunteers mentioned below for their efforts on our behalf.

CONTROL TECHNOLOGY INSIDE

A graduate student recently pointed me to the online videos of the Trimble UX5 Aerial Imaging System (http://uas.trimble.com/ux5#collection-1). This is a commercial product that incorporates various advanced technologies building on, and of interest to, our community: autonomous aerial vehicles; autonomous vehicle control; robust performance; flight planning, monitoring, and analysis; photogrammetry; and more. What I found remarkable was the rate at which these technologies have transformed from research ideas to military and now a (nonmilitary) commercial application for which a viable market plan exists. However, most users of this service will never perceive the modeling, control, and estimation research results, developed over several decades, on which the service is built.

This lack of recognition and appreciation of rigorous research results may not be limited to the nontechnical user. At the IEEE Technical Activities Board meetings, I am often greeted by comments equivalent to "CSS is the theoretical group that likes to prove theorems." While this observation may be true, it makes me wonder whether some colleagues in other Societies appreciate the value and impact of the fundamental understanding, methods, algorithms, and tools that result from such theoretical work.

Yutaka Yamamoto passing the gavel to Jay Farrell at the 2013 IEEE CDC in Florence, Italy.

The fact that control-related technologies are hidden within many successful consumer products and services has motivated some leaders in our field to facetiously suggest that we follow the lead of Intel, by labeling such applications with a sticker stating "Control Inside," with the goal being to enhance the public recognition of the value and impact of control research.

A more practical means to achieve this goal is about to be published in the form of the second edition of "The Impact of Control Report." This report is organized and edited by former CSS President Tariq Samad and current Vice President of Conferences Anu Annaswamy, with contributions by numerous members of our technical community. The first and second editions of the report are, or soon will be, available on www.ieeecss.org.

OUTREACH

The CSS Outreach Fund was approved by the CSS Board of Governors in December 2009 for inclusion in the 2011 CSS budget. The mission of the Outreach Fund is to fund projects that will benefit CSS and the

(From left) Mimiko Yamamoto, Jay and Theresa Farrell, Alex Bayen, Christos Cassandras, Yutaka Yamamoto, 2013 IEEE President Peter Staecker, and Susan Staecker at the IEEE CSS Awards Dinner.

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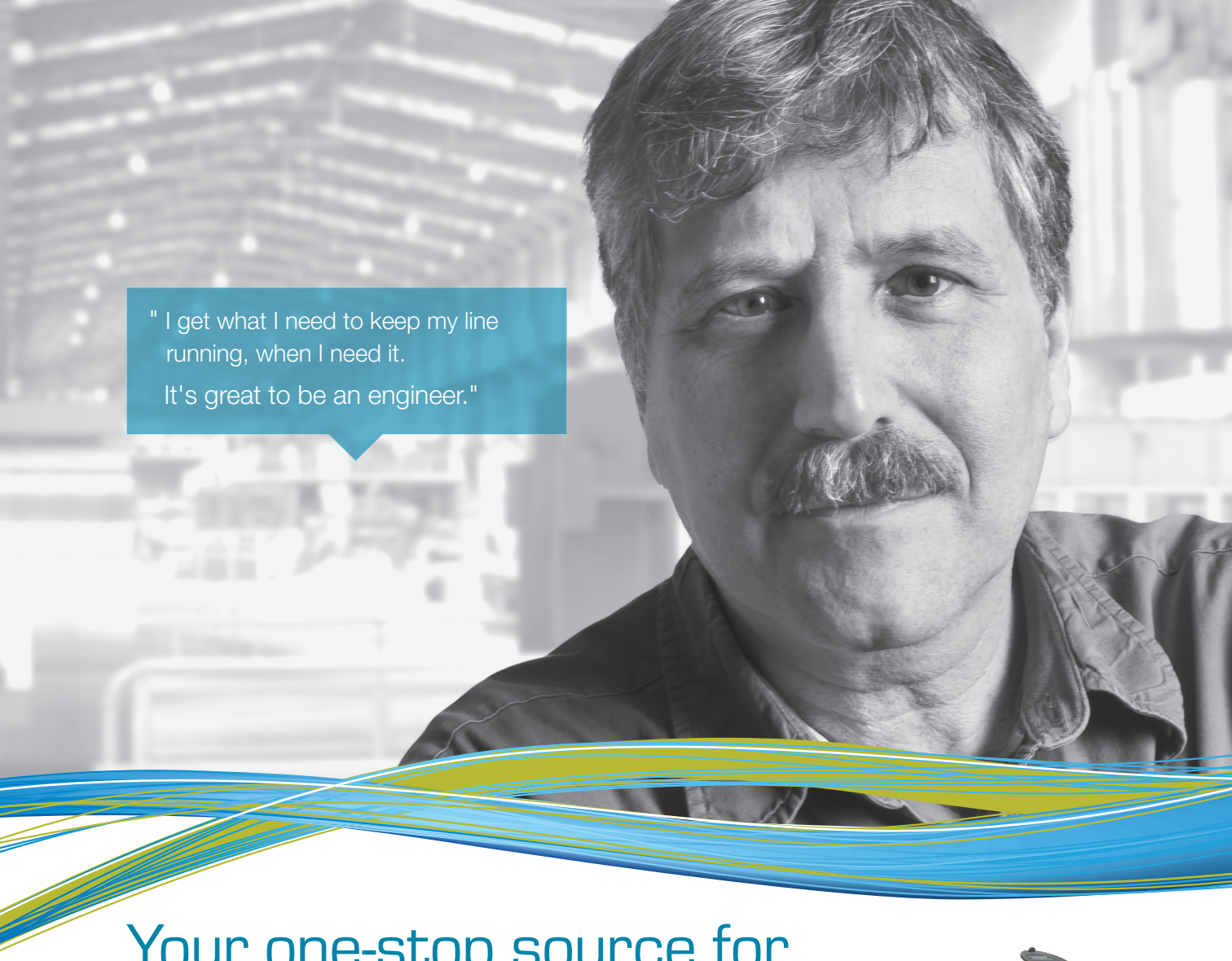

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André Tits (right) and Jay Farrell discussing André's excellent optimal control course notes prior to the CDC 2014 Bode Lecture.

(From left) Theresa Farrell, Jay Farrell, and Mimiko Yamamoto at the CSS Awards Dinner.

controls community in general. We encourage you to consider the CSS Outreach Fund to support ideas for bringing controls to the broader community. IEEE CSS funds outreach projects through a competitive, twice annual, call for proposals announced on the CSS Web page.

From 2011 through 2013, this effort was led by Gary Balas in his role as chair of the CSS Task Force on Outreach. Through May 2013, the outreach program supported 29 projects, at 22 distinct institutions, across ten different countries, spanning all continents except Antarctica. As of January 2014, Gary passed leadership of the task force to Daniel Rivera.

PDF QUALITY IMPROVEMENTS

Several authors have been frustrated in past years about pdf quality issues in the formatting and publication of our articles in IEEE journals. During his term as VP-Publications, Francesco Bullo has collaborated on this issue with personnel in the IEEE Periodicals Editorial Services. I am happy to report progress on three fronts. By the end of 2014, ideally as early as February 17,

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process control variables. Conservative choices for the process control variables are also necessitated by the part programmer's lack of complete prior knowledge of a process as complex as metal cutting. Because conservative values of the process control variables are selected, the typical production rates achievable are not as high as ideally possible. Thus, although CNC systems control the relative position between the tool and workpiece, they do not control the metal-cutting process itself. The process planning, typically done by the part programmer, is generally accomplished off-line based on "worst-case" cutting conditions.

The availability of the processing power of an onboard CNC computer has stimulated research into automating the control of metal-cutting processes. Thus, the control system automatically would select the required values of the process control variables based on on-line process measurements. Such systems have come to be referred to as "adaptive control" systems in the manufacturing literature, although they are not necessarily adaptive in the sense commonly used in the control literature. …

Such systems have come to be referred to as "adaptive control" systems in the manufacturing literature.

A major difficulty associated with adaptive control constraints-type process control in metal-cutting operations has been controller instability or tool breakage, which can arise due to process parameter variations. There has been considerable research in this area in recent years, and several researchers have demonstrated the application of adaptive control methods to adaptive-control-constraints systems. Here we described two adaptive process control systems, one implemented for turning and the other for milling processes. Laboratory experiments have clearly demonstrated the feasibility of using adaptive control concepts for process control in metal cutting …

» PRESIDENT'S MESSAGE

(continued from p. 12)

IEEE plans to use scalable vector fonts as the norm, author-supplied eps files for images, and author-supplied LaTeX source code for our manuscripts (hopefully eliminating the error-prone translation from LaTeX to TeX).

NOMINATIONS COMMITTEE

Given such accomplishments by the leaders of our Society, a few people have asked how the CSS Board of Governors and executive officers are selected. The slate of candidates for each is defined during a series of meetings of the Nominating Committee, either in person at the CDC or electronically, between December and April. The Nominating Committee is chaired by the past president and includes the president-elect and four members elected by the CSS Board of Governors. The CSS Bylaws also allow candidates to be added to the Board of Governors ballot by petition of the CSS membership.

We encourage you to consider the CSS Outreach Fund to support ideas for bringing controls to the broader community.

MOVING FORWARD

I look forward to talking and working with you at the American Control Conference in Portland. I can also be reached anytime by e-mail at j.a.farrell@ieee.org.

Jay A. Farrell