Technical Committee on Automatic Controls

The scope of interests of the IEEE Control Systems Society (CSS) Technical Committee (TC) on Automotive Control (AC) covers modeling, simulation, identification, estimation, control, optimization, and diagnostics of present and future automotive systems. Jessy Grizzle and Luigi Glielmo established the TC in 1999, and the past chairs include Rajesh Rajamani (2003–2005), Ilya Kolmanovsky (2006–2008), Francesco Borrelli (2009–2011), and Stefano Di Cairano (2012–2014). The TC currently has more than 150 members.

With significant participation from both academia and industry, the committee coordinates activities toward improving the understanding of challenges, problems, and effective methods of controlling automotive systems. The TC has been very active in jointly organizing invited sessions at the American Control Conference (ACC) with the American Society of Mechanical Engineers (ASME) Automotive Transportation System TC as well as invited sessions with the International Federation of Automatic Control (IFAC) TC on AC at the European Control Conference. In this regard, one of the missions of the CSS TC on AC is to strengthen ties and further collaborations between the TCs of IEEE, IFAC, and ASME in the AC field and to expand toward stronger and more synergistic activities between the three societies.

As incoming chair, I would like to express a debt of gratitude to the previous chairs and mostly to Dr. Stefano Di Cairano for his active service and

FIGURE 1 Domitilla Del Vecchio (left) was one of the speakers at the 2013 "Open Problems and Challenges in Automotive Control" workshop organized by the CSS TC on AC in Washington, D.C.

Current Research Needs Being Faced by the TC on AC

In battery electric vehicles, the traction efficiency from the battery to the wheel is approximately 80%. Internal combustion (IC)-engine vehicles can provide an energy that is roughly two orders of magnitude greater than that provided by batteries, but this is achieved at a much lower energy efficiency, which represents one of the main challenges for the automotive sector. Improving engine technology by means of a more sophisticated control design will help meet fuel economy, emissions, and drivability requirements. The methods for reducing thermal losses in IC engines are through the system optimization and control design of advanced turbocharged engines, exhaust heat recovery systems based on an organic Rankine cycle, optimization and control of ancillary loads, and vehicle energy harvesting.

For hybrid and electric vehicles, the main challenges are in the areas of diagnostics and prognostics. It is important to know and monitor the state of health of all of the components in the vehicle system. In this case, robust model-based estimators are needed to interrogate a battery and determine how much more life it has to determine if the driving mission can be performed.

One of the main challenges currently faced by control engineers is the lack of availability of control-oriented models that can be used to carry out the control and/or optimization design. Modeling and simulation are an integral part of the control design phase, both of which require different sets of skills and expertise. This typically leads to the realization that the AC challenges must be addressed by teams of researchers and practitioners with a variety of backgrounds (for example, mechanical, electrical, and computer science). In this regard, the need is for a cross-disciplinary education and research model that can transcend traditional disciplinary or organizational boundaries to enable the solution of more complex problems by teams of people from diverse backgrounds.

increased number of examples in the areas of linearized elasticity system and semi-linear equations, an expanded section on mass transportation problems and the Kantorovich relaxed formulation of the Monge problem, a new subsection on stochastic homogenization, new examples illustrating shape optimization, and an entirely new chapter devoted to gradient flows and the dynamical approach to equilibria. The book is intended for graduate students, researchers, and practitioners seeking a systematic treatment of variational analysis.

» TECHNICAL ACTIVITIES (continued from page 18)

for continuing to help as past chair of the TC. Stefano laid the groundwork for new initiatives, including establishing the AC group on LinkedIn and consistently organizing invited sessions at the Conference on Decision and Control (CDC). I would also like to thank all of the active TC members for their enthusiasm and constant dedication.

UPCOMING ACTIVITIES
» The CSS TC on AC is sponsoring the fourth "Open Problems and Challenges in Automotive Control" workshop to be held during the 2016 ACC in Boston, Massachusetts (Figure 1).
» The IEEE CSS TC on AC meets twice a year, at the ACC and at the CDC.
» A Special issue on "Controlling Tomorrow's Smart Automotive Vehicles" in *IEEE Transactions on Control System Technology* is being planned.

More news on these items can be found on the website (http://automotive-controls.ieeecss.org). Any CSS member is welcome to join the TC; just send me an e-mail (sonori@clemson.edu) with your contact information to receive information on committee activities.

I look forward to even more participation in the TC on AC activities in the future and to seeing you at the CDC 2015 in Japan and ACC 2016 in Boston, Massachusetts.

Simona Onori

» PEOPLE IN CONTROL (continued from page 37)

that I believe are the heart of distributed decision making and control—for example, how the network structure and dynamic behavior of the network are interrelated. We then proceed to use the agreement protocol as a springboard to discuss formation control, diffusion on random networks, robotic networks, social and opinion networks, games on networks, and finally networks as dynamic plants with inputs and outputs, networks as dynamic states, and higher-order interactions abstracted in terms of simplicial complexes. The book has been well received and adopted nationally and internationally, which we are very happy about. In the meantime, there has been so much activity on some of the topics discussed in the book that has prompted us to work on its second edition. I have been chipping my way toward finishing three more books, one on aerospace control, the other on linear algebra and optimization for systems scientists, and the last one on a system-theoretic foundation for data-driven decision making. I also occasionally scribble down notes on the control theory of martial arts, which might become a book after I retire. However, my first book-writing project is to finish the second edition of our networks book with Magnus.

Q. What are some of your interests and activities outside of your professional career?

Mehran: I love spending time with my kids (they are not that young anymore), learning about all that this new generation sees and deals with, as well as jogging and martial arts. I also like reading, and writing about all kinds of topics, from parenthood, to students, to social issues, and about life in general.

Q. Thank you for your comments.

Mehran: Thank you! It has been a pleasure.