lessons every week. (To be honest, I study so that my teacher does not become angry with me.) My big passion, however, is road biking. I am the owner of a beautiful red Cannondale Supersix road bike, and I cycle around 10,000 km per year. In summer, I love to take off for cycling tours over the famous mountain passes in the Alps, Dolomites, and Pyrenees from the Tour de France and Giro d'Italia. Also, in winter I cycle. In fact, two weeks ago I cycled the road-bike version of the famous Friesian Eleven Cities Ice Skating Tour, a 200-km tour along all 11 Friesian cities in the province of Friesland in the north of The Netherlands (there was no ice).

Q. Thank you for your comments.

Harry: Thank you.

MEHRAN MESBAHI

Q. How did your education and early career lead to your initial and continuing interest in the control field?

Mehran: I found feedback control and decision making over time fascinating from the very beginning—almost poetic. I was fortunate to have wonderful teachers who made me appreciate the mathematical elegance of reasoning about such processes and see the connections between control theory and other disciplines, some of which I was tempted to pursue, including information theory and game theory. However, at some point during my graduate studies, and probably due to the influence of my Ph.D. advisor, I became more interested in optimization theory, algorithms, and applications. It was only later that I found my way back to control by a deeper appreciation for its roots and intellectual depth and started working on rank-constrained and bilinear matrix inequalities and computational aspects of control synthesis, and, later on, distributed decision-making and control over networks inspired by my work at the Jet Propulsion Lab (JPL) spacecraft formation flight. Large-scale formations might have been intriguing to me, because to some extent, they reminded me of demonstrations that I use to witness on the streets of Tehran as a teenager during the 1979 revolution. I am still very interested in optimization, learning theory, and applications, particularly with so many recent advances in the field, but the dynamic nature of problems in control and the role of feedback continue to fascinate me.

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Mehran Mesbahi in his office at the University of Washington.

Q. What are some of your research interests?

Mehran: There are three main themes to my current research. First is the use of control and optimization techniques for designing autonomous systems, particularly for aerospace applications, such as distributed spacecraft and swarm robotics. Second is the area of dynamics and optimization on networks and system-theoretic issues for influencing such networked systems, as well as dynamics of networks, where the network is the dynamic state at the center stage. I am particularly interested in applications of such a network-centric framework to robotics, transportation, energy, and aerospace systems, as well as social and biological systems. Third, I have become increasingly interested in examining data-driven decision making over time and contributing to foundational studies at the intersection of control theory and machine learning.

Q. What courses do you teach relating to control? How would you describe your teaching style? How do you interact with your students?

Mehran: I teach a variety of courses at the University of Washington, from feedback control, spacecraft dynamics and control, optimal and robust control, linear operator theory in engineering, as well as networked dynamic systems, which is a course based on our book with Magnus Egerstedt, *Graph Theoretic Methods in Multiagent Networks*. I have been told that I am a demanding instructor, which might very well be the case, but I do try to blend in rigor with historical facts and sometimes gossip, in addition to my industry experience (Johnson Controls, JPL/NASA, Boeing), to set the stage for what I cover in my courses. I enjoy teaching a lot and feel that it will take the rest of my career to really master it. Teaching and mentoring have also allowed me to get paid for learning from my students. I particularly like witnessing the excitement of undergraduate students as they learn about "rocket science" as well as the intellectual curiosity of graduate students as they fall in love with their research topics, often through long periods of confusion, sleepless nights, and happy accidents. I like to think of myself as a wise tour guide who leaves

Mehran with his research group in front of Guggenheim Hall at the University of Washington.

his audience one by one at different crossroads, as each one sees a beautiful road or a destination through the fog that steals their heart away. Only my students can say how this ridiculous analogy works in practice.

Q. What are some of the most promising opportunities you see in the control field?

Mehran: I think developing a control-theoretic foundation for complex networks and a system theory that is built on the new paradigms in data sciences and computation are both really exciting; we have made some strides in this direction in our community, but I think a more concentrated effort will distinguish and solidify our impact as a community on problems that are of great current interest to many other disciplines, not only in engineering, but in humanities and biology. I also think control education needs to go through a transformation with the availability of easy to use and develop hardware and software platforms. As a community, we also need to become better in highlighting our impact to other fields and be responsive to technical and technological problems that are system theoretic at their core, as other disciplines appreciate and rediscover control and feedback in a wide range of applications, from social and biological sciences to energy and transportation.

Q. You are the author of the book *Graph Theoretic Methods in Multiagent Networks*. What topics does this book cover? Are you writing any other books?

Mehran: The book starts by looking at the canonical agreement or consensus protocol. This simple protocol exemplifies some of the key questions

(continued on page 64)

Profile of Mehran Mesbahi

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- *IEEE Control Systems Society experience highlights:* associate editor, *IEEE Transactions on Control System Technology*, 2007–2014, *IEEE Transactions on Network Control Systems*, 2013–present, *IEEE Transactions on Network Science and Engineering*, 2014–present.
- *Notable awards:* University of Washington Distinguished Teaching Award, University of Washington College of Engineering Innovator Award, NASA Space Act Award, National Science Foundation CAREER Award, NASA Shuttle Radar Tomography Award, JPL Cassini Mission Award, IEEE Fellow.

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.