The Impact of Control: Do We Have an Impact?

One of the most challenging tasks a president for the IEEE Control Systems Society (CSS) has to accomplish during his/her term is that of writing six "President's Message" columns for the magazine. Writing one of these messages brings me back to my high school years, when I was asked to write essays on unpredictable and often challenging topics, with only two hours of time and no bibliographic source to use. I was expected to write something witty, original, clear, well organized, and of course in correct and pleasant Italian.

Now, the only advantages I see in writing these messages is that I have more than two hours and free access to all possible information sources, including colleagues (which, in my high school years, was strictly forbidden!). But as far as the rest is concerned, I feel that the situation has worsened. I am not a native English speaker. I have many problems in finding something that may be at the same time original and of interest for the control community (many "President's Message" columns have already been written on topics important to the control community). Moreover, there are many more potential readers than just my patient teacher in Italy! Indeed, as Christos Cassandras wrote in [1], I wondered in turn how many people actually read these columns. Since my first column, I have been contacted by several colleagues with comments about it, so I know for sure that there is more than one reader!

The source of inspiration for this message was again a casual conversation with some of my colleagues in Padova, during lunch time. One of them was convinced that our impact is really limited and that surely control has little visibility. We cannot compete with people working in electronics, communication, or computer science, whose contributions to society and impact on every day life are broadly recognized far beyond the borders of the engineering community.

I may agree with the claim regarding visibility, but I do not agree with the fact that what we do does not have an impact. I will try to explain my views about both aspects.

The fact that our contribution to technology is not very visible to the "common man" is, in my experience, supported by the fact that, after more than 20 years in the field, I have not been able to convey to my parents the exact nature of what I do! Indeed, looking at Tariq Samad's "President's Message" [3], I found the prologue of the message. You tell people you are a university professor, and that's fine. With the Engineering Faculty. Fine. Working in automatic control. Blank stare. What is automatic control? After you have been struggling to provide three or four examples, people keep looking at you in a suspicious way. I guess my father never changed that look, especially when it comes to fixing something in my house that, in his opinion, as an electrical engineer, I should be able to do easily!

As Tariq mentioned, we definitely need to improve our communication skills and make it clear to the broad public, but also to decision makers and in particular to those who make funding decisions, what control is about, what benefits it allows us to achieve, and how control is an "enabling technology" and pervasive in all areas. Marketing, in general, is not one of the primary skills of people in the Engineering Faculty, at least compared to colleagues from other faculties.

When it comes to electronic devices, and in particular cellular phones or tablets, Internet services, and software applications, the innovation these items bring provides a clear visibility to the associated research area, without the need for any marketing strategy on their side. But the fact that the performance of these devices, applications, or services may have been significantly enhanced by control algorithms is something far from being visible and quite difficult to convey, especially to someone not familiar with technology. This is one of our main challenges, undoubtedly. The fact that we have significantly increased the number of fields in which control techniques are currently applied [2] to include energy systems, logistics, finance, health care and medicine, and biological systems is an important achievement. But this may not be enough since, again, our contribution may remain hidden from the user or simply credited to the field to which we are contributing. The challenge also is to bring this contribution to the industrial level and not to keep it a research level; otherwise we will only be able convince each other that we matter!

Initiatives like the two "Impact of Control Technology" reports (see [4] and [5]) or like the CSS VideoClip context (see http://ieeecss.org/video-contest/2014/winners and http://ieeecss.org/video-contest) are quite extraordinary and effective in showcasing that control is pervasive and essential. In this case, however, the challenge is to be able to conveying the message outside of our community.

Moving back from the visibility and impact of what we do, I believe that the

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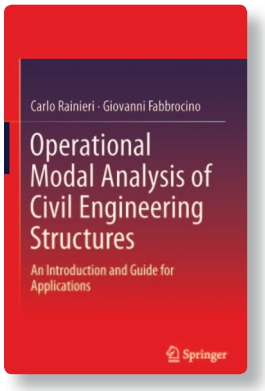
saturation, randomly occurring nonlinearities and randomly occurring uncertainties. The following topics are also covered: introduction to nonlinear stochastic systems, network-induced phenomena filtering and control, recent advances in recursive filtering and sliding mode control, and application to networked control systems.

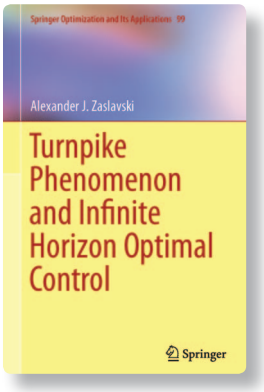


Springer, 2014, ISBN: 978-1-4939-0766-3, 322 pages, US$179.00.

Operational Modal Analysis of Civil Engineering Structures: An Introduction and Guide for Applications

by CARLO RAINIERI and GIOVANNI FABBROCINO

This book covers operational modal analysis (OMA) in structural engineering. Topics include modal theory, measurement hardware, signal processing, and software development. In particular, this book provides a description and discussion of OMA methods, their classification and relationship, and advantages and drawbacks. The authors cover both the well-established theoretical background of OMA methods and more recent developments in the field, providing detailed examples to help the reader understand the concepts and potentialities of the technique. Covering a range of different aspects of OMA, the practical perspective adopted in this book makes it suitable for a wide range of readers working in structural dynamics, system identification, and structural health monitoring.



Springer, 2014, ISBN: 978-3-319-08827-3, 370 pages, US$129.00.

Turnpike Phenomenon and Infinite Horizon Optimal Control

by ALEXANDER J. ZASLAVSKI

This book is devoted to the study of the turnpike phenomenon and describes the existence of solutions for a large variety of infinite horizon optimal control classes of problems. Chapter 1 provides introductory material on turnpike properties. Chapter 2 studies the turnpike phenomenon for discrete-time optimal control problems. The turnpike properties of autonomous problems with extended-value integrands are studied in Chapter 3. Chapter 4 focuses on large classes of infinite horizon optimal control problems without convexity assumptions. In Chapter 5, the turnpike results for a class of dynamic discrete-time, two-player zero-sum games are proven. This exposition will be of interest to mathematicians working in the fields of optimal control, the calculus of variations, and infinite horizon optimization.

» PRESIDENT'S MESSAGE *(continued from page 10)*

rich list of success stories described in [4] and [5] provides supporting evidence that the research in our area has a strong impact in the automotive industry, energy systems, medicine and rehabilitation devices, aerospace industry, communication satellites, and cellular phone technology, just to name a few. So we can make a difference. In some areas we already do, even if it is not visible to the public at large.

I have to admit, however, that not all the research topics we passionately investigate have had an impact on the industrial world in a meaningful level, not even in a hidden way. Many advanced control techniques provide beautiful benchmarks and have been used in research labs, but they seldom have been implemented on a large scale. The technology transfer seems to still be the missing step in many cases, and sometimes it is not even part of the future plans.

If I have to take an honest look in the mirror, I am sure I am not doing an excellent job in this direction. I love the challenge that certain problems bring, but I am guilty of a lack of interest when it comes to applying them to real-world problems, not to mention technology transfer. That is probably the reason why my dad is still fixing my broken electronic devices.

Once I have openly confessed my sins, I have to say, however, that I do not feel so guilty after all. I know I do not give my share of contributions to increase the visibility of the impact of control in everyday life, but I believe that in this large and friendly community there is room for everybody: for those who do abstract research and for those pursuing application-oriented research. We mix well together, and often times we profitably interact with each other by exchanging ideas and providing complementary ideas or motivations. That is one of the reasons why I like so much belonging to this community.

REFERENCES

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Maria Elena Valcher