Discovering China

I have had the idea of writing about my trips to China as IEEE Control Systems Society (CSS) president since my first visit in May, when I was invited to deliver a keynote address at the 27th Chinese Control and Decision Conference (2015 CCDC) in Qingdao. My subsequent trips to Hangzhou [for the plenary talk at the 34th Chinese Control Conference (CCC) and SICE Annual Conference 2015] and to Shenyang [to visit Northeastern University (NEU) and give a lecture] strengthened my intention.

There are two reasons why I may sound like an enthusiastic Pollyana to some of you (but I hope the Chinese control community will be pleased by this). First of all, I was invited to visit Qingdao, Hangzhou, and Shenyang in my role as IEEE CSS president so I was treated like a queen, and I cannot prevent myself from sounding happy and grateful about this. To be fair, I have to say that my experience with SICE, the Japanese Society of Instrument and Control Engineers, during the conference in Hangzhou was also impressive. I met the president, Prof. Satoshi Honda, and the leaders of the SICE to renew the memorandum of understanding between our societies for the fourth time, and it was a memorable event.

Second, with the exception of the combined 48th IEEE Conference on Decision and Control (CDC) and 28th CCC in 2009, a conference that I spent mostly in my hotel room, due to a quite aggressive bout of the flu, this was my first opportunity to visit China and see with my own eyes what several of my colleagues told me about: how impressive the growth is in China, both in terms of the economy (including infrastructure, buildings, shops, and opportunity) and from a scientific perspective.

The impact of China in terms of research activity at an international level is noteworthy.

TABLE 1 Statistical data about Chinese authorship in IEEE Conference on Decision and Control (CDC) proceedings papers and in *IEEE Transactions on Automatic Control* (*TAC*) papers.

	Number of Papers with at Least One Author with Chinese Affiliation	Number of Published Papers	Percentage
CDC			
2014	136	1121	12.13%
2013	122	1282	9.52%
2012	198	1257	15.75%
2011	157	1354	11.60%
2010	169	1264	13.37%
2009	826	1427	57.88%
2008	89	932	9.55%
2007	193	1051	18.36%
2006	110	1131	9.73%
2005	122	1339	9.11%
2004	119	935	12.73%
2003	164	1134	14.46%
TAC			
2014	161	279	57.71%
2013	173	403	42.93%
2012	140	342	40.94%
2011	130	341	38.12%
2010	134	385	34.81%
2009	154	398	38.69%
2008	94	338	27.81%

I will not indulge in statistical data about the growth of the Chinese economy since there are sources more accurate and reliable than my article could ever be. But I would like to mention that as soon as I got out of the airport in any of the aforementioned cities, I was amazed by the huge number of tall skyscrapers. One of those buildings could have easily hosted all the people living on my street in Padova, Italy. Not a surprising comment, considering that Shenyang's population, for instance, is more than 8 million, while Padova sums up to 211,180 souls. I am sure it looks like a toy city to the Chinese people who live here! But I have to say that, in comparison with Shenyang, even New York's skyscrapers seem relatively few.

The impact of China in terms of research activity at an international level is noteworthy. Table 1 shows some statistics that may be of interest to readers since they

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Changyun Wen and Elena Valcher at the end of her keynote address at CCDC 2015.

Elena Valcher with Prof. Chai at Northeastern University, Shenyang.

Elena Valcher receives a token of appreciation from Masayuki Fujita at the end of her plenary talk.

pertain to the IEEE CDC, our flagship conference, and *IEEE Transactions on Automatic Control* (*TAC*), our primary periodical. The percentage of papers that appeared in the CDC proceedings with at least one author having a Chinese affiliation has not significantly increased from 2008 to 2014. It has been fluctuating between 9 and 18%, with an impressive peak in 2009 (almost 58%) when the IEEE CDC was held jointly with the CCC. On the other hand, the percentage of papers with at least one author having a Chinese affiliation that appeared in *TAC* has grown from 27.8% in 2008 to an incredible 57.7% (that goes far beyond what I could even imagine before looking at the statistics). Note that by considering only authors with a Chinese affiliation, we are neglecting all Chinese researchers who moved abroad, and hence, we are quite underestimating the impact of the Chinese community in our research field. It is clear that publishing in top-tier journals is very much stimulated in the Chinese academia. Attending conferences like the CDC may be regarded not as a top priority, even if we have to keep in mind that visa issues discourage or even prevent Chinese authors from attending conferences abroad, and this clearly impacts these numbers. Meanwhile, Chinese participation in control conferences held in China is very high. I was impressed by the fact that the registrations at the joint CCC and SICE conference in Hangzhou almost reached 2100! And the CCDC 2015 in Qingdao was not much smaller.

West Lake in Hangzhou.

It is a very lively and active community, with an amazing number of Ph.D. students who support the conference organization as volunteers. Also, it is a very cheerful community. I found all the receptions and dinners that I attended to be very pleasant and friendly, with people moving from table to table to introduce themselves and to toast with other colleagues.

Elena Valcher in front on the Imperial Palace of the early Qing dynasty in Shenyang.

CSS members in China (the data refer to July 29, 2015) currently numbers 331 out of 8741, which amounts to approximately 3.8% of our total membership. These data, together with the limited conference participation, explain why Chinese participation in conference organization first and in the society governance second is limited, and definitely it would be nice to increase both of them significantly.

Focusing on research activity, I would like to mention that the visit to NEU in Shenyang was impressive under all viewpoints, first of all

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severe limitations on the performance of the compensated system. These limitations can be seen as restrictions on the acceptable operating region of the controller, since outside this region the system, although it may be stable. can exhibit such completely unacceptable behavior as excessive overshoot and oscillations. By enhancing the conventional controller with learning, one effectively expands the region of operability of the controller and creates a more robust controller. The control system can then compensate for a larger number of changes in the plant and its environment. Future control systems will have to be more robust to changes and will need a higher degree of autonomy than the systems of today. Autonomous systems require a high degree of flexibility to adapt to situations which cannot be predicted [3], and adaptive behavior of this type is not offered by conventional adaptive control systems. Learning methods appear to be useful in expanding the region of operability of the controller, and thus offer a higher degree of autonomy.

CONCLUSIONS

The learning method presented here provides performance adaptation for adaptive systems. This appears to be a novel approach to the problem. This method also deals with the question of boundedness of adaptive control systems. While analytical tools exist to determine whether a system variable will be bounded, the analysis typically does not indicate how large the bound will be. It is possible to exceed the system tolerances and yet be analytically stable. The learning method can determine this bound, and use the information in the process of controlling the system.

This method is general and it can be used in any system where performance depends on a number of adjustable parameters.

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» PRESIDENT'S MESSAGE

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because of the time at which it took place! I was expected to land in Shenyang around midday, but my flight was delayed by several hours, and I landed the Shenyang airport past 6 p.m. Prof. Tengfei Liu, who was traveling from Hangzhou to Shenyang with me, was so kind to bring me to the NEU hotel, a two-year-old, five-star hotel that leaves you with your mouth open and where I met with my host, Prof. Tianyou Chai, and some of his collaborators. After a wonderful dinner, Prof. Chai encouraged me to visit The State Key Laboratory of Synthetical Automation for Process Industries that he leads. The State Key Lab is just astonishing for the number of people working there, the research funds it is able to attract, and the number of science and technology awards it has received. I refer you to http://english.neu.edu.cn/key_laboratory/key1.html for more details. I believe that what Prof. Chai has been able to achieve has no equivalent in the academic world of automation.

The State Key Lab was not the only lab I visited that evening, and also the others were impressive for the number of students (yes, the labs after 9 p.m. were still well populated!) and the top-level research activities developed. I was quite impressed by the fact that some labs were monitoring and controlling, in real time, the activities of external plants, and this required a continuous presence of personnel in the lab.

What can I say? I know, I may sound like Pollyana, but my experience in China really made me aware of how active, engaged, and enterprising the Chinese control community is and how amazingly wise and farsighted their national research agencies are to so profusely support these activities and projects. As examples, I mention the Thousand Talents program, the Thousand International Talents program, and the Hundred Talents program. These initiatives really make one understand how committed the Chinese institutions are, in particular the Chinese Academy of Sciences, to the success of their research community and the new generations of Chinese graduates.

I would love to discover that such a mental attitude can be contagious!