

## Mountains and Control

The messages I have published in the magazine this year dealt with issues of internationalization and globalization, the past and future of research in our field, trends in electronic publications, the role of handwriting at present, the data deluge phenomenon, and obliquity for control. This message, which is the last of the series and marks the end of my term as president of the IEEE Control Systems Society (CSS) for the year 2010, presents some reflections on the connections between *mountains* and *control*.

Mountains are amazing for their aesthetic grandeur. In the western part of the Alps, the darkness of granite rocks of peaks emerging from high-altitude glaciers certainly provides a striking effect. The soft limestone color of the Dolomites, combined with green fields and woods, is very pleasing to the eye. Mountains have occupied a large portion of my personal life and are still largely influencing my daily activities. Over the years, during summer or winter, I have admired and climbed many mountains located in several countries of the world, including Australia, Austria, Bolivia, France, Germany, Iceland, Italy, Norway, Peru, Spain, Switzerland, Turkey, and the United States. As a national instructor of ski mountaineering of the Italian Alpine Club, I spend a few days every year teaching in a school located close to my hometown.

"Respect the Unstable" is the title of the famous inaugural Bode Lecture by Gunter Stein. Mountains are sometimes unstable; think, for example, about the rocks that may suddenly fall from peaks made of granite or limestone, or ponder about avalanches that

may abruptly begin from a steep snowy slope. These natural phenomena might seriously intersect with humans during a mountain climb or a skiing excursion. They may be classified as rare events and therefore are hardly predictable, but large deviation theory, laws of large numbers, and importance sampling techniques may explain these phenomena in the context of complex uncertain systems. Recently, we have all observed a striking example of mountain instability that affected our life globally. I am referring to the eruption of the volcano Eyjafjallajökull in Iceland that caused the closure of airspace over many parts of Europe and created major disruptions to air traffic. Several years ago, I explored with friends a few mountains in Iceland, including the Hvannadalshnúkur peak. This is the highest peak of the island, and it is surrounded by the

Vatnajökull glacier, one of the largest in Europe. During the same trip, we also saw the beautiful waterfall of Skógafoss, which is very close to the Eyjafjallajökull glacier. Some other volcanoes that have fascinated me are Monte Etna in Sicily (the view from the top of its main crater is amazing) and Mount St. Helens in Washington State (well known for the incredible explosion that occurred in the 1980s).

Mountaineering is not being crazy, as many people believe, rather it is about controlling the inherent risk related to this wonderful adventure. There is no doubt, however, that it is a dangerous sport. Nowadays, modern technologies provide substantial help, for example, reliable daily weather reports and estimated avalanche risks regarding specific areas of the Alps are available on the Web. The equipment



**FIGURE 1** Roberto Tempo skiing through the North Face of Mont Blanc. Mont Blanc, which is located between France and Italy, is the highest peak in Europe (4810 m or 15782 ft).



**FIGURE 2** Roberto Tempo climbing “Police des Glaciers” in Pointe Adolphe Rey, France.

is robust, light, and reliable. Certainly, all these tools allow us to make more accurate predictions, minimize the risk, and overall enjoy the mountains more. Sometimes, due to the uncertain environment, some unpredictable factors, which may be explained only with a posteriori analysis, may occur. In these unfortunate cases, cell and satellite phones, electronic devices for rescuing people covered by avalanches, and other sophisticated tools may become extremely useful. We can minimize the risk, we can work on more and more sophisticated tools, but we have to admit that mountains (and nature) will never be fully under control. Perhaps this is part of their challenging beauty.

### THE AESTHETICS OF CONTROL

Godfrey Harold Hardy was a prominent English mathematician who obtained outstanding results in several branches of mathematics including number theory and functional analysis. Nonmathematicians usually know him for his famous essay published in 1940 titled “A Mathematician’s Apology,” which focused on the aesthetics of mathematics. Hardy was obsessed by the distinction between pure and applied math, and he wanted his results to fall in the category of “pure math” and therefore completely unrelated to any practical applications.

However, much of his work has found major applications in several branches of applied sciences. Within our community, Hardy is well known for the theory of Hardy spaces that is among the building blocks of modern optimal control. Henceforth, his aesthetics of mathematics may be paraphrased as the *aesthetics of control*, which is definitely not limited to constructing solid theories and deriving beautiful equations but also providing significant practical achievements in various applications within and outside engineering.

### SOCIETY NEWS

During the summer I attended the workshop for high school teachers, “Ideas and Technology of Control Systems” partly supported by the CSS, the American Automatic Control Council (AACC), and the U.S. National Science Foundation. This workshop was part of the 2010 American Control Conference, which was held in Baltimore, Maryland. The purpose of this successful event was to increase the general awareness of the importance of systems and control technology and its cross-disciplinary nature among high school teachers and students. Workshop activities included presentations by control scholars and informal discussions and provided an opportunity for high school teachers to

meet passionate researchers and educators from academia and industry. The talks were designed to be educational, inspirational, and entertaining with the objective of showing the excitement of being a control engineer. This meeting followed a series of similar events and celebrated the tenth anniversary of the CSS and AACC Outreach Program. The driving force behind this series is Bozenna Pasik-Duncan, who deserves our congratulations for her sustained enthusiasm and energies.

At the end of July, I returned to China a few months after participating in the CDC/CCC in Shanghai. This time I attended the 29th Chinese Control Conference, which was hosted in Beijing at the China National Convention Center. The conference was technically cosponsored by the CSS, and it was successfully organized by the General Chair Han-Fu Chen and Program Committee Cochairs Daizhan Cheng and Jie Chen, with the help of their supporting team. Technical highlights of the conference were the plenary lectures by Lennart Ljung, Iven Mareels, and Ben M. Chen. Regarding social events, the dinner held inside the Beijing National Stadium known as “Bird’s Nest” (the location of the Opening and Closing Ceremonies and athletic events of the 2008 Olympics) was unforgettable. After the conference I traveled west to the University of Electronic Science and Technology of China, Chengdu, to attend the “International Workshop on Control Systems Science and Engineering,” technically cosponsored by the CSS and organized with extreme care by Shuzhi Sam Ge and his group. Many thanks to Shuzhi Sam Ge for providing outstanding local arrangements.

My trip ended with an interesting visit to the Northeastern University in Shenyang, where I was positively impressed by the number of activities in the area of automation and control carried on by Chai Tianyou in various university labs. On the social side, during the trip I had a chance to appreciate the very friendly Chinese hospitality and to visit remarkable places like the Jiuzhaigou National Park and the

Benxi underground river cave, which will remain in my memory forever.

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### LOOKING AHEAD

One of the pleasant duties of the CSS president is to represent the Society on several occasions and to deliver some invited plenary lectures. Many important meetings are scheduled after this present message was written. I am not able to provide detailed reports, but I would like to list them in chronological order: Society of Instrument and Control Engineers (SICE) Annual Conference, Taipei, Taiwan; 2010 IEEE Multiconference on Systems and Control, Yokohama, Japan; the fall meeting of the Executive Committee, Irvine, California (preceded by a one-day outreach workshop); the IEEE Technical Activities Board, New Brunswick, New Jersey. Finally, the closing event of my presidency is the 49th IEEE

Conference on Decision and Control, December 15–17, 2010, Atlanta, Georgia. I am looking forward to attending all these meetings with great enthusiasm!

### FAREWELL AND THANKS

I would like to express my sincere thanks to all members of the 2010 Executive Committee for their outstanding collaboration. Maria Elena Valcher has been extremely active and is about to complete her third year as vice president for Conferences; Sam Shuzhi Ge and Shinji Hara are successfully finishing their second year as vice president for Technical Activities and vice president for Membership Activities, respectively; Christos Cassandras and Pradeep Misra actively served during this year as vice president for Publications and vice president for Finance, respectively; Mario Sznaiier provided excellent support as executive director of the Society. Some of these officers will continue their activities and

service to the Society; a list of the 2011 CSS officers is available in "CSS News." Many thanks to Tariq Samad who is concluding his term as immediate past president, and my welcome to Rick Middleton who will serve the CSS as 2011 president. I am sure that the Society is in very capable hands. Finally, I would like to acknowledge the excellent advice I have received on various occasions from many friends, including in particular John Baillieul, Bob Barmish, Tamer Başar, Ted Djaferis, and M. Vidyasagar.

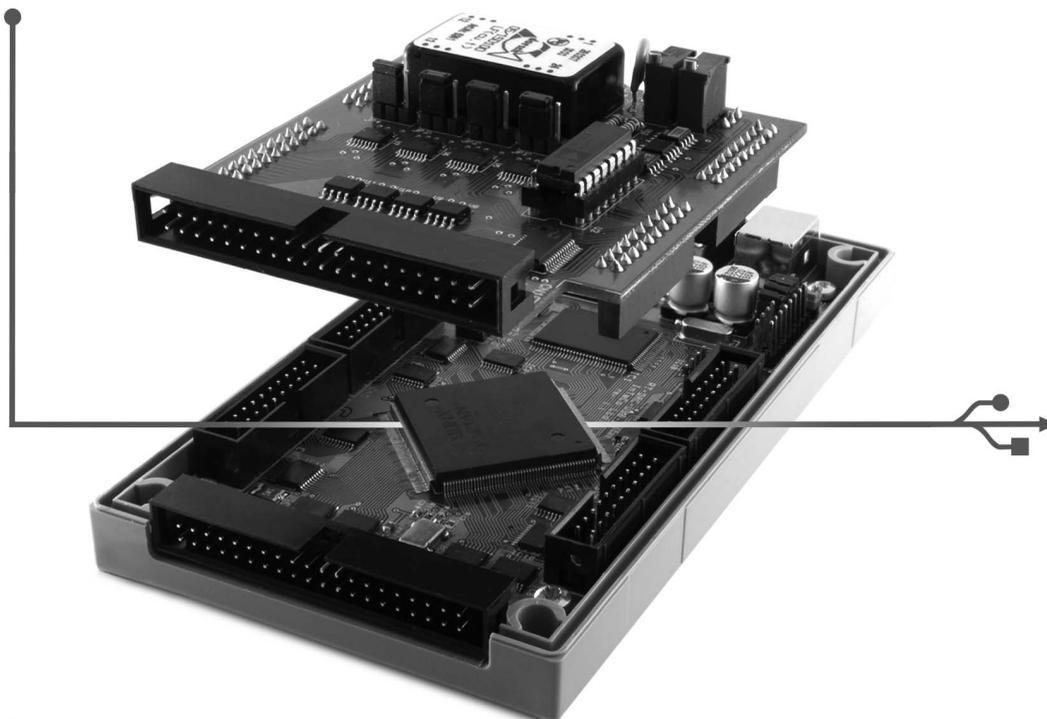
It has been a great privilege for me to serve as 2010 CSS president. A big *thank you* goes to all members of the Society I had the opportunity to work with and to those I did not have yet a chance to interact with. This has been a truly remarkable year for me. My adventure will continue in 2011 as immediate past president of the CSS.

**Roberto Tempo**



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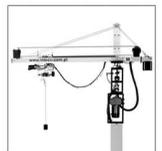
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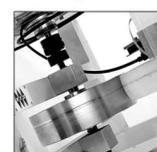
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