

## Handwriting, Typing, and LaTeX

In my "President's Message" in the June issue of *IEEE Control Systems Magazine*, I focused on the topic of reading. The present article deals with its counterpart *writing*. For starters, I would like to pose the following question: Is handwriting history, or is the future of handwriting still bright? An answer to this question is given in a recent essay published on the Web by Anne Trubek, where she argues that "Writing words by hand is a technology that's just too slow for our times, and our minds." In the community of English rhetoric and composition, the essay drew a wide variety of reactions that expressed diverse opinions. It is certainly true that writing has changed dramatically from the schools created by the Sumerians some 6000 years ago to the present way of thumbing short and cryptic text messages with cell phones or broadcasting tweets on social networks.

To explain my own thoughts on this topic, I need to go back to the first papers I published in *IEEE Transactions on Automatic Control* about 25 years ago. At that time, the technical content was first handwritten, then the material was reorganized several times utilizing glue, tape, and scissors for manual cut-and-paste operations. Subsequently, the manuscript was passed on to secretaries who sometimes made mistakes when typing complicated equations. I remember that once a min-max problem was arbitrarily changed to a max-min problem. Luckily, this error was detected before the paper was submitted, which avoided disastrous

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consequences for the review process. I am sure that many colleagues of my generation share similar memories regarding this writing experience. Clearly, we all felt that improvements were necessary for producing high-quality technical papers.

For me, major progress occurred during my stay at the Computer Science Department of Columbia University in the mid-1980s. At that time, I learned about the typesetting system TeX, which was invented by Donald Knuth. TeX was designed to achieve two main objectives, namely, to facilitate preparation of high-quality papers depicting beautiful mathematical equations and to provide a universal tool displaying exactly the same text on the screen of every computer in the world. LaTeX, prepared by

Leslie Lamport, replaced TeX because it was more user friendly and included features not readily available in TeX, such as numbering and cross-referencing equations and citing papers using bibliographies. LaTeX is now the standard typesetting tool used for preparing and submitting papers to our journals and conferences.

TeX and LaTeX have been a technological revolution for writing technical papers and books containing many mathematical equations. They also modified our way of conceiving technical papers, but I am not sure if they really helped us to produce better results and theorems. The typesetting systems greatly facilitated collaborations between colleagues worldwide. They also provided an extended alphabet for scientific exchanges that

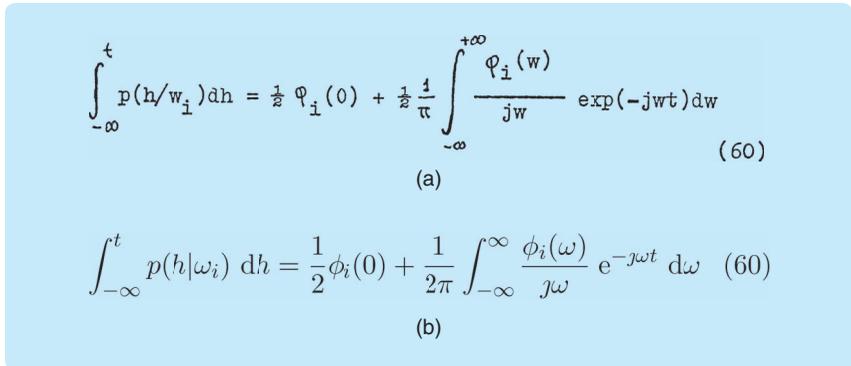


FIGURE 1 (a) Partly handwritten equation and the same equation (b) typeset with LaTeX.



Roberto Tempo (left), 2010 president of the IEEE Control Systems Society, and Alberto Isidori, president of the International Federation of Automatic Control for the triennium 2009–2011.

includes, for example,  $\int$ ,  $\prod$ , and  $\sqrt{\quad}$  to denote integrals, products, and square roots. Writing draft versions of papers and circulating them to all coauthors using e-mail became straightforward and increased the number of papers with multiple authors affiliated with institutions located on different continents. Overall, TeX and LaTeX improved the circulation of ideas. Regarding the look of mathematical equations, Figure 1(a) depicts a partly handwritten formula taken from one of my earliest papers dealing with statistical pattern recognition, whereas Figure 1(b) shows the same equation typeset using LaTeX. The beauty of the latter equation compared to the ugliness of the former is evident, but of course, it is easy to confuse beautiful typesetting with beautiful thoughts.

It is obvious to everyone that handwritten technical papers belong to history. The answer to the future of handwriting is also clear: within the control community, for many of us, writing by hand is still an amazingly powerful technology when *conceiving ideas* during interactive technical discussions. Scribbling equations, annotating numerical results, drafting flowcharts of algorithms, and draw-

ing simple pictures or block diagrams by hand using the old-fashioned markers and boards are irreplaceable techniques for fast communication of ideas to colleagues and students. Once the concepts are crystallized, modern tools can be utilized for preparing technical papers, but writing and drawing by hand are still the underlying technologies.

### SOCIETY NEWS

In December 2007, the IEEE Control Systems Society (CSS) Board of Governors approved the formation of a task force, launched by Tariq Samad, for targeting outreach activities in the control area. Subsequently, many activities have been successfully initiated under this program with the objective to promote our field, to attract members to CSS, and to facilitate connections between academia and industry. In late October 2009, the first technical event organized under the auspices of the task force, the “International Workshop on the Impact of Control: Past, Present, and Future,” took place in the beautiful mountains surrounding of Berchtesgaden, Germany. The workshop was co-organized by Anuradha Annaswamy, Gary Balas,

Martin Buss, Patrick Dewilde, and Tariq Samad. Seventy leading experts from academia, government, and industry attended the workshop and discussed the impact of control on the real world. Specific topics included the successes of advanced control in practice, new and emerging technologies, grand challenges for the future, research opportunities, and barriers to technology transition. A report of the workshop will be available on the CSS Web site when completed.

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The second conference event of the task force was the “International Workshop on the Future of Control in Transportation Systems.” The first two days of the workshop were held at the Università del Sannio in Benevento, and the final day took place in Sorrento, a beautiful city off the Gulf of Naples, Italy, at the end of May. The event focused on transportation systems (road, railway, and aircraft vehicles) and on studying the “hidden intelligence” of control systems, which governs their correct behavior. This event was organized by Gary Balas, Jozsef Bokor, Luigi Glielmo, and Tariq Samad. A report summarizing the activities is under preparation and will be available on the Web sites of the sponsoring organizations.

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Finally, I am pleased to announce that a significant enhancement of the CSS Web site is available at <http://www.ieeecss.org>. This Web site proposes a modern and fashionable look of the Society to the Web surfer. Our journals, conferences, recent awardees, ongoing activities, and latest news are now more easily accessible. In the next few months, we are planning to add further content and material to the site.

Your comments, suggestions, and ideas regarding how activities for the Society can be improved are welcome. I can be reached at [roberto.tempo@polito.it](mailto:roberto.tempo@polito.it).

**Roberto Tempo**  
