

## Fear of Finding

**H**ow many systems and control journals are there? In no particular order I can think of *TAC*, *TCST*, *SCL*, *IJC*, *EJC*, *JDSMC*, *JGCD*, *Automatica*, *JVC*, *JDCS*, *AJC*, *IJRNC*, *IJACSP*, *ARC*, *CEP*, *CTA*, *MCSS*, *TIMC*, *OCAM*, and *SICON*. I could also include at least a few specialized control journals as well as some open-access Web-based journals. We should also not forget defunct journals such as *CTAT* and the cryptically named *Journal A*, whose contents are every bit a part of the archival literature as are those of living journals. Finally, I could (and should) include control-related journals published in languages other than English. I know of at least one in Spanish, mentioned recently in *IEEE Control Systems Magazine*.

A researcher in the systems and control field—as in any research area—needs to be cognizant of the literature in his or her area of specialization. Many of us have access through our institutions, at least through interlibrary loan agreements, to most of these journals, while many Web-based journals, not to mention sites such as ArXiv, are universally and freely accessible. With interests limited to our particular field, a reasonable attempt to follow the contents of all of the major systems and control journals as well as the major conferences can take a significant amount of time.

But compared to mathematics, a couple dozen journals is not much. The number of math journals is uncertain, but there seem to be at least 500, in numerous languages. Many do not seem to have electronic access, and back issues are scanned only for the major titles. I would imagine, even with



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Dennis Bernstein on a winter hike in southeastern Michigan.

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search engines, that it's impossible to have a complete picture of the work that exists on a specific topic. There's always the possibility that the problem you're working on has already been solved. In fact, rediscovery in mathematics was common before the Internet. Although it's less frequent today, I'm

sure it still happens. In any event, it's likely that there's some useful mathematics out there that you'll never find.

Fortunately, because of search engines we don't need to check the contents of every new issue of a journal or the titles of every paper in CDC and ACC proceedings. But search engines are imperfect (run a few test cases on *IEEE Xplore* and you'll see what I mean). Even with perfect search engines, you may not know which words to search for since not all researchers may use the same terminology. In cases like that, the best resource is knowledgeable experts.

The irony of literature searches is that it's often difficult to find and appreciate relevant work until you've already done some research on the topic. This phenomenon suggests the value of repeatedly searching the literature, not just at the start of a project but as the project progresses. But as a project moves forward, each search is accompanied by greater trepidation. There is nothing more disappointing than to make progress on a problem and *then* find that your "new" results are already out there. With this in mind, I often have to force myself to search for what I hope not to find.

If your literature search is incomplete, you'll know soon enough, since the reviewers will gladly point out papers that you might have missed. Debates inevitably arise about which publications are relevant and which types of works—such as unpublished sources—warrant citation, but the necessity of recognizing prior work is clear. Finding them is another story.

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