AACC American Automatic Control Council

Newsletter, Fall 2004

U.S. National Member Organization of: INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

Columns: Officers Speak

President's Corner

I hope you enjoyed your summer, at least those of you who live in the northern hemisphere. And I hope that most of you are working on papers for the 2005 American Control Conference (ACC), which will be in Portland Oregon from June 8-10. I am looking forward to seeing as many of you as possible in Portland. The AACC exists for three purposes, to sponsor the ACC, to be the United States' national member organization (representative) to the International Federation of Automatic Control (IFAC), and to give several awards for research and teaching in control. If people do not attend the ACC and present papers there, then we have little or no reason to exist. For more information about the 2005 ACC, see the conference web site http://www.ee.washington.edu/conf/acc2005/

I hope you are also planning to participate in the 2005 IFAC Congress, which will be held in Prague, Czech Republic from July 4-8, 2005. The deadline for submitted papers was September 8, 2004. You can find more information about this meeting at the web site http://ifacplaza.certicon.cz/index.php

I would like your opinion on a decision reached by the AACC Board of Directors at our meeting on July 2. We are occasionally asked to provide our mailing list to some other organization. Generally, they want it for a reasonable purpose such as to notify the people on our mailing list of some meeting. Apparently, it is now illegal in Europe to provide our list without first obtaining permission to do so from all of the names on it. The Board of Directors discussed two possible policies. Obtain permission from all the people on the list so we can provide it to appropriate organizations. Alternatively, do not provide the list to anyone else. The Board of Directors vote resulted in a tie. I cast the deciding vote in favor of the alternative. Thus, our mailing list is not available to anyone else. I am very interested in your views on this. We can change our decision at our meeting in December if you think we should.

Lastly, you may have noticed that we have begun surveying those who attend the ACC by means of the web. Until last year, the survey was done by paper forms handed out at the meeting. Replacing this by a web-based survey has many advantages. The two most important are that we have gotten a much higher response rate and it is much easier to process the data. For instance, we have 268 responses so far to our questions regarding the 2004 ACC versus 34 to a similar paper-based survey in 2002. The mean response to our question about the technical quality of the 2003 ACC was 4.06 out of a possible 5 (Most satisfied equal 5, least satisfied equal 1) with a standard deviation of 0.86.

We take these surveys very seriously. All the General Chairs of future ACC's look at this data. They are encouraged to try new things in the hope of improving our meetings. If these experiments succeed, they become a regular part of the ACC. If not, we do not do them again. We strongly encourage you to respond to the survey. It is not hard and, as people specializing in control, we certainly appreciate the value of feedback.

William S. Levine, President, AACC 2004-2005

Vice President Invites Feedback

The American Automatic Control Council (AACC), as the national member organization representing the U.S.A. in the International Federation of Automatic Control (IFAC), plays an important role for the U.S.A. control community. The AACC also annually organizes the American Control Conference (ACC), which brings together the control engineering researchers from a variety of professional societies. Although two decades old, the ACC continues to be a vibrant venue, with about 1000 attendees per year, where one can interact with control engineers engaged in research from a variety of disciplinary perspectives.

Each year we conduct a survey to better understand how to continually improve the ACC from year to year. For example, by introducing tutorial and interactive sessions, workshops, special sessions, etc. There is also an ACC Steering Committee, chaired by the vice president of AACC, that brings together the general and program chairs of recent and future ACC's to share best practices. The surveys and the Steering Committee help ensure that we build each year on the strengths of previous ACC's while continuing to bring in new ideas. Amazingly, this is all done by volunteers - most of whom can't even fit their regular jobs into a 40 hour week!

As the current vice president of AACC, I encourage you to respond to the ACC surveys, to contact me directly with your ideas and suggestions. I will bring them to the ACC Steering Committee for consideration. For example, are there other professional societies with significant control activities that would enrich the AACC? Are there new activities that we should try out at the ACC? Can we use the AACC to provide a stronger voice for control engineering research nationally? Please send me your ideas email appearing elsewhere in the newsletter.

A. Galip Ulsoy, Vice President AACC

Global Concerns XXXI

How do birds fly? Before the Wright brothers, almost everyone was convinced that birds fly by flapping their wings. As a result, early aviation pioneers naturally focused on flapping wing mechanisms. As early as 1884, **Lawrence Hargrave** had small working model airplanes with wings that produced motions of birds in flight (or that of a swimming fish). A year later, he had ten working models; seven based on flapping bird wings and three that used "screws". He claimed that both approaches were equally effective, but he *preferred* - and could cite several advantages for - flapping wing arrangements. By 1890, he had demonstrated several working vehicles (typically weighing less than 5 or 6 pounds) with compressed air engines for short duration flights. He believed that steam engines – using flapping wing mechanisms - would eventually enable sustained flight. By 1892, Hargrave had discovered that

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wings with curved surfaces achieve increased lift and in 1894, he linked together four box kites into a "cellular" wing arrangement which achieved greater stability and lift than any other configuration. This box kite wing design was subsequently used by many other inventors, including the Wright brothers.

Although Hargrave achieved many breakthroughs, including curved wings (with thick leading edges) and vertical stabilizers to improve glide stability, he refused to abandon the "obvious" flapping wing approach for power. As a result, he never achieved a propulsion system to deliver the necessary lift-to-weight ratio for sustained flight. In the meantime, the Wright brothers, using a gasoline engine and screw propeller, achieved in 1903, the first powered flight with a human on board!

Hargrave was recognized for his considerable accomplishments. Indeed, it was reported in 1893, "If there be one man, more than another, who deserves to succeed in flying through the air, that man is Mr. Lawrence Hargrave …" Nevertheless, although Hargrave had a well defined problem, and although he accomplished much, he was blinded by *tunnel vision* toward a particular solution that was ultimately impractical.

How do computers work? About 80 years before the Wright brothers' success, another pioneer was making progress in another field. **Charles Babbage** dreamed of developing a mechanical machine to calculate mathematical tables. As a mathematician, he derived methods to perform relatively complex formulas using simple "addition" operations and then designed a "Difference Engine" in 1819 to implement the methods. Although it was difficult to convince his government to invest in a complex mechanism of brass, steel, and pewter clockwork, he nevertheless was able to do so. By 1832, Babbage conceived of an even better machine, an "Analytical Engine" that could perform not just one mathematical formula, but any kind of calculation. Unfortunately, in 1834, after the British government had put £17,000 into the Difference Engine (and Babbage had put £6,000 of his own money), work was stopped. After eight more years of indecision (whether to continue the Difference Engine or start the Analytical Engine), the government decided in 1842 to proceed no further with either project. Meanwhile, Babbage completed his first designs for the Analytical Engine and then developed several more, but, unfortunately, he never completed any of the designs.

Although the Analytical Engine never progressed beyond detailed drawings, it had many of the logical components of today's computers. It had a "store" (registers), which contained the variables to be operated upon - as well as results of prior operations; a "mill" (CPU) where variables were brought to be operated upon; and a "control" (program) which prescribed the sequence of operations to be performed for any given application. "Control" was to be developed by the user (programmer) and would be assembled as a sequence of punched cards (the program).

Many believe Babbage was a hundred years ahead of his time, but that critical tolerances required for his machines exceeded available technology. However, this is incorrect. In fact, in 1841, **Thomas Fowler**, a self-taught printer and bookseller, designed a successful calculating device (built from wood) that used mechanical rod logic. Whereas Babbage used an *analog* decimal system (with numbers 0 through 9 each represented by a discrete position of a rotating wheel), Fowler's machine was *digital* with numbers represented by simple sliding rods that occupied only one of three positions at any time. Reducing the number of distinct physical states meant parts could be made less precisely; simple wooden devices were entirely sufficient. Furthermore, in 1853 two Swedish engineers (**Georg** and **Edvard Scheutz**) built a small working Difference Engine - using Babbage's description - which *printed* mathematical, astronomical, and actuarial tables with unprecedented accuracy, and which was used by both the British and American governments. In 1876, only five years after Babbage's death, an obscure inventor, **George Barnard Grant**, exhibited a full-sized Difference Engine (containing over 15,000 moving parts) at the Philadelphia Centennial Fair. The point is that, although Babbage's Analytical Engine was intellectually sophisticated, construction was certainly *not* beyond the technology of his day.

What was the Problem? Hargrave had a well defined problem, but his mental and emotional commitment to "flapping wings" was an unworkable solution. Babbage could also define his problem - and even had a vision for an excellent solution - but was vexed with implementation. He used analog (rather than digital), mechanical (rather than electrical), and he envisioned steam powered operation. And like all pioneers, both Hargrave and Babbage had only limited colleagues with which to work.

We can all have similar experiences to Lawrence Hargrave and Charles Babbage. We can work hard, and some of us may develop significant innovations, but sometimes in spite of our devoted work and truly useful accomplishments, we may still have "incorrect assumptions" which prevent truly revolutionary breakthroughs. How does one avoid such incorrect assumptions or "blind spots"? Experts describe engineering design as a combination of intuition / innovation / creation followed by analysis / implementation / refinement. Today, numerous tools assist us during the final *refinement* phase: verified mathematical models, simulation tools, and rapid prototyping can produce excellent forecasts for the behavior of a given design. However, there are few tools that leverage the *creation* phase – that point where we conceive of the fundamental ideas (sometimes on a simple paper napkin). Basic assumptions made during the concept phase usually make the difference between ultimate success and failure.

How can IFAC help? To improve creativity, it is useful to increase the diversity of ideas to which we are exposed, to have discussions with colleagues who are exploring other approaches for similar problems, and to have someone else question our fundamental assumptions. Indeed, a recent survey of IFAC affiliates indicated that the *most* valuable reason for participating in IFAC events is exposure to high quality papers; this exposure clearly broadens our subsequent creative powers. The *second* most relevant reason is the opportunity to "network", which also leverages our perspective. Clearly, we should engage in IFAC and other similar activities whenever possible. *Your career success may be the ultimate result!*

However, engaging in IFAC doesn't solve all problems. On December 17, 1903, the Wright brothers sent a telegram to their sister, Katherine, *"We have actually flown 120 feet. Will be home by Christmas"*. When Katherine showed the exciting news to the Editor of her local newspaper, he noted, "How nice. The boys will be home for Christmas".

Mike Masten, IFAC Council Member

Conferences

2004 American Control Conference: Program Highlights

The 2004 ACC was held Wednesday through Friday, June 30 to July 2, 2004 at the Boston Sheraton, Boston, MA.

2004 AACC Awards recipients (L-R) W.S. Levine (president), P. Christofides, H. Kushner, W. Powers, M. Spong, M. Tomizuka (awards chair)

Conference Highlights include: 1796 papers submitted. Based on peer review there are 1031 papers selected for publication (invited & contributed papers); 10 tutorial sessions; 8 one-day workshops and 2 two-day workshops before the conference; 3 plenary speakers; Industrial & publisher exhibits; 5 Special sessions: Systems Engineering of Systems Biology (Wed. morning 9:30-11:00), Women in Control (Wed. Lunch), NSF Micro- and Nano-scale systems (Wed. afternoon 1:30-2:30), Winning that Academic Job Session (Wed. evening 6:15-7:30), Resume Exchange Session (7:30-8:30), History of Control Session (Thurs. Evening 6:30-8:00), and Writing a Winning NSF CAREER Proposal (Friday 11:30-12:00).

Jason L. Speyer, General Chair 2004 ACC

2005 American Control Conference: Call to Participate

The American Automatic Control Council will hold the Twenty-fourth American Control Conference (ACC) from June 8-10, 2005 (Wednesday-Friday) at the Portland Hilton in Portland, Oregon. It is time to start thinking about 2005 ACC as an outlet for your research and an opportunity to enjoy Portland, OR. Note the key dates and the new ACC policy that will go into effect with the 2005 ACC.

The conference will take place during the famous Portland Rose Festival with an opportunity to watch the nation's second-largest all-floral Parade from the hotel. Nestled in the heart of the Willamette Valley, Portland sits squarely between the Pacific Ocean (90 minutes by car) and the 10,000 plus foot tops of the Cascade Mountain Range (Mount Hood is 1 hour by car). A 45 minute drive east from town will get you to the middle of the Columbia Gorge National Scenic Area, a place of breath-taking beauty which includes the 620-foot Multnomah Falls. Portland's downtown area is scaled to human dimensions. The blocks are short, just 200 feet long. Cafes, restaurants, bookstores, galleries and specialty stores are waiting around every corner.

NEW ACC MANUSCRIPT SUBMISSION POLICIES

- **Paper Submission Format:** all papers submitted to the ACC for review and publication after acceptance must be formatted in the standard 2-column Proceedings format. See the Author's Kit at the conference web site for Word and LaTeX style files. Regular and invited papers are limited to 8 pages and short papers to 3 pages. Papers exceeding these limits will NOT be reviewed.
- **Paper Publication:** accepted regular and invited papers are limited to 6 pages and short papers to 2 pages. Papers exceeding these limits will be published in the Proceedings only after payment of a page over-length fee.
- **Registration Fee:** One regular registration fee at the advance registration rates must be paid by one of the authors before uploading the final version of the paper for inclusion in the conference proceedings.

KEY DATES	
Notification of Acceptance/Rejection:	Jan 31, 2005
Final manuscript submission deadline:	Mar 15, 2005

Visit www.ee.washington.edu/conf/acc2005/ for complete conference information. You may also contact the General Chair: S. Jayasuriya, sjayasuriya@ mengr.tamu.edu 979/ 845-0271or the Program Chair, S.N. Balakrishnan, bala@umr.edu 573/ 341-4675.

Suhada Jayasuriya, General Chair 2005 ACC

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