

IEEE Control Systems Society Enrollment

The summary report from the IEEE Control Systems Society (CSS) Board of Governors meeting in June 2015 [1] notes that “S. Hirche provided some statistics on CSS membership development: there is an overall decrease in CSS membership by 1.3% and IEEE membership by 1.1%. She provided a breakdown by region and noted a 10% decrease in Latin America.” While those numbers for the membership reduction from December 2013 to December 2014 may not be overly alarming, the December 2015 data suggest that the membership is actually down 4.5% from December 2014, which is one of the sharpest membership declines of the major IEEE Societies.

Furthermore, digging a little bit deeper into the data shows that the highest contribution to this decline comes from IEEE higher-grade mem-

bers (see Table 1): 412 members left the CSS from December 2014 to December 2015, a reduction of approximately 4.4%. Among student members, the number decreased by 25 from December 2014 to December 2015 (313 student members), which corresponds to a relatively large decrease of 7.4%. This contrasts rather sharply with the IEEE Robotics and Automation Society (RAS) increase by 15.8% during the same time period.

Table 2 splits out the graduate student and student memberships to provide even more detail. The data show that CSS and RAS graduate student numbers are similar (8.9% versus 11.4%), but the student member numbers differ greatly (3.5% versus 17.5%). These results also show that RAS is doing exceptionally well in attracting younger people, compared to all other Societies, in that 28.9% of their members are student or graduate student members, compared to the average of 14.8% over all Societies. CSS is below

average in student or graduate student membership, at 12.3%.

MEMBERSHIP HAS ITS BENEFITS

CSS membership benefits are likely well known to most readers [2]. Each member receives *IEEE Control Systems Magazine*; *IEEE Spectrum*; and discounts on IEEE publications, IEEE education courses and tutorials, and IEEE-sponsored conferences. CSS also produces *IEEE Transactions on Automatic Control*, *IEEE Transactions on Control Systems Technology*, and *IEEE Transactions on Control of Network Systems*. A subscription to these journals provides web access to the same-year issues through *IEEE Xplore*. Local Chapters of the IEEE CSS [3] exist in all regions of the world and provide a forum for presentation and discussion of new ideas in systems and control as well as a source of information about the IEEE and CSS. CSS also sponsors numerous conferences, workshops, and seminars [4] throughout the world.

Digital Object Identifier 10.1109/MCS.2016.2558296

Date of publication: 18 July 2016

TABLE 1 Membership data from December 2015 for several major IEEE Societies. The percentage changes are from December 2014 to December 2015. The students here correspond to undergraduate members. Table 2 splits out the graduate and undergraduate populations. (Data courtesy of Mary Curtis, m.curtis@ieee.org.)

IEEE Society	Higher-Grade Members	Percentage Change	Student Members	Percentage Change	Percentage Change in Total Population
Aerospace and Electronic Systems	4601	-2.2%	277	-5.1%	-2.4%
Computational Intelligence	7043	+8.1%	715	+86.2%	+12.5%
Control Systems	8974	-4.4%	313	-7.4%	-4.5%
Robotics and Automation	11,138	+5.8%	2374	+15.8%	+7.4%
Systems, Man, and Cybernetics	4495	-2.4%	203	-8.1%	-2.7%

TABLE 2 The student membership for several major IEEE Societies as of January 2016. The total membership includes all levels of IEEE Fellows, Senior Members, Members, and all levels of Student Members. (Data courtesy of Mary Curtis, m.curtis@ieee.org.)

IEEE Society	Total Membership	Percentage Graduate Student Members	Percentage Student Members	Percentage Students of Total Membership
Aerospace and Electronic Systems	4688	4.3%	5.6%	9.9%
Computational Intelligence	7282	12.2%	8.4%	20.6%
Control Systems	9125	8.9%	3.5%	12.3%
Robotics and Automation	13,500	11.4%	17.5%	28.9%
Systems, Man, and Cybernetics	4616	10.4%	4.5%	14.9%

These might be compelling reasons for professionals to join a new Society, but once a member and the true benefits are realized, I assume that it is even easier to convince members to re-enlist. In that case, we are left with the question of how do we do a better job of attracting students so that they can be fully aware of these benefits?

STUDENT ENROLLMENT

Current activities that promote student membership include improving publicity for student activities at the CSS website (student chapters [5] and travel support program [6]). Note that membership in a CSS student Chapter is free and establishes the direct link between the classroom and the meeting room. Members of student Chapters have the opportunity to meet with industry leaders, participate in professional development programs, and develop contacts for internships and future career opportunities. These seem like good points but, even though the cost of CSS membership is far less than a textbook, the fact remains that the value added for paying a student membership fee is not clear when students can already get access to the publications online. Can we find ways to increase this added value?

It would also be important to improve the publicity and awareness associated with student Chapters to help

increase student member involvement. This could, for example, include starting student Chapters in regions where they don't exist, which, for example, appears to be the case in four of the six U.S. regions [5]. Again, this contrasts sharply with the list of approximately 130 RAS student Chapters that exist throughout the world [7]. Increased faculty mentoring and involvement in these CSS student Chapters might also help increase the value added to the students and make the involvement more rewarding. This could also include adding a "Student Chapter" column to *IEEE Control Systems Magazine* (student volunteers interested in organizing this should e-mail me to apply).

Another option would be to invite the students taking your graduate, undergraduate, and online classes to join IEEE and CSS. It is my impression that the America Society of Mechanical Engineers (ASME) and the American Institute of Aeronautics and Astronautics (AIAA) tend to have much more significant (and visible) footprints on the MIT campus than similar IEEE student groups. Is it the same at other institutions? If so, then perhaps there are some lessons to be learned on what ASME/AIAA are doing better than IEEE in forming and energizing student groups.

I also think the CSS community should put more effort into increasing the excitement about the capabilities

offered by the field (beyond that offered in [8]), such as using control for Formula 1, control for more efficient cars, verification of software systems, control of biological systems, and control-theoretic approaches in neuroscience and brain medicine [9]. Of course, there is a lot of excitement in robotics, autonomous cars, unmanned aerial vehicles, and quadrotors, but many of the capabilities required for those systems are enabled by advances in control systems (such as adaptive, nonlinear, networked, and multi-agent control).

There could be a significant benefit to the field in terms of increased publicity and awareness by developing competitions and demonstrations that are equivalent to the DARPA Robotics Challenge or the Pluto flyby. Even the recent gravity-wave detection announcement that captured many people's attention was aided by heroic levels of active and passive vibration isolation, perhaps another missed opportunity to highlight the role of control in these great scientific endeavors [10], [11].

Social media is another way to raise awareness. The RAS [12] has approximately 2800 followers on Twitter with several posts each week, in contrast to CSS [13], which had its last post in March 2014 (at the time of writing).

A previous editorial discussed ways that conferences could be improved to make the presentation formats more

innovative, exciting, and informative [14]. Onsite competitions (similar to the International Conference on Robotics and Automation (ICRA) picking competition [15], [16]) or experiments could also be added to the conferences to increase the level of excitement and student involvement. These would provide students with a venue to showcase talents and enable networking. Another idea would be to emulate the ICRA trailer video [17] that highlights some of the best work presented and is another way to increase the “buzz” about the work being done in the field.

For a field that has expressed concern about the future directions in control theory/systems, as evidenced by numerous workshops on the subject, it is important to understand why the membership is declining and why the student population is relatively low, and decreasing. These students, in particular, represent the future lifeblood of the Society, and the community should become more actively engaged to try to reverse these recent membership trends.

I would like to acknowledge Dr. Sandra Hirche, CSS vice president,

Member Activities, for her thoughtful discussions while preparing this editorial and help obtaining the data for Tables 1 and 2.

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Save the date 2017 American Control Conference

The 2017 American Control Conference will be held Wednesday through Friday, May 24–26, 2017 at the Sheraton Seattle Hotel in Seattle, Washington.

Important Deadlines

- Draft manuscripts are due Monday, September 19, 2016.
- Best student-paper nominations are due Friday, September 30, 2016.
- Workshop proposals are due Monday, October 10, 2016.

More details are available at <http://acc2017.a2c2.org/>.

Digital Object Identifier 10.1109/MCS.2016.2558300



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