

IEEE Control Systems Society and IFAC

Over the course of the last several months, I have had numerous colleagues ask me about the differences between the International Federation of Automatic Control (IFAC) and the IEEE Control Systems Society (CSS), owing to the respective roles (CSS president and IFAC vice president) I hold in these organizations. At times it might appear to the casual observer as if the two were simply overlapping and competing in the conference business. But a deeper analysis reveals a rich, connected, and complementarity relationship between the two. In this column, I will quickly review the history of each organization as well as their missions and governance structures. Then I will attempt to point out the overlapping and complementarity elements of the two. Finally, I will share some personal thoughts on future opportunities between the two.

Since the history of IFAC is well documented in several places, I will borrow a succinct version from the IFAC website here [1].

The first International Conference on Automatic Control was held at the University of Heidelberg from 25 to 29 September 1956. The conference was called “Regelungstechnik—Moderne Theorien und ihre Verwendbarkeit” (Control Engineering—Modern Theories and their Application) and was organized by the German VDI/VDE-Fachgruppe Regelungstechnik founded in 1938. At that conference 30 participants signed a

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declaration in which the need to create an international organization of automatic control was clearly defined. The signatories pledged to promote the formation of national organizations,



if not already existing at that time. At the end of the Heidelberg Conference a Provisional Committee was established under the chairmanship of Victor Broida (France) to draft a constitution for the planned International Federation of Automatic Control. On September 12, 1957, the First General Assembly convened at the constituent meeting in Paris. Delegates from 18 countries representing their national organizations assembled at the Conservatoire National des Arts et Métiers under the chairmanship of Victor Broida. They voted on the Constitution and By-Laws; they elected the first President, Harold Chestnut, as well as the members of the Executive Council; and they appointed committee chairmen.

The governance structure of IFAC reflects its mandate to serve the international community [2].

The General Assembly is the supreme body of the Federation and comprise [sic] of delegations from all the National Member Organizations (NMOs). NMOs are responsible for furthering the aims and objectives of IFAC within their respective countries. The President, nominated by the Council and elected by the General Assembly, legally represents the Federation. The Council is responsible for the management of the Federation and receives its mandate from the General Assembly. The Council is assisted in its work by the Technical Board, the Executive Board, and the Secretariat.

The office of the IFAC president is a three-year term, and the current president is Janan Zaytoon (2014–2017), the immediate past-president is Ian Craig (2011–2014), and the president-elect is Frank Allgöwer (2017–2020). Additional officers are John Lygeros (treasurer), Kurt Schlacher (secretary), Sergio Bittanti (vice president and chair of the Executive Board), and me (vice president and chair of the Technical Board). The remaining council members and advisors are listed on the IFAC website [7]. In the

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spirit of the international mission of IFAC, no two Council members may be from the same country/NMO.

A corresponding historical analysis of origins of the IEEE CSS is recounted on the CSS website [3].

The present-day IEEE Control Systems Society is descended from the old Institute of Radio Engineers (IRE) Professional Group on Automatic Control (PGAC), whose formation was formally approved by the IRE Board of directors on October 5, 1954. [The IRE was one of the predecessor organizations of the Institute of Electrical and Electronics Engineers (IEEE). The IEEE was formed in 1963 through the merger of the IRE and the American Institute of Electrical Engineers (AIEE).]

Officers in the CSS (the Executive Committee) are appointed for one year and for 2016 comprise a president (Frank Doyle), past-president (Elena Valcher), president-elect (Edwin Chong), vice president for Conference Activities (Maria Prandini), vice president for Financial Activities (Robert Bitmead), vice president for Member Activities (Sandra Hirche), vice president for Publication Activities (Fabrizio Dabbene), vice president for Technical Activities (Kirsten Morris), and director of operations (Ragu Balakrishnan). In addition to the Executive Committee, IEEE CSS is managed by an Administrative Committee known as the Board of Governors (BoG). The BoG consists of 18 CSS members elected by the members, Executive Committee members, the editor-in-chief of each society publication, the editor of electronic publications, and six other members of the Society appointed by the president-elect.

The CSS governance structure reflects the traditional IEEE revenue sources.

The mission statements of each organization have overlapping elements. In the case of IFAC: "The aim of the Federation is to promote the science and technology of control in the broadest sense in all systems, whether, for example, engineering, physical, biological, social, or economic, in both theory and application. IFAC is also concerned with the impact of control technology on society" [4]. The IEEE CSS is "dedicated to the advancement of the theory and practice of systems and control in engineering" [5]. In a broader sense, the CSS also serves IEEE's overarching mission: "to advance technology for humanity and the profession." Both institutions (IEEE CSS and IFAC) employ, primarily, technical meetings and publications to accomplish their mission, relying on the interchange and circulation of technical ideas.

One of the more striking differences between the two organizations is the underlying financial model and corresponding membership structure. In CSS, membership occurs at the individual level and requires a small additional fee beyond the nominal IEEE membership fee. This reflects the early mission of the IEEE as a U.S.-centric professional society, although the global outlook of the IEEE has expanded over the years (this is revealed, among other ways, in the international distribution of the officers in the CSS Executive Committee). CSS membership confers discounts on the Society's technical publications, a subscription to *IEEE Control Systems Magazine*, and networking opportunities with over 9,000 members. For IFAC, the members are the actual

NMOs, representing a suitable scientific or professional organization for a given country/geographical area. At this time, there are 49 NMOs in IFAC.

These different membership structures give rise to some remarkable differences in the business models for technical meetings. In the IEEE, technical meetings become a source of revenue (along with journals) for the Institute and the Society, enabling the Society's other activities. In IFAC, the financial responsibility rests with the sponsoring NMO for a regional event; consequently, there is no revenue flow back to the Federation. Instead, the NMO membership fees and publication revenues provide funding for IFAC initiatives.

Of course, there is a very interesting link between IEEE CSS and IFAC: the U.S. NMO to IFAC is the American Automatic Control Council (AACC), of which IEEE is a member and the CSS is the designated society representing IEEE. The origins of this NMO designation date back to 1957, following a meeting attended by representatives from IRE, AIEE, ASME, International Society of Automation (ISA), and AIChE [6]. In addition to that group (with IEEE replacing IRE and AIEE through the merger), the current AACC includes American Institute of Aeronautics and Astronautics (AIAA), Informa, ASCE, SCS, and Society for Industrial and Applied Mathematics (SIAM).

The IEEE CSS and IFAC enjoy a long history of reciprocal technical-meeting cosponsorship. The active researchers of the technical fields are represented on the respective technical committees of both organizations, although the specific topics are not completely overlapping across the two bodies, and IFAC includes a more formal hierarchical organization with overarching coordinating committees that direct the activities of the technical committees in their respective fields.

As we look to future initiatives, there are several areas where the mutual strengths of IFAC and CSS can be harnessed to a mutual advantage. There are already ongoing joint

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initiatives, such as the project proposed by Frank Allgöwer to build and maintain a wiki page for the systems and control field. The formulation of guidelines for ethics in publishing as well as technical sponsorship of conferences are obvious opportunities for sharing institutional best practices across organizations that share a common technical audience.

Educational initiatives represent another area with shared activities in the past and tremendous potential for further joint initiatives. A prominent example is the highly impactful series of high school teacher and student workshops organized by Bozena Pasik-Duncan, with cosponsorship from AACC, IEEE CSS, and IFAC. "Impact" studies, such the ones recently conducted by Tariq Samad [8], represent another category of collaborative initiative where the highly overlapping technical volunteer base can be leveraged to mutual advantage. It strikes me that perhaps the greatest unrealized opportunity for future collaboration is in the area of outreach—combining the significant resources of the IEEE with the vast international network of IFAC, then, paraphrasing the IEEE, one could truly advance control technology and education for the global community.

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