

CHARTER RENEWAL APPLICATION

SIAM Activity Group on Control and Systems Theory (SIAG/CST)

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Control and Systems Theory (SIAG/CST). The SIAG/CST was originally formed under the aegis of SIAM on July 20, 1986 by the SIAM Council and July 25, 1986 by the SIAM Board of Trustees. Its initial operating period began January 1, 1987 and ended December 31, 1989. Its charter has been renewed by the council and board ten times thereafter. This SIAG had 537 members as of December 31, 2014; of these, 192 were students. While the number of regular members remain stable, there were spike-like increase in student members around 2010 and 2011. [This also happened to other SIAGs. The reason is still unknown, and SIAM is currently studying it.]

According to its Rules of Procedure, the objective of the SIAG is to foster activity and interaction between mathematicians, engineers and other scientists interested in control and systems theory. The SIAG plans to encourage further development of theory and methods for the estimation and control of systems.

Within the framework of SIAM, the SIAG will conduct activities that implement its purposes. Its purposed functions are to organize activities, including conferences, sessions at SIAM meetings, sessions at meetings of other organizations cooperating with SIAM, and publications, to (1) promote interaction between mathematicians, engineers and other scientists interested in control and systems theory, (2) keep SIAM membership up to date on developments in this area, (3) facilitate the development of control and system theory and (4) encourage its application.

The activity group awards two prizes: (1) the SIAM Activity Group on Control and Systems Theory (SIAG/CST) Prize, established in 1997, is awarded every two years to a junior researcher for outstanding research contributions, as determined by the prize committee, to mathematical control or systems theory and (2) the SIAG/CST Best SICON Paper Prize established in 2007. The prize is awarded every two years to the author(s) of the two most outstanding papers, as determined by the prize committee, published in SICON in the two calendar years before the year of the award.

The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

1. List all current officers of the activity group (including advisory board, if relevant).

Chair: George Yin (1/1/2014 - 12/31/2015)

Vice Chair: Fariba Fahroo (1/1/2014 - 12/31/2015)

Program Director: Bozenna Pasik-Duncan (1/1/2014 - 12/31/2015)

Secretary: Maurizio Falcone (1/1/2014 - 12/31/2015)

SIAG/CST Advisory Committee

John Burns, Virginia Polytechnic Institute and State University (1/1/2014 - 12/31/2016)

Michael Demetriou, Worcester Polytechnic Institute (1/1/2014 - 12/31/2016)

Mary Ann Horn, National Science Foundation (1/1/2014 - 12/31/2015)

Qing Zhang, University of Georgia (1/1/2015 - 12/31/2017)

Arthur Krener, Naval Postgraduate School (1/1/2014 - 12/31/2015)

SIAG/CST Conference Steering Committee

Michael Demetriou, Worcester Polytechnic Institute

Wei Kang, Naval Postgraduate School

William Levine, University of Maryland College Park

William M. McEaney, University of California San Diego

2. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last two years?

Mathematics has played and will continue to play a crucial role in the development of control science. The field of control and systems theory continues to develop and to demand fundamental advances in applied and computational mathematics. Although it is a relatively mature field, mathematical control and systems theory has witnessed continuing development, which is highlighted by the mathematical progress as well as by the response to the pressing needs in technological developments in computing, communications, and related fields. Emerging areas include for instance, networked systems, systems biology, multi-agent systems, cyber-physical systems, computational methods and numerical solutions for control systems, stochastic control (fractional Brownian motion models), hybrid systems, systems with jumps and non-local structures, game theory (e.g., mean field games), control with state constraints (e.g., model predictive control methods and linear matrix inequalities), nonlinear systems (e.g., Lyapunov function-based and max-plus methods). cooperative and decentralized control paradigms for interconnected systems, financial engineering systems, and quantum information processing etc. Many of the aforementioned systems and methods are far beyond the classical control theory.

3. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

The activity group remains vibrant and expanding. This is evidenced by the attendance to the CT conferences organized by the SIAG. In fact, CT11 had better attendance compared to the previous years, and CT 13 had the largest attendance in more than a decade. The upcoming CT15 this year has attracted even more attendees. Since the registration is just started, we do not have the precise figure, but it has the largest number of submissions so far (95 sessions including 67 minisymposia of 4 and 5 papers each, 28 contributed sessions of 6 papers each, and 22 posters have been accepted for presentation). One of the distinct features is that the submission to CT15 shows substantially increased participation of scientists from European countries. It confirms that having CT conferences be held outside of the US from time to time is a great idea, which will boost the SIAM visibility internationally.

4. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

The SIAG/CST organizes the biennial conferences SIAM Control on Control and Its Applications (CT). CT11 was held in Baltimore, Maryland in 2011. CT13 was held in San Diego, California in 2013. The next CT conference is to be held in Paris this July. The CT conferences have been continuously doing very well. The number of participants are increasing. The list of conferences may be found at: <http://www.siam.org/meetings/ct###/>. It has been

difficult to obtain attendance numbers when CT conferences are co-located with SIAM AN conferences.

Started from CT13, this SIAG has begun to publish conference proceedings. This practice is welcomed by the control and systems theory communities. This year, the submission to be considered for publication in the proceedings of CT15 have been more than doubled. It is conceivable that it will further grow in the future.

5. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?

The 2013 SIAM Conference on Control and its Applications (CT13) was held jointly with the SIAM annual meeting in San Diego. Prior to that, CT05 and CT09 were held jointly with the SIAM annual meetings as well. [The information of the number of minisymposia organized by members of the activity group in the last SIAM annual meeting is not readily available to us, however.]

6. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?

- Starting from 2014, this SIAG has revitalized its Newsletters. Now the newsletters are published monthly and the distribution is through emails, which appears to be a rather effective channel for rapid communications.
- Thanks to the diligent work of a new liaison person of the SIAG/CST to the SIAM News, this SIAG has contributed a number of articles to the SIAM News recently, which improved SIAG/CST's visibility.
- SIAM now becomes a member of the American Automatic Control Council (AACC). We organized several invited sessions (equivalent to the SIAM minisymposia) at the American Control Conference and the IEEE Conference on Decision and Control (CDC) every year.
- Both the SIAM Activity Group on Control and Systems Theory (SIAG/CST) Prize and the SIAG/CST Best SICON Paper Prize have been active. The recipients of the awards can be found in <https://www.siam.org/prizes/sponsored/siagcst.php> and <https://www.siam.org/prizes/sponsored/bestsicon.php> respectively.

7. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

This year, CT15 will be held in Paris, the first ever CT conferences to be held outside of the US, which will be a significant milestone for the SIAG. We will make continuing effort to grow the SIAG internationally and make it more visible to and with more significant impact on the international applied and computational mathematics, and control and systems communities. We plan to have CT17 be held in the US, possibly joint with the SIAM Annual Meeting.

8. How can SIAM help the activity group achieve its goals?

It will be crucially important if the SIAG can have much longer planning horizon for its biennial conferences. Some progress has been made, but we need to continue our efforts. The following is from 2011 Charter Renewal Application: "... we need to have our biennial conference announced earlier and publicized better. All of the other conferences in our area,

CDC, ACC, MTNS, etc. announce the dates and venue at least two years in advance of the conference.” Because the SIAG/CSG is largely multi-disciplinary, some of the CST members and attendees of CT conferences do not have or do not regularly look at the SIAM web site and/or SIAM News. We need to find other ways to reach out the interested colleagues in the broader communities.

9. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

Covering a wide range of topics, control and systems theory is highly inter-disciplinary. SIAG/CST provides a bridge to link applied mathematics and control engineering. This SIAG facilitates the transfer of knowledge from mathematics to practice. Meanwhile, control engineering continuously demands new developments in fundamental mathematical control theory. This further promotes the development in applied and computational science.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning Jan. 1, 2016.

Signed
George Yin
May, 2015