IFAC Industry Committee

Technical Board Meeting

Florianopolis, September 1, 2018

Agenda

- Background and overview of Industry Committee

- Workstreams

- New survey results

- Next steps and plans

Industry Committee background

As a result of motions passed in the IFAC World Congress last year (Toulouse)…

- A permanent Industry Committee has been established by IFAC: "the objectives of the Industry Committee will include increasing industry participation in and impact from IFAC activities"

- The Industry Committee is chaired by a new "Vice Chair for Industry Activities" who is part of the IFAC Technical Board and who is appointed by the IFAC Council

- The Technical Board Vice Chair for Industry Activities will be an *ex officio*, nonvoting member of the IFAC Council

Industry Committee—initial activities

- Executive Committee formed

- Membership established

- Workstreams formed and operational

- Survey conducted—and others planned

- Webex meeting with membership held (repeated at two different time zones)

Executive Subcommittee (ExCom)

- Kevin Brooks
- Roger Goodall
- Philippe Goupil
- Steve Kahne
- Silvia Mastellone
- Carlos Pereira
- Lucia Quintero
- Tariq Samad (chair)
- Atanas Serbezov
- Alex van Delft

IFAC Industry Committee Roster

The committee roster has been populated as follows:

a)   Pilot Industry Committee members who were interested in continuing to serve

b)   Nominations from IFAC NMOs (in response to a request from the Secretariat for such nominations)

c)   TC representatives: Industry Vice Chairs of Technical Committees

d)   Others who expressed interest in Toulouse or thereafter

Current membership:

- Total number of members: 77
- Affiliations: 36 industry, 37 academia, 2 government, 2 retired
- Geographies: 40 Europe, 15 N. America, 14 Asia-Pacific, 6 C./S. America, 2 Africa
- 32 TC representatives
- 11 NMO representatives

Workstreams (and selected activities)

- WS1: Industry-academia-government collaboration (chair: Silvia Mastellone)
  - Connecting real-world problems to academic solutions
  - Strategies for improving the research-to-product workflow
  - Fostering knowledge exchange
  - Survey to identify next-generation products and services (joint survey with WS4)
- WS2: Industry engagement in IFAC TCs and events (chair: Philippe Goupil)
  - Monitoring industry participation in IFAC (with help from Secretariat)
  - How to involve and engage more industry in IFAC
  - Increase IFAC visibility in industry, especially at executive levels
  - Identify, disseminate, and apply good practices
- WS3: Industry engagement in IFAC publications (dormant)
  - Dormant workstream, may be activated next year

Workstreams (and selected activities)

- WS4: Gleaning the "voice of the industry" (chair: Alex van Delft)
  - Identify the control-related issues and business problems faced by different industry sectors
  - Identify issues that have led to industry's disenchantment with IFAC
  - Survey of control needs by industry sector (joint survey with WS1)

- WS5: Educating control engineers for industry roles (chair: Atanas Serbezov)
  - Competencies and skills for entry-level (BS, MS, PhD) control positions
  - Survey focusing on topics for an only control course in engineering (with TC 9.4)
  - Sessions and publications planned for ACE, *J. System and Control*, 2020 WC

- WS6: Industry Committee communication (chair: Lucia Quintero)
  - LinkedIn, Facebook, and Twitter accounts set up
  - Workshop organized at 2018 American Control Conference
  - Some content added; seeking more to feature

Survey: Current & Future Impact of Advanced Control

Technology	Current Impact		Future Impact	
	%High	%Low/None	%High	%Low/None
PID control	91%	0%	78%	6%
System Identification	65%	5%	72%	5%
Estimation and filtering	64%	11%	63%	3%
Model-predictive control	62%	11%	85%	2%
Fault detection and identification	48%	17%	78%	8%
Process data analytics	51%	15%	70%	8%
Decentralized and/or coordinated control	29%	33%	54%	11%
Robust control	26%	35%	42%	23%
Intelligent control	24%	38%	59%	11%
Adaptive control	18%	38%	44%	17%
Nonlinear control	21%	44%	42%	15%
Discrete-event systems	24%	45%	39%	27%
Other advanced control technology	11%	64%	25%	39%
Hybrid dynamical systems	11%	68%	33%	33%
Repetitive control	12%	74%	17%	51%
Game theory	5%	76%	17%	52%

Some Industry Sector Differences

	MPC		Robust Control		Adaptive Control		Nonlinear Control	
	%High	%Low/None	%High	%Low/None	%High	%Low/None	%High	%Low/None
Aerospace	64%	14%	36%	14%	29%	36%	36%	21%
Process (Chem, Metals, O&G, Mining, F&B)	59%	9%	9%	44%	9%	50%	9%	56%
Automotive	60%	10%	10%	30%	30%	50%	20%	30%

Note: Many respondents indicated multiple domains of experience

Q3 Responses (13 statements)

Statement	%Agree	%Disagree
Industry lacks staff with the technical competency in advanced control that is required for high-impact applications	70%	18%
Control researchers are much poorer than researchers in other fields at communicating their ideas and results to industry management	32%	27%
The maturity or readiness level of results of advanced control research is too low for attracting industry interest	47%	26%
Advanced control has limited relevance to problems facing industries and their customers	21%	62%
Control researchers place too much emphasis on applied mathematics or advanced algorithms whereas successful industry applications require deep domain knowledge	86%	6%
Control students (undergraduate and graduate) are not sufficiently exposed to industry problems	65%	8%
The academic control community is not seriously interested in collaboration with industry	35%	39%
There is no problem—advanced control is successful and appreciated in relevant industries	17%	56%
Industry should define the next generation of control problems for academic research	53%	15%
More research should be done on implementation aspects of control	79%	0%
Industry should provide academia with relevant and concrete industrial benchmarks	77%	3%
Industry views advanced control applications as high-cost and high-risk	47%	27%
Control researchers should better address the business justification of advanced control (e.g., cost-benefit analyses)	79%	6%

Some findings/hypotheses

- Process industries the largest users of control?
  - \>50% of respondents experienced in this domain (34/66, versus 14/66 for aerospace, 10/66 for automotive)

- Significant discrepancies among application domains
  - Perception of impact of robust control in aerospace (low) versus other industries (minimal)
  - Discrepancy between process industries' perception of adaptive and nonlinear control (minimal) versus aero/auto (low)

- In general, awareness of impact of advanced control not broadly shared
  - Even for MPC some "Low" and "None" impact assertions

- Broad-based optimism about impact growth in future, except for PID and estimation & filtering

- Industry-relevance of education and research needs to be improved—implementation, applications, benchmarks, domain knowledge

- Hard to see any significant difference based on years of experience, or on industry versus academic experience (based on a partial review)

Next Steps and Plans

- Expanding the committee with a few good additional men and women
  - Suggestions? Send a short e-mail to Tariq with the following info: name, affiliation, e-mail address, country, and a couple of sentences on why you think they would be a good addition
  - Please respond within two weeks if possible

- Industry Committee meeting tomorrow
  - 17:00 – 18:30, CC 2 – G2 Level
  - TB attendance welcome

- Plans for next year include . . .
  - Workstream surveys
  - Conference workshops and sessions

- Second all-committee meeting (Webex) toward the end of the year; other meetings at selected IFAC conferences and symposia

Questions?