INTERNATIONAL FEDERATION
OF AUTOMATIC CONTROL

IFAC Industry Committee

Tariq Samad

Council Meeting

Florianopolis, September 3, 2018

Industry Committee—initial activities

- Executive Committee formed
- Membership established
- Workstreams formed and operational
- Survey conducted—and others planned
- Webex meetings with members

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

Expanding the committee with a few good additional men and women

- Please send suggestions to Tariq within a couple of weeks

Workstreams (and selected activities)

- WS1: Industry-academia-government collaboration (chair: Silvia Mastellone)
- WS2: Industry engagement in IFAC TCs and events (chair: Philippe Goupil)
- WS3: Industry engagement in IFAC publications (dormant)
- WS4: Gleaning the “voice of the industry” (chair: Alex van Delft)
- WS5: Educating control engineers for industry roles (chair: Atanas Serbezov)
- WS6: Industry Committee communication (chair: Lucia Quintero)

→ All launched WSs active: membership, web meetings, surveys, discussions, . . .

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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%

A Few General Comments

- Control researchers broadly unaware of successes of advanced control, especially but not only outside of application domains of their interest
- Different industry sectors differ substantially in their research-to-practice workflows, value chains, safety criticality, etc.
- “Implementation” aspects cannot be ignored in applied research—including computational platforms, economic factors, workforce, etc.
- Importance of domain knowledge, not just control knowledge

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Plans for the Next Year or Two

- Collect and promote industry success stories
- Better connect control with “hot topic” technologies of industry interest: machine learning, artificial intelligence, analytics, internet of things, computer vision, quantum computing, . . .
- Recommendations for TCs to enhance industry participation
- Disseminate the industry perspective to interested control researchers
- Get the control community more aware of and engaged in “innovation” ecosystems

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Questions?

Backup

Member comments

- Clearly define requirements for industrial papers
- Need to create value proposition for control—what new business opportunity would control enable?
- Standards and standardization: inputs, models, constraints . . . open standards for plug-and-play controllers
- Advanced control should be easier to use by non-math-experts
- A common language for more effective collaboration
- Potential for “design for control,” not just “control design”
- Collect and disseminate positive examples
- Industry categorization between technology suppliers (Siemens, ABB, Rockwell, etc.) and technology consumers (oil & gas, energy, food, etc.)
- Implementation of pilot plants and industrial elements in labs is necessary
- National/independent research facilities bridging low-TRL university and high-TRL industry—much more successful than direct industry/academia collaboration

Member comments

- The few examples of good direct industry/university collaboration is not a scalable or useful model
- Different countries have different practices and funding organizations to support I/U collaboration—what are best practices?
- How to solve IP rights issues?
- Promote publication of strong industry problem definitions that many researchers can use
- “Classic advanced control” (ratio, cascade, override, filtering, tuning, feedforward, decouplers) is important and underutilized
- Take message of industry-relevant research needs to government funding agencies—have them redirect priorities
- Very different rules regarding control applications in different sectors (mission-criticality in spacecraft vs. cost reduction in industrial production)—need more sectoral differentiation
- Greater integration of control theory with methods and technologies of software engineering

Member comments

- Almost impossible for industry to identify a math problem whose solution can result in industrial value. Iterative process required: specifying, prototyping, evaluating, respecifying/pivoting, . . . until convergence. Close and frequent collaboration required—an integrated working relationship
- Categorization into technology categories (robust control, identification) not as useful as an "achievement-oriented" mindset—e.g., grasping and localization in robotics
- "Implementation" includes aspects of the computational platform, people, and work processes
- Social media (FB, Twitter) good for young people, not for industry managers
- Special sessions at conferences that are run by journalists
- Addressing topics from the IFAC Research Agenda, e.g., aging workforce

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)

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