Iterative Learning Control and Repetitive Control: Theoretical Advances and Emerging Applications

Tom Oomen*, Kira Barton**, Sandipan Mishra***, Bing Chu****

*Eindhoven University of Technology, The Netherlands (t.a.e.oomen@tue.nl).
**University of Michigan, USA
*** Rensselaer, USA,
**** University of Southampton, UK

Abstract: Iterative Learning Control (ILC) and Repetitive Control enable improved tracking performance on repeated trajectories by updating the control on each iteration using measured signals from the previous task. Several frameworks have been developed, and these can be applied to a myriad of engineering systems that operate repeatedly on the same trajectory, especially in manufacturing, robotics, data storage systems, process control, etc. The aim of this session is to bring together researchers working on different frameworks, addressing theoretical advances and/or new and nontraditional application areas.

Keywords: Include a list of 5-10 keywords, preferably taken from the IFAC keyword list.

1. The choice of an IFAC technical committee for evaluation

TC 4 Mechatronics, Robotics, and Components (Alternative: TC 1, Signals and Systems)

2. A detailed description of the topic:

Iterative Learning Control (ILC) and Repetitive Control enable improved tracking performance on repeated trajectories by updating the control on each iteration using tracking signals from the previous iterations. Several frameworks have been developed, and these can be applied to a myriad of engineering systems that operate repeatedly on the same trajectory, especially in manufacturing, robotics, data storage systems, process control, etc. The aim of this session is to bring together researchers working on different frameworks, addressing either new theoretical challenges and/or new application areas and results.

After several decades of development in the field, several dominant design paradigms have emerged. The aim of this session is to:

- Bring together papers representing these dominant paradigms, including linear repetitive process design, internal model design, norm-optimal design, frequency-domain design, and nonlinear ILC.
- Address new theoretical challenges in ILC and repetitive control, including robustness and flexibility to varying tasks.
- Present new emerging and nontraditional applications.

In recent years, the track proposers have organised ILC invited sessions at the American Control Conference (annually since 2009, excluding 2012), as well as at the 2015 CDC. Historically, the ILC sessions have been well attended with 35-40 people in attendance on average and a balanced participation from North America, Europe, and Asia. The proposed IFAC invited session promises to have broad appeal as well.

3. It can be completed by an Internet link to some additional material (recommended): N/A