PROPOSAL FOR OPEN INVITED TRACK ON

Emerging Challenges and Directions of Advanced Battery Management

at IFAC World Congress 2023

(Submission code: **uxctn**)

Gregory L. Plett
University of Colorado Colorado Springs
gplett@uccs.edu

M. Scott Trimboli
University of Colorado Colorado Springs
mtrimbol@uccs.edu

Huazhen Fang
University of Kansas
fang@ku.edu

Simona Onori
Stanford University
sonori@stanford.edu

Abstract

Recent years have witnessed rapid advances in the research and development of control-theory-driven advanced battery-management systems. Despite significant progresses in this field, new problems and challenges continue to arise, posing a pressing need for more research efforts to keep pace. Focused on the emerging problems and directions in this field, this open invited track is meant to provide a timely forum for researchers from both academia and industry to demonstrate state-of-the-art results and share visions about future explorations. The discussions will not only offer strong insights, inspiration, and incentives to the audience, but also hopefully translate into a lasting impact on future battery management research.

Evaluating IFAC Technical Committee

The organizers recommend the proposal be evaluated by the following Technical Committee:

- IFAC TC 7.1. Automotive Control

Additional recommended TCs are:

- IFAC TC 1.1. Modelling, Identification and Signal Processing
- IFAC TC 6.3. Power and Energy Systems

Detailed Description

Battery energy storage systems are rising as the backbone of numerous industrial and civilian systems. Their performance and safety critically rely on advanced battery-management systems, which have attracted considerable research efforts—particularly from the controls community—in the past decade. This research field today is seeing a tremendous emergence of new problems and challenges, due to the incessant demands for higher-performing batteries as well as the increasing sizes, cell- to system-level complexities, diversity of electrochemistries, and application scenarios of various battery systems. This open invited track thus aims to gather researchers from both academia and industry to share up-to-date research advances and perspectives about future opportunities and outlook of this vibrant field.

This open invited track will solicit submissions of IFAC-standard papers or extended abstracts based on original research. The topics of interest include, but are not limited to:

1) new concepts of battery modeling, simulation, estimation, and control;
2) battery management in both data-abundant and data-sparse situations;
3) control and state estimation of large-size battery systems;
4) machine learning and artificial intelligence for battery systems;
5) thermal modeling, prediction, and thermal runaway detection;
6) health/ageing modeling, diagnosis and prognostics;
7) fault tolerance and failure mitigation in battery management;
8) battery management integrated with applications, e.g., electric vehicles, grid, and transportation.