TFMST 2019

3rd IFAC Workshop on
Thermodynamic Foundation of
Mathematical Systems Theory

Louvain-la-Neuve
03-05 July 2019

IFAC
INTERNATIONAL FEDERATION
OF AUTOMATIC CONTROL

FIRST CALL FOR PAPERS

WORKSHOP THEMES

The aim of this workshop series is to explore connections between abstract systems theory and physical systems behavior when they are dynamically constrained by conservation laws and exhibit dissipation related to maximization of entropy-like functions. Application domains may include but are not limited to: Energy efficient chemical processes or processes related to the production of smart materials at micro- or nano-scales; Biological phenomena from a cell (biochemical) level through tissue/organism behavior up to the ecological interactions between organisms; Behavior and control of particulate systems; Quantum control; and, Emergence of self-organizing behavior in networks of interacting agents where collective dynamics emerge from the consensus among a large number of ensemble members. Applications would cover fields such as ecology, robotics or socio-economy and more generally Cyber-Physical Systems, and control of large scale networked systems, such as chemical plants, integrating financial systems and sociological systems

WORKSHOP HISTORY

When TFMST I was held in Lyon July 14-16, 2013, it was discovered that research activities were taking place in different institutions with the common aim of bringing thermodynamics at the quantum, molecular and macro scales together with mathematical systems theory to define a common platform for analysis, control, and optimization of networked mechanical and chemical processes. The central idea, as expressed tentatively by Jan Willems in his seminal papers on dissipative systems, is at least in part motivated by words of Einstein. He expressed “that thermodynamics is the only physical theory of universal content concerning which I am convinced that within the framework of the applicability of its basic concepts, it will never be overthrown.” Classical thermodynamics, dissipation, and passivity theory are concepts concerned with the study of internal stability of systems and how external actions alter fundamental properties such as mass, energy, momentum, and entropy leading to motion, phase transition, and self-organization at the macro-level despite chaotic/random behavior at the microscopic level. Such lines of thought led to a control theory for dissipative Hamiltonian systems with applications in mechanics. In the same spirit, several research groups from Australia, Europe, and the US deployed programs to connect irreversible thermodynamics with control theory. Elements of the theory turned out to be useful for analysis and control design applications of mechanical and process systems and some of these applications and underlying theories were reviewed at TFMST I workshop in Lyon. However, many questions were left open and there is not, at present, an agreement on the integration of macroscopic theories of thermodynamics as expressed by conservation laws and dissipation through entropy production with control, non-convex optimization, differential geometry, and behaviors at the micro-, nano-, and quantum-scales. At the conclusion of the workshop, it was suggested to extend discussions to include complex and networked systems and phenomena occupying a varied range of time and spatial scales. Future theoretical developments may draw inspiration for the classical circuit approaches pioneered by Tellegen and Brayton and Moser.

The second edition of TFMST took place in Vigo, Spain from September 28 to 30, 2016. The next one will be held in Louvain-la-Neuve, Begium from July 3 to 5, 2019.

IMPORTANT DATES

Submission opening	01 March 2018
Registration opening	01 May 2018
Deadline for submission of draft regular papers	15 February 2019
Authors notification	15 April 2019
Final Paper due	01 May 2019
Final Program	01 June 2019
Workshop TFMST2019	03 to 05 July 2019

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WEBPAGE

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