Mechanical design and advanced control methodologies for flexible systems

Organizers:

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Tracks abstract:

The hypothesis of perfect rigidity for the study of systems that exhibit mechanical flexibilities (compliant devices, robot, aircraft, etc.) may prove ineffective in several situations (e.g. increasing accuracy requirements, high-bandwidth and precise operations, etc.). It may be induced naturally by the use of specific technological components composing the system or through the geometry of specific slender structures.
Regardless of the origin of flexibility, such mechatronic systems have a range of deformations and constraints that depend on their topology and the nature of materials used. The combination of mass and stiffness, linked to an exchange between kinetic energy and elastic deformation energy, entails oscillating dynamic behavior. Instrumentation, advanced control and optimal design methodologies can overcome these limitations in some cases. When the design stage allows it, using appropriately sized and controlled flexible structures allows having precise or safe behavior, or/and motions with specifically targeted frequency content.
In addition, flexible structures can be manufactured as monolithic 2D parts as well as 3D parts, thanks to rapid advances on additive manufacturing. This technology simplifies the manufacturing procedures and reduces by the way the number of parts required for a given design.

The essential steps of optimal design, modeling, identification, diagnosis and control laws synthesis have to follow specific methodologies to help designing/controlling appropriately such mechanically flexible systems.
The aim of this open invited track is to create the opportunity of bringing together control and mechanical sciences communities around challenges and methodologies issued from such systems.

Papers presenting feasibility results of mechanical design and control methodologies on simulated models or real physical systems are well suited for this open invited track. Topics include but not limited to:

- modelling of flexible/oscillating system,
- methodologies for advanced control and optimal design,
- modal identification and diagnosis,
- manufacturing process,
- lightweight/compliant structures or robot manipulators.

40 pt
0.556 in
14.1 mm

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