Special Issue

Dynamics and Control of Underactuated Systems

Message from the Guest Editors

Recently, interest has grown in the research field of underactuated systems. A system is said to be underactuated if the number of degrees of freedom within it is greater than the number of independent actuators. In industrial high-performance applications, this property occurs for several reasons. Firstly, it develops as a consequence of weight- or cost-driven design methodologies that fulfill some predefined specification, leading to a reduction in the number of required motors. Secondly, underactuation can arise due to the failure of one or more actuators. Lastly, in order to lower energy consumption and, for instance, fulfill one of the goals regarding the United Nations 2030 Development Agenda, the mass of the components should be significantly lowered. This yields lightweight, highly flexible components and renders underactuation less negligible. By taking all these possible situations into account in order to ensure good performances in the presence of underactuated systems, proper dynamic modeling and control strategies must be developed. In this light, this Special Issue aims to present advances in both the dynamic modeling and control of underactuated systems.

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About the Journal

Message from the Editorial Board

We are just entering the Next Wave of Technology (NWT) where actuators will play the same role as the computer chip did for computers/social media approximately four decades ago. Just in the U.S., production of $1 trillion year of electromechanical systems (vehicles, orthotics, manufacturing cells, freight trains, aircraft, etc.) will be impacted by the NWT, all driven by actuators. Five key trends can be found for the future perspectives: “Performance to Reliability”, “Hard to Soft”, “Macro to Nano”, “Homo to Hetero” and “Single to Multi functional”. We invite papers that primarily impact these economic sectors; those illustrating basic scientific principles are also welcome.

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