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EDITORIAL

Although some systems are approximately linear over their range of operation, no system is truly linear. While some nonlinearities become more pronounced as deviations from the equilibrium state increase, other nonlinearities, such as backlash and deadzone, affect system behaviour arbitrarily close to an operating point. In either case, control engineers tend to ignore the presence of nonlinearities in the early stages of control design. In practice, however, nonlinearities are invariably found to impact system performance and thus control-design methods are needed to account for their presence.

In recent years, much of the research effort in control theory has shifted from robust linear control to nonlinear control. While linear robust control can account for plant uncertainty within linear models, the problems of plant nonlinearities requires separate treatment.

In this Special Issue, the contributing authors apply a variety of nonlinear control methods to an illustrative nonlinear benchmark problem. The plant is a fourth-order mechanical system that combines two linear elements, namely, a rotational rigid body and an undamped translational oscillator. The rotational rigid body, which is torque-commanded, is mounted on the translational oscillator. The configuration was initially studied as a simplified model of a spinning spacecraft with mass imbalance. The same plant was later considered for feedback stabilization involving a rotational actuator for translational motion. Relevant references are given in the benchmark problem statement in this issue.

It is hoped that this benchmark problem will encourage researchers to propose other nonlinear benchmark problems that reflect real-world control problems. A collection of such problems will provide challenges and motivation for future generations of control researchers.

Dennis S. Bernstein
Guest Editor