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Editorial

A Message From the Special Issue Editor

Time delay in dynamic systems has long been considered a complex phenomenon. One can see increased research activity on this topic since the early 1980s, and primarily from the mathematics research community. Most investigations are directed toward the issue of stability, which is considerably different from those of delay free dynamics. Stability research is still alive and progressing at an increased pace after four or five decades of brilliant work by prominent researchers. In the past decade, we observe increased participation by the engineering and applied science researchers. This is the primary reason for this Special Issue on Time Delayed Systems (TDS).

We have collected over 65 papers around the main theme, and selected 20 after a careful review process involving active researchers in the area. The papers in this issue present a variety of interesting research results in the Time Delayed Systems (TDS) area. The reader will find three categories among these papers dealing with: *a*) Stability and control of TDS, *b*) Practical application of TDS, and *c*) Modeling and identification of system dynamics with time delays.

Stability is, without dispute, the hottest area in TDS research today. It spans from Linear Time Invariant (LTI) single delay TDS to multiple and unrelated time delay cases, and further to nonlinear and uncertain time varying time delayed structures. A common objective is to find the stability interval(s) of time delay for a given dynamics, another is to find the ranges of some structural parameters which render stability while the time delay remains fixed. The capabilities of most current methods are often limited due to some inherent assumptions for the methods to be viable. And they offer many valuable directions for future research. It is obvious that our community is still looking for more precise, universal and practicable procedures in order for the TDS to be a part of the every-day arsenal.

In many *practical applications*, time delay may appear due to two main reasons: either the dynamics is inherently time delayed (such as the machine tool chatter problem), or the feedback control structure introduces the delay. Although the source of the delay may be different, these two groups render mathematically identical representations and ultimately the same tools for analysis apply to both.

In *modeling*, if there is a time delay, then its proper representation in a dynamic model is a very critical step. Many interesting problems are encountered in this class especially as computerized control systems improve rapidly yielding better and faster system identification. We are at a very exciting period.

Both the reviewers and I were mindful, in selecting the final papers for this Special Issue, that it provide a source for inspiration. I hope our readers will be pleased with the content. As I complete the editorial work, I would like to acknowledge the support of my graduate students in my lab at UCONN (ALARM Lab), without which the task of the Guest Editor would have been an impossible mission. I extend my deep appreciation to the reviewers of the papers. The value of the assistance I received from the Journal Office (G. Ulsoy and T. Marion) is not measurable. I also thank wholeheartedly, all the authors who participated in this activity, including those who did not make the final selection. I hope to handle their future work through regular issues of our Journal. Best wishes to you all.

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