Feedback control of systems with memory

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Abstract: In control applications, the control signal can be derived based on knowledge of the system in the form of a mathematical model and on the estimation of disturbances. Such derivation is called feed forward control. The control signal can also be derived using the system response itself and is called feedback control.

To optimize performance, it is common to incorporate a feedback loop with feed forward controllers. Control accuracy can often be improved significantly by well thought out implementation of combined control. However, if the system has memory and is comprised of many internal states, the addition of such a feedback loop alters the stabilizability of the states. That is, not all the state variables may have stable dynamics for every input to the system.

In this talk, I will introduce memory systems and related control questions by taking examples from economics, biology and material science. Common feedback loops utilized in such systems are proportional derivative and integral controllers (P, PD, PID). I will answer the question, "Could the addition of a PD loop to the feed forward control of a memory system alter the stability of the system?" This talk will include a sufficient introduction to the subject and should be appropriate for larger audience.

DEPARTMENT of MATHEMATICS

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Refreshments will be served at 3:30 p.m.