SEMINAR NOTICE

Department of Electrical and Systems Engineering

NEW IDEAS ON THE STABILITY OF THE ORIGIN OF AUTONOMOUS ORDINARY DIFFERENTIAL EQUATIONS

Ph.D. Preliminary Research Examination

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Abstract: Lyapunov stability theory is the backbone of many important control schemes. Linear control theory rests entirely on the Lyapunov's indirect method, while schemes which address the general control problem rely largely on Lyapunov's direct method. This method allows an engineer to prove the stability of the system under study by using a function which, in some sense, models the energy of the system. If one can show that the derivative of this function is negative, then it agrees with our intuition that the system must approach a rest position.

Unfortunately, there is no way to find Lyapunov functions in general. There have been many attempts to address, or bypass, this problem in the literature. But for the most part we're left with little more than rules-of-thumb and artificial constructions. Often, one is left trying various Lyapunov function "candidates" until one can find one with a negative derivative.

But apart from not being easy to find Lyapunov functions, they themselves add an undesirable conceptual layer to control synthesis problems. We believe it does not make sense that one should need to know about something external to the system itself to determine the qualitative properties of its solutions.

In this talk, we discuss a novel perspective which removes the undesired conceptual layer. We show that the stability of equilibrium points of systems of ODEs may be analyzed by first determining whether the solutions are bounded and then characterizing their long-term behavior. We present two conditions which are enough to determine the boundedness of solutions, and, we propose a theorem to help answer the second question.

DATE:	Friday, April 23, 2010
TIME:	11:00 a.m.
PLACE:	Bryan Hall, Room 305

Thesis advisor:
Dr. Hiro Mukai

This seminar is in partial fulfillment
of the Doctor of Philosophy degree

Washington University in St. Louis
SCHOOL OF ENGINEERING & APPLIED SCIENCE