Systems over a Semiring: A New Frontier

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Abstract: This presentation reports upon recent investigations on systems over a semiring, which are systems evolving with variables without negatives. This new type of system is motivated by the analysis of hybrid systems. Fundamental problems in hybrid systems, such as the verification problem, the stability problem, and the non-blocking problem, can be formulated as linear mappings between semi-groups to achieve compositional analysis without higher computational complexity. This talk summarizes the disturbance decoupling problem, the structural controllability, and the structural observability analysis for systems over a semiring. Along with the theoretical results, interesting applications will be presented, including a biped and a hexapod walking robot, a hysteretic discrete event structural system, and a queueing network with two buffers. Future research of semi-systems is to explore application areas including the min-plus algebra in communication networks and the Boolean networks in genetic regulatory systems.

Wednesday, February 13, 2008
10:00 – 11:00 a.m.
9:45 a.m. - Refreshments
Bryan Hall, room 305

Host: Joseph O'Sullivan