MAE207: Hybrid Systems (F08)
Final project

Each student should select a project for presentation in the final week. A project can be any of the following:

1. reading and understanding of a paper or book chapter from the hybrid systems literature
2. a research topic that combines the hybrid systems theory explained in class with the student's own research.

A list of suggested projects is given below, but students are welcome to select on their own a paper of the literature or topic that they like to work on. *The selection of the project should be coordinated with the instructor.*

Projects should be selected by November 6 and will be presented in class on December 2 and 4.

Some potential final projects include:

Modeling of biological chemical reactions using stochastic hybrid systems

[P1]: J. P. Hespanha and A. Singh. Stochastic models for chemically reacting systems using polynomial stochastic hybrid systems. *International Journal on Robust and Nonlinear Control*, 15(15):669–689, 2005. Special Issue on Control at Small Scales — Marvin Lin

Modeling of network protocols using hybrid systems

[P2]: S. Bohacek, J. P. Hespanha, J. Lee, and K. Obraczka. Modeling communication networks using hybrid systems. *IEEE/ACM Transactions on Networking*, 15(6):663–672, 2007 — G. B. Singh

Control of biped walking using hybrid systems

[P3]: E. R. Westervelt, J. W. Grizzle, and D. E. Koditschek. Hybrid zero dynamics of planar biped walkers. *IEEE Transactions on Automatic Control*, 48(1):42–56, 2003

Air traffic management via hybrid systems

[P4]: C. Tomlin, G. J. Pappas, and S. S. Sastry. Conflict resolution for air traffic management: A study in multiagent hybrid systems. *IEEE Transactions on Automatic Control*, 43(4):509–21, 1998 — Nikolaos Bekiaris-Liberis

Hybrid stabilization in quantized control

[P5]: D. Liberzon. Hybrid feedback stabilization of systems with quantized signals. *Automatica*, 39(9):1543–1554, 2003 — Minghui Zhu

Hybrid modeling for robotic control and motion planning

[P6]: V. Manikonda, P. S. Krishnaprasad, and J. Hendler. Languages, behaviors, hybrid architectures and motion control. In J. Baillieul and J. C. Willems, editors, *Mathematical Control Theory*. Springer, New York, 1998 — Halil Basturk

[P7]: M. Egerstedt. Motion description languages for multi-modal control in robotics. In A. Bicchi, H. Christensen, and D. Prattichizzo, editors, *Control Problems in Robotics*, volume 4 of *Tracts in Advanced Robotics*, pages 75–90. Springer, Berlin Heidelberg, 2002 — Dan Miller

[P8]: E. Frazzoli, M. A. Dahleh, and E. Feron. Maneuver-based motion planning for nonlinear systems with symmetries. *IEEE Transactions on Robotics*, 21(6):1077–1091, 2005 — Teymur Sadikhov

Hybrid stabilization of nonlinear systems

[P9]: C. Prieur, R. Goebel and A.R. Teel. Hybrid Feedback Control and Robust Stabilization of Nonlinear Systems. IEEE Transaction on Automatic Control, Vol. 52, No. 11, Nov. 2007 — Hanqiao Gao

Abstractions of hybrid systems with applications to user interfaces

[P10]: M. Oishi, I. Mitchell, A. M. Bayen, and C. Tomlin. Invariance-preserving abstractions of hybrid systems: Application to user interface design. IEEE Trans. Control Systems Technology, vol. 16, no. 2, pp. 229-244, March 2008 — Chris Duarte

Hybrid control for containment

[P11]: G. Ferrari-Trecate1, M. Egerstedt, A. Buffa , and M. Ji. Laplacian Sheep: A Hybrid, Stop-Go Policy for Leader-Based Containment Control. Lecture Notes in Computer Science, HSCC 2006, J Hespanha and A. Tiwari (Eds.), vol 3927, pp. 212226, Springer-Verlag, 2006. — Paul Frihauf

Research project on hybrid stabilization for distributed deployment of unicycles — Andrew Kwok

Research project on switching control for depth stabilization of a mini-buoy — Younghee Han

Additional interesting papers can be found in the proceedings of the International Conference on "Hybrid Systems: Computation and Control." There are 11 volumes available online at http://www.springerlink.com/content/105633