Computational Techniques for Hybrid and Embedded Systems Design
(CPSC 538A, Term 1, Winter 2002–2003)

Course Survey

The following topics were discussed during this semester. Use the corresponding numbers to answer the questions at the bottom of the page. Your answers will not be examined until after grades have been submitted.

1. Review of differential equations and dynamical systems theory.
2. Matlab simulation environment (homework problems).
3. Properties of models: local existence, global existence, uniqueness, continuity with respect to data/initial conditions/inputs.
4. Design of embedded systems: specification/modeling, validation and synthesis.
5. Tagged signal model for heterogenous models of computation.
6. Finite state machines and Statecharts models of computation.
7. Hybrid time trajectories, hybrid automata and hybrid executions.
8. Validating designs by construction, verification, simulation and less trustworthy methods.
9. Ptolemy II and HyVisual simulation environments (homework problem).
10. Hamilton-Jacobi based reachability for nonlinear hybrid automata.
11. CheckMate reachability for polyhedral invariant hybrid automata.
12. Transition systems, equivalence of systems, quotient transition systems, bisimulation.
13. Lyapunov methods for deductive verification and stability.
14. Codesign finite state machine model of computation (student presentation).
15. Petri nets model of computation (student presentation).
16. Formation switching for multiple mobile robots (student presentation).
17. Metropolis project for modeling embedded systems (student presentation).
18. Timed Automata.
19. Optimal control of hybrid systems by fast marching methods (student presentation).
20. Hardware in the loop simulation (student presentation).
21. Time-triggered architecture and Giotto.
22. Verifying an autopilot interface (student presentation).

- What topics did you find most interesting and/or useful?

- What topics did you find least interesting and/or useful?

- Were there any topics from this list that you would like to have covered in more depth?

- Were there any topics from this list that you would like to have skipped?

- Are there any other topics that you would prefer to have seen?

- Do you have any comments regarding the pace or style of the lectures (too slow/fast, too few/many examples, too little/much theory, ratio of chalkboard to discussion, etc.)?

- Do you have any comments regarding the homework, reading, or project assignments (too short/long, too simple/hard, grading scheme, etc.)?

- What was the single worst thing about the course, and how would you fix it?

- What was the single best thing about the course?

- Any other comments?