Project Report

The final report for your project is designed to give you practice writing your results in a format suitable for academic publication. Typical academic papers contain the following components:

- Title, author name, author affiliation, date.

- Abstract: summarizes your problem and your solution in 100–200 words.

- Introduction: Motivation of your problem, starting from a broad level and narrowing to your particular problem. Brief description of the specific problem you will solve, how you will solve it, and your results (in some sense, this is an outline of the paper).

- Background and related work: Discusses previous results in this and other fields, and how they relate to the results in this paper.

- Problem formulation: Describes the problem in detail, generally introducing a mathematical description of the problem. It will also generally give some description of how you will judge the quality of your solution.

- Solution Methodology: This section (may be more than one) describes how to solve the problem. In theoretical papers, you will prove here that you solved the problem, and (when possible) analyze the quality of the solution.

- Results: This section typically includes examples of the problem and their solution. In empirical papers (eg: papers that are not theoretical) you will demonstrate here that you solved the problem, and analyze the quality of the solution.

- Conclusions and future work: What did you do, and what still needs to be done?

- References.

However, these components do not necessarily need to occur in this order, be partitioned in this manner, or use these section titles; for example, sometimes the solution methodology is interspersed with results, or the related work is blended into the introduction or postponed until just before the conclusion.

Here are a few examples of papers that we have studied this term and which I think are particularly well organized and written.

- Stephen Prajna & Ali Jadbabaie, "Safety Verification of Hybrid Systems Using Barrier Certificates" in *Hybrid Systems Computation and Control*, LNCS 2993, pp. 477–492 (2004).

- Antoine Girard, "Reachability of Uncertain Linear Systems using Zonotopes" in *Hybrid Systems Computation and Control*, LNCS 3414, pp. 291–305 (2005).

- Thomas Ball & Sriram K. Rajamani, "Automatically Validating Temporal Safety Properties of Interfaces" in *SPIN Workshop on Model Checking of Software*, LNCS 2057, pp. 103–122 (2001).

- Claire J. Tomlin, Ian M. Mitchell, Alexandre M. Bayen & Meeko Oishi, "Computational Techniques for the Verification of Hybrid Systems" in *Proceedings of the IEEE*, volume 91, number 7, pp. 986–1001 (2003).

You are not required to produce publishable work as a class project, but this process should give you a good start. Length is not a primary concern, but the final reports will probably be 7–12 pages including figures and references. Keep in mind that your project report should emphasize the *formal verification* aspect of your problem and/or solution—for the purpose of this course, I do not care as much about the technical merit of your approach in another field. If you find that you have too much material, then cut down on the application details to focus on the formal verification.

You may use whatever document production system you prefer, but please submit your reports in pdf format. I personally prefer to use LaTeX, which is available on the departmental computer system or as the free "MiKTeX" package for Windows machines.