Level Set Methods: Dynamic Implicit Surfaces and Hamilton-Jacobi Equations
CPSC 542D, Term 1, Winter 2004–2005

Project Description

Your project will form a significant portion of your grade for this class. It will likely involve 20–40 hours of work. In order to avoid any exam week rush, it is important to get started early and follow a timeline that includes steady progress toward project completion.

Projects can take several different forms. Every project will include a literature review, which requires collecting, reading and analyzing research papers from related areas. Some projects will include theoretical, algorithmic, implementation and/or computational aspects as well. Those projects consisting entirely of a literature review will need to be more in depth than those that include other components. Projects may be performed in teams of two, with a corresponding increase in their scope.

You may choose your project from among those suggested by the professor, or you may design your own project in consultation with the professor. Your project may be combined with research in other fields, should you wish. If you design your own project, and especially if that project is a portion of a larger research undertaking, it is important to identify at the start what work will be completed by the end of term and will constitute the CS 542D project.

In order to keep projects on schedule, there will be several milestones, each with a deliverable. Only the final two deliverables will be graded.

date	deliverable
October 13	topic paragraph (by email)
October 27	proposal
November 15	literature review and problem formulation
November 29(?)	presentation
December 17	report

The proposal should be approximately one page. It should outline the problem you seek to solve, related areas of research and your proposed solution. Any resources (equipment, software, etc) that you need (beyond those available to all grad students) should also be listed.

The literature review milestone should be a written report of 3–7 pages discussing your problem formulation and the related work that you have examined in preparation for your project. This literature review will form a significant chunk of your final report (the background and problem formulation sections described below), so it should be written

carefully. For those projects that are not entirely literature review, you should be able to proceed to your own work after this milestone. For those projects that are entirely literature review, the final report will require significant additional reading.

The project presentation will be a 10–15 minute talk in front of the class. You may use overheads or a computer projector. You may give demos. These presentations will be held in the last week of class. At the time of this milestone the project should be almost complete, except possibly for data collection and analysis.

The final report 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.
- Solution Methodology: This section (may be more than one) describes how to solve the problem.
- Results: This section typically includes examples of the problem and their solution.
- Conclusions and future work: What still needs to be done?

You are not required to produce publishable work in one month, but this process should give you a good start. Length is not a primary concern, but the final reports will probably be 7–15 pages including figures. Here are a few examples of short papers that I think are pretty well written:

- Mitchell and Tomlin, "Level Set Methods for Computation in Hybrid Systems" in Proceedings of Hybrid Systems Computation and Control 2000, Springer LNCS 1790, pp.310–323 (2000).
- Foster and Fedkiw, "Practical Animation of Liquids" in Siggraph 2001, pp.15–22.
- Sethian, "A Fast Marching Level Set Method for Monotonically Advancing Fronts" in Proceedings National Academy Sciences, v.93, pp.1591–1595 (1996).

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