Physics-Based Animation

01 — Introduction

September 8, 2015
Today

- Mostly administrivia
  - What this course will involve
  - Objectives, prerequisites, format, evaluation, etc.
Medium Surface Tension
About the instructor
About me

- Rahul Narain
  http://rahul.narain.name/
narain@umn.edu

- Assistant professor in CS&E
  Keller Hall 6-225E

- Research interests:
  computer graphics, animation, numerical methods
About the course
General information

- **Class hours:**
  Tuesdays and Thursdays, 2:30–3:45 pm
  Bruininks Hall 420A

- **Office hours:**
  Every weekday, 11:00 am–noon, or by appointment
  Keller Hall 6-225E

- **Moodle site**

- **Course home page:**
  [http://z.umn.edu/physicsbasedanimation](http://z.umn.edu/physicsbasedanimation)
Objectives

This course is intended to prepare you for understanding and advancing research in physics-based animation.

- *identify appropriate computational models* for animating various phenomena

- present and discuss the *key contributions and limitations of technical papers*

- implement and demonstrate *state-of-the-art simulation techniques*. 
Prerequisites

• Familiarity with **linear algebra** and **multivariable calculus** is **essential**

• If you haven’t studied **numerical linear algebra**, you should be taking **CSCI 2033** or **5304** now

• Experience with **computer graphics** is **recommended** but not required

• I’ll provide a code framework for drawing stuff
Prior knowledge

diagnostic

https://chimein.cla.umn.edu/
Prior knowledge diagnostic

- 4
- 3
- 2
- 3
Materials

There is no textbook for the course. Selected articles and course notes will be made available as the course goes on.

The following resources available online may be useful:

- Witkin and Baraff's course notes on *Physically Based Modeling*,
- Nealen et al.'s survey paper, "Physically Based Deformable Models in Computer Graphics", and
- Bridson and Müller-Fischer's course notes on *Fluid Simulation for Computer Animation*.

http://z.umn.edu/physicsbasedanimation
Format

• *First few classes*: Lectures by the instructor

• *After that*: Lectures and student presentations of technical papers

• *Final project* implementing a nontrivial simulation algorithm
Lectures

- **Before class**: assigned reading
- **After class**: short programming assignment
- **During class**: lecture, discussion of assigned reading, questions from the previous assignment

- There may be unannounced quizzes on the reading
- **Assignments** are ungraded but build on each other, so you should do them on time
Student presentations

Choose a technical paper and present it. ×2

• What is the **problem** and why is it hard? What are the **key ideas** that make this paper work? What are the **tradeoffs and limitations**?

• Try to go beyond the text of the paper

• You will be evaluated by me, but you will also **evaluate each other** with written critiques
Final project

Implement a recent simulation paper

or

Implement a new technique of your own

If there’s a phenomenon you particularly want to animate and don’t know where to start, I can point you to relevant papers.

In any case: talk to me first
Final project

Deliverables

• **Project proposal**: about 5 weeks into the course

• **Final presentation** or **report**: last week of class

• Code
Evaluation

• In-class participation (20%)
  • Quizzes on assigned reading (5%)
  • Written critique on presentations (10%)
  • Participation in class discussions (5%)
• Paper presentations (30%)
• Final project (50%)
  • Written proposal (10%)
  • Presentation or report (20%)
  • Code (20%)
Student survey
Policies

• Grading and Transcripts
• Student Conduct Code
• Student Responsibilities
• Makeup Work for Legitimate Absences
• Sexual Harassment
• Equity, Diversity, Equal Employment Opportunity, and Affirmative Action
• Disability Services
• Mental Health and Stress Management
• Academic Freedom and Responsibility
Next class

• *Mass-spring systems*

• **Pre-lecture reading:**
  “Differential Equation Basics” and “Particle Dynamics” from Witkin and Baraff (see schedule on course website)