Numerical Methods

CS 357 - Fall 2016

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Introduction

Numerical Methods: What?

- 'Numerical'?
- 'Method'?

↳ math idea

↳ formula

↳ algorithm

↳ analysis

↳ accuracy

↳ accuracy - cost tradeoff

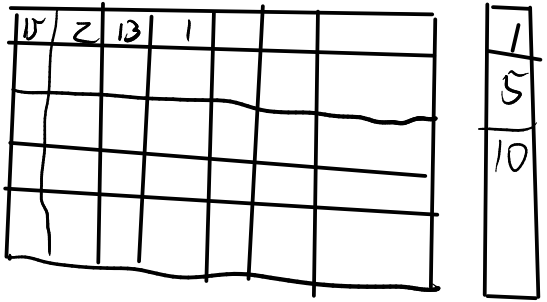
method = math + cost + algorithm + accuracy

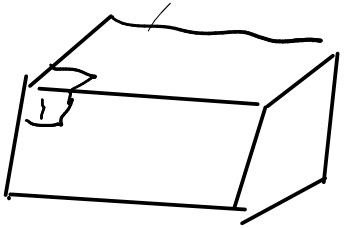
To do with numbers

Real numbers

↳ number → computer

Arrays of numbers





Accuracy

- Why might a numerical method **not give the right answer?** (i.e. be inaccurate)
  - Because (unlike in the special cases that math has taught you), mostly we *can't write down the answer*. Not in a finite amount of space anyway. And a computer *is* finite.

Demo: Waiting for 1

Numerical Experiments

Model:

- Small-scale behavior easy to describe
- Large-scale behavior desired, but hard to understand

Demo: Brownian Motion

Numerical Experiments

- What are we going to want to know about a numerical experiment?
  - What's the question?
  - What's the answer?
  - Accuracy
  - Cost of the computation / tradeoff vs. accuracy
  - Repeatability / Reproducibility
  - Efficiency? → "good use of human/computer time"

Class web page

bit.ly/cs357-f16

Watch for Discussion hour announcements

- Assignments
  - HW0!
  - Pre-lecture quizzes
  - In-lecture interactive content (bring computer or phone if possible)
- Exams
- Class outline q(with links to notes/demos/activities/quizzes)
- Scribbles
- Virtual Machine Image
- Piazza

- Policies
- Video
- Interactive Questions
- Calendar
    - Office Hours

In-class activity: Complexity of Matrix-Matrix Multiplication