CS 194 Project Proposal

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Agenda

- Introduction
- Subject Area/Motivation
- Previous work
- Future work
- Road map
- Questions

Introduction

- Me: Nathan Beckmann
  - 4th year student in Computer Science and Mathematics of Computation
- Advisor: Glenn Reinman
  - Also working with a graduate student, Thomas Yeh

Subject Area/Motivation

- Physics simulation in interactive entertainment
- Current games are limited to unrealistic models because of performance constraints
- This field has interesting properties
  - Tangible real-time constraint (fps)
  - Some leeway in computation accuracy
  - Extensive parallelism
- Can we develop new hardware to improve the status quo?

Previous Work

- Thomas Yeh is working on this problem for his PhD thesis
- Benchmark suite has been created
- Error tolerance levels are known
  - Fit errors within conservative believability constraints
- Physics engine has been parallelized in important sections
  - Using Open Dynamics Engine (ODE)
  - Parallelized with OpenMP

Future Work

- Build simulator for testing of ideas
  - Current simulators are limited by number of cores, performance, or other factors
  - Assemble simulator from assorted pieces
    - MINT/SESC simulator
    - NOC component from previous work

Future Work

- Exploit savings in parallelism and accuracy
  - Use many cores to divide the work
  - Lower accuracy allows for smaller floating-point units, which might allow for ...
    - ... a larger cache
    - ... a faster interconnect
    - ... more cores
  - Other clever techniques, such as fuzzy value prediction
- Choose a subset of the above and thoroughly investigate

Road Map

- Get ODE to run on un-modified MINT. (1 week)
- Build simulator. (2 months)
- Investigate performance of various optimizations. (2 months)

Questions?