CS 194 Project Proposal

Student – Nathan Beckmann
Advisor – Glenn Reinman
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?