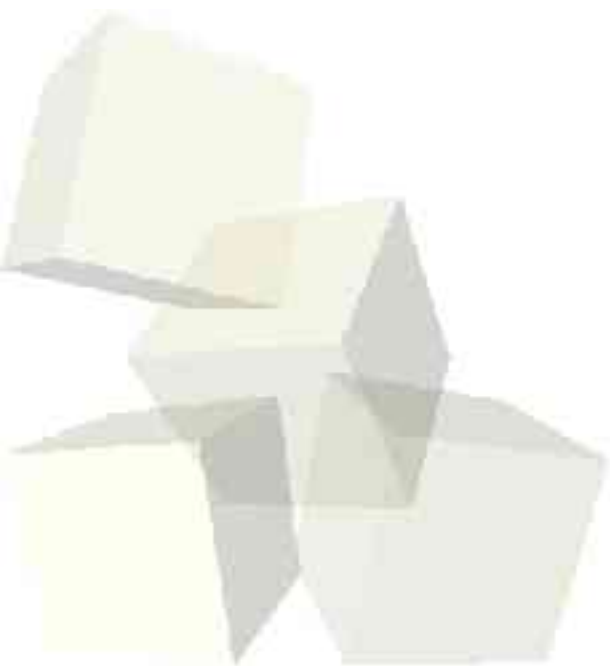




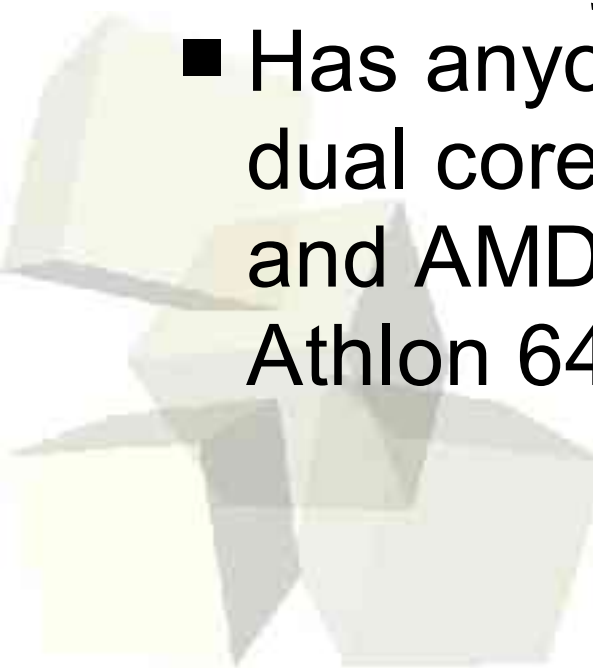
Parallel Spatial Models

4-26-2005





Opening Discussion

- Do you have any questions about the exam?
Grades were much higher this time.
 - What did we talk about in the class before the exam?
 - How are you coming on your projects?
 - Has anyone been reading reviews of the dual core chips? Intel has the Pentium D and AMD has Opertons and will soon have Athlon 64 X2 chips.
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Parallelizing Spatial Models

- Spatial models are incredibly good when it comes to parallelization. However, as in all forms of parallelization, there are pitfalls.
- In particular, we have to be careful to make sure that communication or synchronization overhead doesn't defeat the purpose of the parallelization.





Methods of Parallelizing Spatial Models

- There are two basic ways of parallelizing spatial models
 - ♦ Spatial distribution – We divide the space between different processors. Communication has to make sure each processor knows what it has and often things nearby as well.
 - ♦ Entity distribution – We divide the entities up between the processors. So one processor might have the first 100 entities or something like that. This can exhibit poor locality, but that isn't an issue if the problem doesn't have good locality.



Shared Memory vs. Message Passing

- How you break up a problem can depend a lot on the type of parallelization you are doing.
- For a shared memory environment, communication isn't a significant issue. Breaking things up by entities can pay big dividends if you can find sections of code that write to disjoint sections of memory.
- For message passing frameworks, the communication overhead often means that a spatial distribution will be superior.



Examples: Gravity and Collisions

- Let's consider two example physical systems. One has long range interactions and the other has short range interactions.
- How would you parallelize each of these in a message passing environment? What about in a shared memory environment?





Minute Essay

- How important do you think parallelization is to simulations? Have you considered making your project run in parallel?

