Details

• TAs:
  – André Madeira. Rec: Wed 3.05 to 4 PM, SEC 217. Office Hours: Mondays 2 - 4 pm (Hill 206)
    • amadeira@cs.rutgers.edu
    • http://paul.rutgers.edu/~amadeira/
    – Rohan Fernandes: Rec: Fri 3.05 to 4 PM, SEC 211
      • rohanf@cs.rutgers.edu
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• Homeworks:
  – Out on fridays, due on tuesdays 11 days after.
  – Due at the beginning of the class.
  – Groups of 5. No exceptions (except possibly one).
Example

• Problem: Maximum subarray sum
• Input: Array A[1..n] of integers.
• We designed n^3 and n^2 algorithms. What is the best possible?
Why we care about running time?

• Say n=10^6. Using a 10MIPS machine.
  – n^3 algorithm takes time 10^11, roughly 500 years.
  – n^2 algorithm takes time 10^5, roughly 1 day.
  – n algorithm takes time 0.1 sec.

  Clever algorithms beats fast machine.

• Think about the following back-of-the-envelope calculation. If you had one day to solve a problem on your PC, what is the largest n you can handle if you are using an algorithm that takes time n^3, n^2 or n.
How do we measure running time?

- OS clock?
- Compile, determine the number of instructions and time per instruction, and add?
- Factors affecting speed:
  - Compiler optimization
  - Machine speed
  - Memory access.
  - Coding tricks
  - Good algorithms

This course is about good algorithms.
Example

• Find any number of algorithms you can for
  – finding the number of 1’s in an unsigned integer
  – finding what is the position of the most significant bit in an unsigned integer.

• Check out
  http://www/db.stanford.edu/~manku/bitcount.html for a wonderful expose’.

• Lessons:
  – even on simple problems, creative solutions abound.
  – difficult to develop a theory of algorithms for measuring exact performance of algorithms on all machines and environments.
A Warm Up Problem

• A celebrity is a person who knows nobody but whom everyone knows. Say there are $n$ people. You can any person $A$ if they know person $B$. How many questions do you have to ask to determine the celebrity?

• I/p: I/p Size: O/p: Straightforward: Best: Correctness. Number of questions?