COT 6405: Analysis of Algorithms

Giri Narasimhan

ECS 389; Phone: x3748

giri@cs.fiu.edu

www.cs.fiu.edu/~giri/teach/6405Spring04.html

Evaluation

- Exams
- Homework Assignments
- Semester Project
- Class Participation

Search

- You are asked to guess a number X that is known to be an integer lying between integers A and B. How many guesses do you need in the worst case?

- You are asked to guess a positive integer X. How many guesses do you need in the worst case?

  - NOTE: No upper bound is known for the number.

Polynomials

- Given a polynomial
  - $p(x) = a_0 + a_1 x + a_2 x^2 + \ldots + a_n x^n$

  compute the value of the polynomial for a given value of x.
- How many additions and multiplications are needed?

Celebrity Problem

- A **Celebrity** is one that knows <u>nobody</u> and that <u>everybody</u> knows.

Celebrity Problem:

INPUT: n persons with a $n \times n$ information matrix.

OUTPUT: Find the "celebrity", if one exists.

MODEL: Only allowable questions are:

- *Does person i know person j?*

- Naive Algorithm: $O(n^2)$ Questions.

Celebrity Problem (Cont'd)

- **Induction Hypothesis:** We know how to find a celebrity (if one exists) among a set of $n-1$ people.

[The above hypothesis leads to an inefficient solution.]

Given n persons, 3 cases arise:

1. Celebrity is among the first $n-1$ persons
2. Celebrity is the n-th person.
3. No celebrity exists.

Celebrity Problem (Cont'd)

– **Induction Hypothesis 2:** We know how to find $n-2$ non-celebrities among a set of n-1 people, i.e., we know how to find at most one person among a set of n-1 people that could potentially be a celebrity.

– Resulting algorithm needs [3(n-1)-1] questions.