Last Week

Servers Problem

- We have servers S1, S2, … Sn
- We are interested in optimal configuration of servers to minimize the cost of access
- Let Si be the current new server
  - Sk the last server with a copy of the file
  - Special case, when i = 1, assume server S0 has a copy – without loss of generality
- Simple cases
  - At start, k = 0, i = 1 – simple case
  - When i =2, k = 0, we do not keep in in S1 if C1>1

Server problem

- When i > 2
- We are interested in finding a server Sm, where, (k+1) ≤ m ≤(i-1) such that cost is minimized for all servers Sj, j ≤ i.
- The server Sm is determined by using

$$Min[\sum_{j=k+1}^{m-1}(m-j)+C_m+\sum_{j=m+1}^{i-1}(i-j)] where, (k+1) \leq m \leq (i)$$

Ci =0.

- Case 1: If for Min, m ≤ i-1, we update k ← Min (m), i ← i+1
- Note, now we are interested in optimal configuration for servers after Sk. As for each server to the left of Sk, fetching the file from Sk is cheaper than fetching from any server to the right of Sk.
- Case 2: If for Min, m = i, no suitable m ≤ i-1 is found, we fetch the file from Si by default.

Server problem

m	Cm	A	B
k+1			
k+2			
…			
Min …			
i-1			

$$Min[\underbrace{\sum_{j=k+1}^{m-1}(m-j)}_{A} + C_m + \underbrace{\sum_{j=m+1}^{i-1}(i-j)}_{B}]$$

$$(k+1) \le m \le (i-1)$$

Case 1: k ← min (m), i ← i+1

Entries B are incremented by (i-m)

Case 2: No min (m), found i ← i+1

Entries B are incremented by (i-m)

Entries A are incremented by (m-k)

Random Number Generation

- Congruential method (Kunth 98)
  - Choose an integer seed r(1) [e.g., date, time]
  - r(i) = (r(i-1)*b+1) mod t
  - b and t are constants
  - t should be very large
  - b should be one digit less than t, and end with x21, where x is even.
  - The method avoids repeats and gives a number in the range 0 … t-1

Knuth, The Art of Computer Programming Vol. 2: Seminumerical Algorithms, 3rd Edition, Addison Wesely, 1998

Another method

- x is a continuous variable in the range 0 ..1
- y $= l + \lfloor x(r-l) \rfloor$

- l and r are two integers l < r.
- y is uniformly distributed in the range l … r-1.

Exam
12/03/2007 at 12 noon

- Six questions – required to answer all
- Some questions will have sub questions – of short answer type.
- Focus on concepts and understanding
- Problem solving