CS 571 Materials

March 19, 2002

4:30pm - 7:10pm

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AGENDA

- Q&A
- Discussion of Project P1
- Storage Management
- Memory Policies

Review of P1

- Elevator controller
- Passenger and elevator threads
- Monitor to synchronize
- Original + FIFO (or other) policy
- Experimental performance study

Engineering Report Components

- Statement of the problem, approach to solution, and main claims of the report
- Overview of architecture investigated as a solution to this problem (includes diagrams, data flows, data structure, algorithm sketches)
- Overview of the experiments used to test the architecture
- Results of the individual experiments (including graphs and plots)
- Findings and conclusions
- Appendices: simulator source code; raw data outputs

Issues in Simulation

- Managing the clock
- Loop-back delay in passenger thread
- Startup conditions
- Stopping condition
- Experiment design
- Reasonableness of results

Managing the Clock

- Simulation contains DELAY statements representing delays in the real system.
- Simulation routines consume compute power and add some delay themselves.
- Want to manage simulation so that DELAYs, but not simulation overhead, affect the measurements

Managing the Clock, cont.

- Real time delays
  - DELAY(15000) -- wait 15 seconds
- Scaled clock
  - Chose scale factor A
  - Use DELAY(15000/A)
  - At end, multiply all times by A
- Internal simulation time clock
  - Internal variable TIME
  - DELAY statement --> advance TIME by delay
  - Use TIME as source of time stamps for measurements

Loop-Back Delay

- Form of passenger thread

```
P: DELAY(D)
call elevator
enter and select floor
exit elevator
repeat
```

- D a constant? Random variable?
  - Better for delay to be random with mean D
  - Exponential: sample = -D*ln(rand(0,1))
  - Uniform: sample = rand(D-a,D+a)

Startup Conditions

- With passenger thread format, initial passengers will arrive at random times.
  - Some projects put DELAY at the end or used constant DELAY
  - This bunches passengers up at the beginning and may give false impression of higher load

Stopping Condition

- Some condition to stop the simulation
  - Number of trips
  - Simulation time limit
- In either case, discard samples for incomplete trips in progress
- Experiment with a few runs to see how sensitive the averages are to stopping parameter

Experiment Design

- Choose values of N and D
  - N = 5, 10, 15, 20, 30
  - D = 60, 120, 300, 600, 900 secs
- Conduct one simulation run for each combination of (N,D)
  - 25 runs
- Plot queue time, trip time versus N and D.

Reasonableness of Results

- If possible, get qualitative description of results; do actual results agree?
- For example, increasing N increases number queued at or in elevator; expect W (mean queue wait) to *increase* with N.
- Increasing D reduces time passenger wants to spend in elevator, reducing congestion; expect W to *decrease* with D.

Reasonableness, cont.

- Increasing N (decreasing D) increases congestion with original policy; more passengers in elevator means longer trip times with original policy.
- Expect FIFO trip times to be independent of N and D since only one passenger rides at a time.
  - In fact, average trip length of one passenger is N/3, so FIFO trip would be approximately 15*N/3+4 = 5*N+4 sec = 44 sec
- Expect FIFO to have worse W and better T than the original policy, and overall (W+T) to be worse.