Lecture 15: Multimedia Systems II (Mar 29, 2005) Yap

March 29, 2005

1 ADMIN

- Homework 5 will be out this Thur

2 Review

- Q: What are two main characteristics of files storing the new media that distinguishes it from traditional media?

  A: The new media files are VERY large, and requires REAL-TIME scheduling to operate the files.

- Q: In continuous media (audio/video), the data are waves that must be digitalized (discretized) for storage. What are the 2 sources of error in this digitalization?

  A: Sampling error and quantization error.

- Q: You have 8 bit budget and try to encode a YIQ file. How would you allocate your bit budget to the components?

  A: 3:2:2.

3 Review of Multimedia

- Audio
- Video
- Color Theory
- JPEG Algorithm
- MPEG Algorithm

4 Real Time Scheduling

- Example: Processes A, B, C.
  A is every 30 msec (e.g., NTSC 30fps), need 10 msec,
  B is every 40 msec (e.g., PAL 25fps), need 15 msec,
  C is every 50 msec (e.g., slow NTSC 20fps), need 5 msec.
- Check schedulability
- Figure of independent scheduling (Fig 7-11 from text)
  A runs at 0, 30, 60, 90, ...
  B runs at 0, 40, 80, 140, ...
  C runs at 0, 50, 100, 150, ...
- Allow preemption in multimedia applications.
- RMS (Rate Monotonic Scheduling):
  – independent processes
  – realtime constraint for periodic processes (period P_i for ith process)
  – same CPU time needed by each process (C_i for the ith process)
  – nonperioding processes have no deadlines
  – preemption has no cost
- RMS ALGORITHM:
  – Each process gets a priority equal to its frequency (1/period)
  – Always run the highest priority ready process (use preemption)
  – Liu/Layland 1973: this is optimal for static scheduling
  – If $U(m) = \sum_{i=1}^{m} \frac{C_i}{P_i} \le m(2^{1/m} - 1) = U^*(m)$ then RMS will always work.
  – E.g., $m = 3$ requires $U(m) \le 3(\sqrt[3]{2} - 1) = 0.780$.
  – $U^*(m) \rightarrow \ln 2 \sim 0.696$.
- EDS (Earliest Deadline First) Algorithm