Specifying RTOS Systems

John C. Shovic

Specifying Systems

• Specifications - Same philosophy as in CS350
  – Do it right the first time, and if it is wrong, fix it early

Hardware Failure Curve
Software Failure Curve (Idealized)

Wear vs. Deterioration

The Cost of Change!
The Dilemma

Don't ship; Let the Schedule Slip
or
Ship on time, with buggy features!

What to do?

• Change the “Ship” philosophy
  "We're going to ship a high quality product on time!"

• To make possible:
  • Practice the best possible project management
  • Be willing to sacrifice some less essential features in first release
Tradeoffs

Schedule

Quality Features

The First Rule

• Do a specification for your code!
  – Don't just jump in

Do Iterative Development

• This means:
  • Decide to ship high quality/on time
  • Manage features, not code
  • Build a skeleton first
  • Hang features of skeleton
  • Test each feature completely
  • Identify hardware problems early
  • Get your Real Time Code Up Early!
Special Issues In Specification of Real Time Systems

- Interrupts
- Task States
- Task Scheduling
- Memory Usage

Interrupts

- Interrupt Latency
  - Max Time Interrupts disabled + Time to start executing ISR
- Interrupt Response (preemptive)
  - Latency + Time to save CPU Context + Kernel Int Entry time
- Interrupt Recovery (preemptive)
  - Time to check for higher task + Time to restore context + Time to execute return from interrupt

Task States

- Design for task states
  - Running?
  - Delayed?
  - Pending?
  - Ready?
  - Deleted?
  - Logical states
Task Scheduling

- Priorities
  - Many issues, will discuss next week
- CPU Utilization
- Deadlock
- Hogs

Memory Management

- Heaps are dangerous
  - (malloc, free - new, delete)
- The evil Fragmentation problem
- UCOSII uses block allocation to avoid fragmentation

Stack Issues

- Stack Space
  - Limited per task
  - Overflows really, really, really bad
    - Corruption
    - Evil
- Use Stack Monitors
Homework Assignment

- IBM 1130
- Released in 1965
- 512Kbytes Hard Disk
- 8Kbytes Memory
- $895 a month rental
- $41,280 for purchase
- No Screen - Printer I/O
- Fortran IV
- Processor ~ 277KHz

Read the handout article