Announcements
- Next Tuesday - Review for Final
- Next Thursday - Demos in 100 Deschutes

Topic for Today:
- N&L Case Study A: CPM-GOMS analysis and user testing of a telephone operator's workstation.
- Operational sequence diagrams

The major points of the study (as they apply to this class)
- A real-world case study of design, implementation, and evaluation
- Fancy GUI's are not always better than simple text interfaces.
- Usability analysis methods can predict usability issues before you test your systems with real users.
- Usability analysis methods are scientifically proven.

The users and the task
+ Users
  - Toll and Assistance Operators (TAO's)
  - Highly practiced at this routine activity

+ Task
  - Answer the phone call
  + Determine...
    - Who should pay for the call
    - What is the correct billing rate
    - When the connection is complete enough to hang up
  - Involves discussion with customer, typing into workstation, reading information on the workstation screen

The study
+ Two threads conducted in parallel:
  + Observational
    - Prototype of proposed system built, installed, and used by 24 TAO's for four months.
    - 24 TAO's continued using current system
  - CPM-GOMS analysis

What is CPM-GOMS analysis?
- CPM = Critical Path Method.
- Critical Path: The tasks in a project such that, if any are delayed, the whole project will be delayed.
- Similar to, but more complex, than KLM.
- Models keystrokes, but also simulates the parallelism that exists in the human information processor
- Maintains a separate thread for each human perceptual, cognitive and motor processor.
- Predicts task execution time by finding the critical path

Why GOMS analysis is appropriate for this task and this interface
+ Time is the important metric
  - 1 second = $3 million
+ The task is easily modeled using GOMS
  - Operators: Listening, talking, reading, keying, writing, and various cognitive activities.
CPM-GOMS is particularly appropriate because many of these subtasks are performed simultaneously.
- Well-practiced, expert performance
- A large-scale field study was conducted concurrently.
- An alternative prediction (based on intuition) could be tested.

Built CPM-GOMS Models
- Built fifteen models for each workstation (for the fifteen benchmark tasks)
- For each model: Decomposed the task, established the dependencies
+ Assigned operator times
  - Some were taken from the literature (psychological studies, previous GOMS modeling)
  - Other operator times were established by observing the current workstation.
- The proposed workstation was not observed during the modeling.

Results
+ CPM-GOMS Model:
  - Proposed workstation 0.63 msec (4%) slower
+ Observed:
  - Proposed workstation 0.65 msec (4%) slower
- The models consistently underpredicted observed times by a fraction of a second, but correctly captured the difference between the two workstations.

Parallels to other interface problems
+ The execution time problems identified in project Ernestine are analogous to general usability problems in other interfaces.
  - Execution time is correlated to overall ease-of-use.

Take home messages
+ Use analytic methods early in the process
  - KLM or other GOMS methodologies
  - Cognitive Walkthrough
  - Prototype
  - Test with real users doing real tasks
  - KLM can be used effectively in the design stage.

Why the difference?
- No benefit from new keyboard layout
- No benefit from new screen layout
- Keying procedures not on critical path

Miscellaneous
- Car crash simulations
- Incorporating pre-recorded bits of spoken text.
- Text-only is not so bad