User Interface Design and Programming
CS422

Evaluation Techniques and Inducing Sickness

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Books

- Information Anxiety by Saul Wurman,
- The Psychology of Human-Computer Interaction by Stuart Card and friends
- Designing the User Interface 3rd Ed. by Ben Schneiderman
- Human-Computer Interaction 2nd by Dix
Three Goals

- Assess the extent of the system's functionality
- Assess the effect of the interface on the user
- Identify any specific problems with the system
Examples

- Jonas Salk spent 98% of his time documenting things that didn’t work before he found the thing that did.

- Kenneth Boulding "The moral of evolution is that nothing fails like success because successful adaption leads to the loss of adaptability ... This is why a purely technical evaluation can be disastrous. It trains people only in thinking of things that have been thought of and this will eventually lead to disaster"
How evaluation is done?

- Stage of design
- Novelty of project
- Number of expected users
- Criticality of the user interface
- Costs of product and finances allocated for testing
- Time available
- Experience of the design and evaluation team
Different types of Evaluation

- Evaluating the Design
- Evaluating the Implementation
- Usability Testing
Evaluating the Design

- Cognitive walkthrough
- Heuristic evaluation
- Review-based evaluation
Cognitive walkthrough

- Detailed review of a sequence of actions
- Main focus is on how easy the system is to learn for a new user

Given:
- description of system prototype
- description of task user is to perform
- complete written list of actions user must perform
- indication who the users are and what experience they have
Heuristic evaluation

- Multiple evaluators
- Main focus is evaluating early designs
Ten Heuristics

- visibility of system status
- match between system and real world
- user control and freedom
- consistency and standards
- error prevention
- recognition rather than recall
- flexibility and efficiency of use
- aesthetic and minimalist design
- help users recognize, diagnose, recover from errors
- help and documentation
Review-based evaluation

- Literature study
- Look through existing documents for previous related experiments
Model-based evaluation

- GOMS, keystroke-level model, etc
- A reduction of a user's interaction with a computer to its elementary actions. Using these elementary actions as a framework, called the Keystroke-Level Model (KLM), an interface can be studied.
- **Goals** are what the user intends to accomplish. An **operator** is an action performed in service of a goal. A **method** is a sequence of operators that accomplish a goal. There can be more than one method available to accomplish a goal. If more than one exists, then one of them is chosen by some selection **rule**.
Evaluating the Implementation

• Qualitative
• Quantitative
• Expert reviews
Usability Testing

- in the laboratory - controlled but may be unrealistic and short term focus
- in the field - longer term, more realistic but harder to control

- informal testing with mockups
- thinking aloud
- video and audio tapes
Usability Testing

- tends to emphasize first time usage and limited number of features
- pilot studies are very important to find errors in the testing procedure
- run through the entire experiment with a small group of subjects
- participation should be voluntary and FULLY informed
- user should feel they are not being tested
- important to collect data about the participant's background
- privacy of records is very important
Surveys

- Questionnaire for User Interaction Satisfaction (QUIS)
- http://www.lap.umd.edu/quis/
- http://www.tele.sunyit.edu/TEL598sur.html
Acceptance Tests

- establish specific testable criteria for the application
- time to learn, speed of usage, rate of errors
Controlled Experiments

- Come up with a hypothesis that is testable and measurable
- Set up an experiment where certain control variables are varied
Controlled Experiments

- Subjects
  - match expected users
  - should have at least 10 subjects, in general more is better

- Variables
  - variables that are manipulated - independent variables
    - each independent variable can have a number of different values - levels
  - variables that are measured - dependent variables
  - manipulate independent variables to produce different conditions for comparison
  - dependent variables should be only affected by the independent variables
Experimental method

• between groups (randomized) - each subject assigned to a different condition
  • each user only does 1 condition
  • experimental condition - the variable has been manipulated
  • control - experimental condition without manipulating the variable
  • need more subjects
  • differences among subjects can bias the results

• within groups
  • each user performs under each condition
  • possible problems with transfer of learning effects
  • need fewer users
Controlled Experiments

- Hypothesis
  - prediction that varying the independent variables will affect the dependent variables in a certain way
  - goal is to show that this prediction is correct
  - disprove the null hypothesis (no difference in the dependent variable between levels of independent variable)
  - produce values to compare to various levels of significance
  - if its significant, at some level of certainty, that differences would not have occurred by chance
Controlled Experiments

- Statistics
- LOOK at the data and SAVE the data

- Control and privacy
  - IRB (Institutional Review Board) issues
  - and especially issues of informed consent
Eye-Tracking

Understanding an Individual Session Image

Data from individual session data sessions offer a wealth of insight into viewing behavior. From the green dot below (the entry point for this test subject) follow the black lines. This note provides details about what can be observed.

The blue lines indicate the overall path the eye took, where the eye first fixated, where the eye looked to the lower of the subject's viewing.

The green dot is the entry point - the first eye fixation for the test subject.

The red dot is the exit point, or the spot where the test subject left the page.

The white "halos" indicate the area of the subject's viewing.

The black lines are "magnified" and indicate the path that the eyes took through the page. They connect each area of fixation.

Each circle represents a point of eye fixation where a test subject looked at the page for at least a fraction of a second.

The "numbers" indicate where eye movements are likely to occur.

The "numbers" indicate the sequence of eye movements on the page.

The "numbers" indicate that the eye fixated on the specific part of the page.

The "numbers" indicate the duration of each fixation and the sequence of eye movements.

The "numbers" indicate the probability of each fixation occurring.

The "numbers" indicate the number of times the eye fixated on a specific area.

The "numbers" indicate the frequency of eye fixations in each area.