Web TANGO: Towards Automated Comparison of Information-centric Web Site Designs

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Current Status of the Web

Research Problem

- 90% of sites provide inadequate usability
- Most problems due to poor information architectures
- 196 million new sites in 5 years

Proposed Solution

New automated methodology and tool– Web TANGO (Tool for Assessing Navigation and Organization) –to enable designers of information-centric Web sites to compare designs early.

Web TANGO Methodology

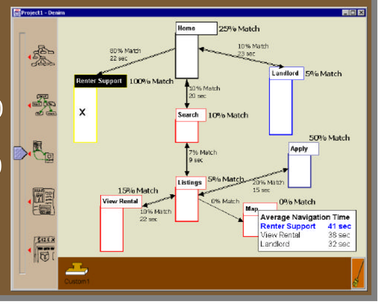
Assess usability of a Web site's information architecture:

- Approximate people's information-seeking behavior (Monte Carlo simulation)
- Output quantitative usability metrics (e.g., number of errors & navigation time)

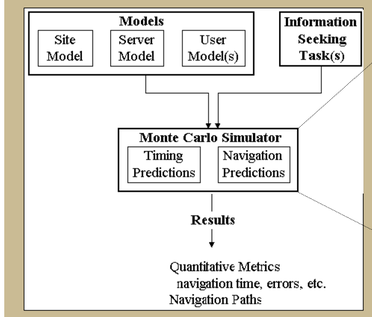
Goal: automated support for comparing design alternatives (existing and new sites)

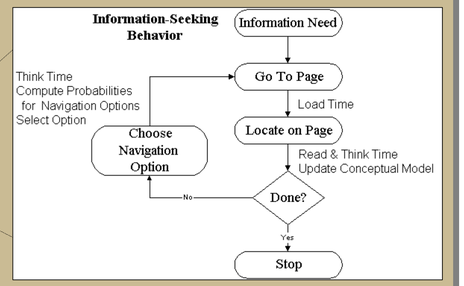
Web TANGO Usage Scenario

- Represent design in TANGO (site model)
- Specify server parameters (server model)
- Specify user characteristics (user models)
- Specify target information (tasks)
- Specify starting page(s) in site)
- Run simulator to produce results
- Compare results & select best design



Web TANGO Architecture





Models

Site – node for each page (metadata, links, page complexity)
Server – latency and load
User – Personal and Computer Characteristics
Personal - memory size, reading speed, probabilities for non-intrinsic characteristics (e.g., read a page, complete task, make an error)
Computer – transfer speed

Information Seeking Task(s)

Target pages in site and keywords

Monte Carlo Simulator

For each trial
Choose links based on probability function(s)
Functions incorporate user models & metadata analysis (information retrieval principles)
Predict metrics (e.g. loading, reading & thinking time) at each page
Report quantitative usability measures (e.g. navigation time, number of errors, memory load)
Report simulated navigation paths
Results averaged over all trails

Survey of Automated Web Methods

We developed a taxonomy for classifying automated evaluation methods and conducted an extensive survey of 50 methods.

Taxonomy of Automated Usability Evaluation

Our taxonomy consists of an automation type and a testing level.

Automation Types

- Non Automatic - no level of automation
- Automatic Capture - capture interface usage
- Automatic Analysis - identify usability problems
- Automatic Critique - identify usability problems and solutions

Testing Levels

- Minimal Effort - no testing or modeling required
- Informal Use - requires normal interface usage
- Model Development - requires an interface and/or user model
- Formal Study - requires structured formal testing (i.e., structured tasks)

Survey Findings

We surveyed 50 methods that fall into the following categories: testing, inspection, inquiry, analytical modeling and simulation.

- Automation is greatly underexplored (only 26% of methods surveyed)
- 85% of methods require formal studies or informal use

Analytical modeling and simulation are two promising areas for future automated usability evaluation methods for Web sites.

UE Method	Automation Type: None	Capture	Analysis	Critique	Description
Testing (Formative)					
Thinking-aloud Protocol	F (1)				user talks during test
Question-asking Protocol	F (1)				tester asks user questions
Shadowing Method	F (1)				expert explains user actions
Coaching Method	F (1)				user can ask an expert questions
Teaching Method	F (1)				user teaches novice
Co-discovery Learning	F (1)				two users collaborate
Performance Measurement	F (1)	F (4)			capture usage and quantitative data
Log File Analysis			FIM (7)		analyze captured usage data
Retrospective Testing	F (1)				review videotape with user
Remote Testing		FI (1)			distance testing
Inspection (Formative)					
Guideline Review	F (4)		(5)		guideline conformance
Cognitive Walkthrough	F (1)	F (1)			simulate problem solving
Pluralistic Walkthrough	F (1)				group cog. walkthrough
Heuristic Evaluation	F (1)				identify heuristic violations
Perspective-based Inspection	F (1)				narrowly focused heur. eval.
Feature Inspection	F (1)				evaluate product features
Formal Usability Inspection	F (1)				formal heur. eval.
Consistency Inspection	F (1)				UI consist. across products
Standards Inspection	F (1)				industry standard compliance
Inquiry (Summative)					
Contextual Inquiry	F (1)				field interviewing
Field Observation	F (1)				observe system use
Focus Groups	F (1)				user group discussion
Interviews	F (1)				formally ask user questions
Surveys	F (1)	I (1)			informal interview
Questionnaires	F (1)	I (1)			subjective evaluation
Self-reporting Logs	F (1)				user records UI operations
Screen Snapshots	F (1)				user captures UI screens
User Feedback	F (1)				user-initiated comments
Analytical Modeling (Predictive)					
No Methods Surveyed					
Simulation (Predictive)					
Information Processor Model			M (1)		simulating user interaction
Information Scent Model		M (1)			simulating web site navigation
Automation Type					
Total	26	6	3		
Percent	74%	17%	9%		

Table 1: Automation characteristics of Web UE methods. A number in parentheses indicates the number of methods surveyed for a particular method and automation type. The testing level for each method is represented as: minimal (blank), formal (F), informal (I) and model (M).

Automated Web Site Evaluation Methods

- Log file analysis is heavily used (requires usage data)
- Several methods use operationalized guidelines to analyze pages
  Correlation to usability has not been explored yet
- Only one simulation analysis approach by WebCriteria
  Provides inadequate support for comparing Web site designs

Future Work

Web TANGO is a work in progress. Future work entails:

- Conducting an online study to correlate page composition (e.g., number of words, links, graphics, fonts, reading complexity, etc.) with perceived page complexity.
- Developing several user models based on observed usage.
- Developing navigation prediction algorithms.
- Implementing the simulator.
- Validating simulator results with user studies.

Our evaluation testbed is a healthcare intranet that enables clinician to access a wide range of information resources.

More info - http://www.cs.berkeley.edu/~ivory/research/web