Mensch-Maschine-Interaktion 2

HCI and the Web

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HCI and the Web

1.1 HCI – A Quick Reminder
1.2 Web Technology – A Brief Overview
1.3 Web Usability: How Do We Use the Web?
1.4 Designing Web Sites for Usability
1.5 Web Accessibility

Literature:
- Steve Krug: Don’t Make Me Think, New Riders 2006 (2nd ed.)
Building Successful Digital Products

• Tension
  – different objectives
  – different design goals

• Step by step 1-2-3

• Solution
  – Products in the overlapping space

1. What do people desire?
2. What will sustain a business?
3. What can we build?

Objective: a product that is desirable and viable and buildable

From A. Cooper, About Face 2.0
What is Usability?

• “Usability is a quality attribute that assesses how easy user interfaces are to use. The word ‘usability’ also refers to methods for improving ease-of-use during the design process.” (Jakob Nielsen)

• “Scientific discipline using observation, measurement and design principles to enhance a site visitor’s ability to perform specific tasks” (Kathy Gill)

• “… the effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of tasks …” (ISO)
Why is Usability Important?

• Improving usability can
  – increase productivity of users
  – reduce costs (support, efficiency)
  – increase sales/revenue (web-shop)
  – enhance customer loyalty
  – win new customers

• Several case studies that show the benefit of usability
• Usability is often considered as sign of quality
• Working with users can create ideas for new products, e.g. "similarities" feature (people who bought this also bought that) at amazon.com
  (Source: Interview Maryam Mohit)
Human-Computer Interaction Basics (1): Views and Models

• Facade & machinery and their integration
  – What the user sees and what happens in the background
  – What humans can perceive
    • Physiological and psychological limitations
  – What users want
  – What humans make of what they see
    • Mental models

• Create adequate conceptual models
  – Make the application domain visible/tangible
  – Know Thy User
  – Map internal functions to externally visible affordances
  – Create an experience
Human-Computer Interaction Basics (2): Process

• Investigate requirements seriously
  – Observations, studies, focus groups

• Usability is a central element of all development activities
  – Part of quality assurance

• Iterative development
  – Early prototypes: Paper prototypes, mock-ups
  – High-fidelity prototypes & user studies

• Guidelines and principles
  – E.g. learnability, efficiency, memorability, errors, satisfaction (Nielsen)

• Evaluation
  – Usability engineering as an empirical discipline
Web Usability

• Usability of Web sites and applications delivered over the WWW
• Dependent on several issues related to
  – Web technology
  – Web design
  – Project Management
  – Usability evaluation
• Web usability is not about “adding some fancy graphics, color, and cool styles at the end of the project”
• Web usability can be measured!
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What do we need for a distributed system to share documents?

• How are documents encoded?
  – Content
  – Semantics
  – Presentation

• How are documents identified?
  – Where is data held?
  – How can data be accessed?

• How are documents transmitted/transported to the user?
Distributed File Servers

• Document format
  – Any document

• Mechanism for identification
  – File name (Alias for server name and path)

• Transfer protocol
  – E.g. SMB/CIFS, NFS, AFP
The WWW Approach

• Document format
  – Hypertext Markup Language, HTML
    • Document Type of Standardized General Markup Language (SGML)
  – Alternative (simpler): XHTML, based on XML

• Mechanism for identification
  – Uniform Resource Identifier, URI
    • used as Uniform Resource Locator, URL

• Transfer protocol
  – Hypertext Transfer Protocol, HTTP
    • ASCII-coded Request-Reply protocol using TCP/IP
Mixture of Content, Semantics, Presentation

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/REC-html40/loose.dtd">

<html>
  <head>
    <title>Simple Example Document in HTML</title>
    <meta name="author" content="Heinrich Hussmann">
    <meta name="description" content="Just for demo">
  </head>

  <body>
    A simple text. <br>
    <font face="Helvetica">Font Helvetica</font> <br>
    <font face="Times">Font Times</font> <br>
    <b>Bold</b> <i>Italic</i>
  </body>
</html>
Architecture and Protocol (simplified)

- Client-server architecture
- Synchronous communication model (request/response)
- Resources
  - Unit that is communicated between Client and Server
  - Static or dynamic

Web Client

Web Server

HTTP Protocol

resources in the file system

request URL

download HTML
Documents and Resources

![Diagram showing the interaction between a client (browser) and a server. The client initiates requests with a URL, analyzes the request, and sends requests for resources like images. The server responds with load resource messages for each request.]

- **Client (Browser)**:
  - URL
  - analyze
  - image 1
  - image 2
  - ...
  - image n

- **Server**:
  - load resource (HTML)
  - load resource
  - load resource
  - ...
  - load resource
Example Architecture
The WWW is a Distributed System

• What is a distributed System?
  – Tanenbaum, A.,S. (from Computer Networks)
    "... in a distributed system, the existence of multiple autonomous computers is transparent (i.e., not visible) to the user."
  – Leslie Lamport:

There has been considerable debate over the years about what constitutes a distributed system. It would appear that the following definition has been adopted at SRC:

A distributed system is one in which the failure of a computer you didn't even know existed can render your own computer unusable.
Information Exchange Between Browser and Server

• Obviously the document

• Further information available (e.g. header fields)
  – Browser type and version
  – Operating system (version)
  – Referer
  – Cookies
  – Screen size, window size
  – If Java/JavaScript/VBScript are enabled
  – List of plug-ins installed
  – Network parameter and route
  – ...

• Rich source of information
  – Can make applications more usable
  – Information may not be complete or may be wrong

Try it out at: http://network-tools.com/analyze/
The WWW is a Distributed System

Usability Issues

• Network
  – Delay
  – Failure
  – Jitter
  – Latency
  – Bandwidth

• Multi-user System
  – Work load, system performance
  – Concurrency problems
Designing Distributed Applications

• Basics
  – applications consist of several parts (e.g. different processes)
  – in general these parts are executed on different machines
  – these parts of the application are executed concurrently or one after another
  – there is communication between these parts

• Software/Application Design Aspects
  – data
    • analyzing data transfer (optimize for minimum)
    • investigate how caching can be supported
    • keep data safe (minimize data that is given away)
  – functional
    • execute functions where it is most reasonable
    • regard the infrastructure on that the applications will be executed
  – response time (optimize for minimum)
The Web Means Heterogeneity of Platforms

• Processing power
  – Processor, co-processors, cache
  – RAM
• I/O-performance
  – Hard drive speed
  – Network
• Input and Output
  – Displays
  – Keyboard layout
• Additional Hardware and Periphery
  – Video and audio (in/out)
  – Card reader, printer, scanner
• Software,
  – Browser
  – Operating System
Statistics on Platform Usage

• Never trust the statistics!
  – Also small groups of users are important!
  – Statistics may be very unreliable
Other Graphical Browsers
Plain Text Browser, e.g. Lynx
Audio Browsing

• There are users who listen to Web sites!
• Example:
  – Web browser Safari
  – Screen reader Voice Over (built into Mac OS)
• Who among the Web designers will think of these users?
Media Types in the Web

- text / hypertext
- Inline graphics in Hypertext
- icons / graphics (bitmap, vector) / drawings / photos
- interactive graphics: active maps
- animations
- programs (e.g. JavaScript)
- audio clips / video clips (e.g. MP3, MPG)
- audio / video streams
- 3D-scenes (e.g. VRML)
- objects, like Applets, Flash, ---
- any type of media ...
Media Types in the Web - Concept

• open concept to integrate arbitrary media
  – transmitted in the MIME format

• interpretation of different Media types in the WWW
  – browser build-in for most basic types
    • text, HTML hypertext, GIF and JPEG images
  – using browser Plug-Ins
    • e.g. for Acrobat PDF, Real-Audio, RealVideo, Shockwave, Flash
  – using external applications (helper applications)
    • e.g. ghostscript for PostScript, other proprietary formats/applications
  – save files
    • Download of arbitrary formats
MIME Extension

• mapping of file types (e.g. extensions in the file system, UNIX) onto MIME types (on the server)

• foo.ps => application/postscript => ghostview

• mapping of MIME types to applications (in the browser)

• … it is open – but this may be a serious usability problem
  – Do the users have the right connection?
  – Does the external program, plug-in work?
Technology Overview Client

• content that can be displayed/provided
  – text, HTML, images, videos, audio, ...

• content and programs that can be interpret by the browser
  – HTML
  – browser script: JavaScript, VBScript, SMIL, MathML, ...

• programs that are executed in the context of the browser
  – Java Applets (Byte Code, Virtual Machine)
  – Flash
  – ActiveX (Native Code, executed directly by the operating system)

• programs that are pluged into the browser and executed in the context of the browser for specific data types
  – Plug-Ins

• external programs that are started by the browser to handle data that can not be handled by the browser
  – helper applications
Technology Overview Server

- content (e.g. HTML-pages) that contains statements that can be replaced or executed:
  - SSI, XSSI
  - server side scripting (ASP, PHP, JSP, ...)
- programs that create content
  - additional process: CGI
  - In the context of the servers: Servlets, ...
- extensions of web servers
  - NSAPI, IISAPI, Apache-Modules, ...
- gateways and front-ends for databases
- application server
- dedicated/specific server
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The Web Means Heterogeneity of Users

• In principle, anybody can use the Web!
• Huge span of user variety:
  – Kids
  – Beginners
  – Elderly
  – Experienced technically educated professionals
  – Technically ill-educated professionals
  – Hackers
• “Know Thy User” - Is it possible on the Web?
• Why do people use the Web?
  – Assumedly easy and simple way of achieving things
  – Because it is fun
  – Because there are no other options
• (As always:) Simplicity is most important
Steve Krug: Design and Reality

What we design for...

- Read
- Read
- Read
- [Pause for reflection]
- Finally, click on a carefully chosen link

The reality...

Look around feverishly for anything that:

a) is interesting, or vaguely resembles what you're looking for, and

b) is clickable.

As soon as you find a halfway-decent match, click.

If it doesn't pan out, click the Back button and try again.
Steve Krug: We Don’t Read Pages, We Scan Them

• We are in a hurry.
• We know that we do not have to read everything.
• We are educated in scanning things.
Steve Krug: We Satisfice (satisfying & sufficing)

• We do not make optimal choices
  – We are in a hurry.
  – There is not much penalty for guessing wrong.
  – Weighing options does not guarantee success.
  – Guessing is more fun.

• Gary Klein: Sources of Power - How People Make Decisions
  – Example: Fire commanders do rarely compare options!
    • Find a reasonable plan
    • Check it for obvious problems
    • Try it!
Steve Krug: We Muddle Through

• Users in general do not care how and why things work
  – Any working solution is accepted
  – We do not have the time to analyze the details
  – There is no incentive for having it understood better

• Example:
  – Use a search box for navigating to a site