Usability paradigms and principles

Overview

- Designing for maximum usability is the goal of design
- History of interactive system design provides paradigms for usable designs
- Principles of usability are more general means of understanding usability

Introduction

Concerns

- How can an interactive system be developed to ensure its usability?
- How can the usability of an interactive system be demonstrated or measured?

Approaches

Paradigms for usability

examples of successful interactive techniques

Principles for usability

theoretically driven from psychological, computational and sociological knowledge

Paradigms for usability

Historical perspective on interactive system design

Time-sharing

40s and 50s – explosive technological growth

60s – need to channel the power

J.C.R. Licklider at ARPA

single computer supporting multiple users

Video Display Units

more suitable medium than paper

1962 – Sutherland's Sketchpad

computers for visualizing and manipulating data

one person's contribution could drastically change the history of computing

Paradigms (cont'd)

Programming toolkits

Engelbart at Stanford Research Institute

1963 – augmenting man's intellect

1968 NLS/Augment system demonstration

the right programming toolkit provides building blocks to producing complex interactive systems

Personal computing

70s – Papert's LOGO language for simple graphics programming by children

A system is more powerful as it becomes easier to user

Future of computing in small, powerful machines dedicated to the individual

Kay at Xerox PARC – the Dynabook as the ultimate personal computer

Paradigms (cont'd)

Window systems and the WIMP interface

humans can pursue more than one task at a time

windows used for dialogue partitioning, to "change the topic"

1981 – Xerox Star first commercial windowing system

windows, icons, menus and pointers now familiar interaction mechanisms

The metaphor

relating computing to other real-world activity is effective teaching technique

- LOGO's turtle dragging its tail
- file management on an office desktop
- word processing as typing
- financial analysis on spreadsheets
- virtual reality – user inside the metaphor

Problems

some tasks do not fit into a given metaphor

cultural bias

Paradigms (cont'd)

Direct manipulation

1982 – Shneiderman describes appeal of graphically-based interaction

- visibility of objects
- incremental action and rapid feedback
- reversibility encourages exploration
- syntactic correctness of all actions
- replace language with action

1984 – Apple Macintosh

the model-world metaphor

What You See Is What You Get (WYSIWYG)

Language versus Action

actions do not always speak louder than words

DM – interface replaces underlying system

language paradigm

interface as mediator

interface acts as intelligent agent

programming by example is both action and language

Paradigms (cont'd)

Hypertext

1945 – Vannevar Bush and the memex

key to success in managing explosion of information

mid 60s – Nelson describes hypertext as non-linear browsing structure

hypermedia and multimedia

Nelson's Xanadu project still a dream today

Multimodality

a mode is a human communication channel

emphasis on simultaneous use of multiple channels for input and output

Computer Supported Cooperative Work

CSCW removes bias of single user/single computer system

Can no longer neglect the social aspects

Electronic mail is most prominent success

Principles to support usability

A structured presentation of general principles to apply during design of an interactive system.

Learnability

the ease with which new users can begin effective interaction and achieve maximal performance

Flexibility

the multiplicity of ways the user and system exchange information

Robustness

the level of support provided the user in determining successful achievement and assessment of goal-directed behaviour

Principles of learnability

Predictability

determining effect of future actions based on past interaction history

operation visibility

Synthesizability

assessing the effect of past actions

immediate vs. eventual honesty

Familiarity

how prior knowledge applies to new system

guessability; affordance

Generalizability

extending specific interaction knowledge to new situations

Consistency

likeness in input/output behaviour arising from similar situations or task objectives

Principles of flexibility

Dialogue initiative

freedom from system imposed constraints on input dialogue

system vs. user pre-emptiveness

Multithreading

ability of system to support user interaction for more than one task at a time

concurrent vs. interleaving; multimodality

Task migratability

passing responsibility for task execution between user and system

Substitutivity

allowing equivalent values of input and output to be substituted for each other

representation multiplicity; equal opportunity

Customizability

modifiability of the user interface by user (adaptability) or system (adaptivity)

Principles of robustness

Observability

ability of user to evaluate the internal state of the system from its perceivable representation

browsability; defaults; reachability; persistence; operation visibility

Recoverability

ability of user to take corrective action once an error has been recognized

reachability; forward/backward recovery; commensurate effort

Responsiveness

how the user perceives the rate of communication with the system

stability

Task conformance

degree to which system services support all of the user's tasks

task completeness; task adequacy

Summary

Paradigms for usability

the history of computing contains examples of creative insight that enhanced interaction

Principles for usability

repeatable design for usability relies on maximizing benefit of one good design by abstracting out the general properties which can direct purposeful design

The success of designing for usability requires both creative insight (new paradigms) and purposeful principled practice