Paradigms for Interaction

- New computing technologies arrive, creating a new perception of the human-computer relationship
  - Batch processing -> Impersonal computing
  - Time sharing -> Interactive computing
  - Networking -> Community computing
  - Graphical displays -> Direct manipulation
  - Microprocessor -> Personal computing
  - WWW -> Global information
  - Ubiquitous computing -> ???

Time-sharing

- 1940s and 1950s – explosive technological growth
- 1960s – need to channel the power
- Single computer supporting multiple users

IBM 360

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

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
  - The tablet sdk makes developing for the tablet relatively easy
Personal computing

- 1970s – Papert’s LOGO language for simple graphics programming by children
- A system is more powerful as it becomes easier to use
- Future of computing in small, powerful machines dedicated to the individual
- Kay at Xerox PARC
  - Smalltalk – first OO language - visual interface
  - the Dynabook as the ultimate personal computer (better than today’s PDAs)

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

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
- Paper - tablet
- Problems
  - Some tasks do not fit into a given metaphor
  - Cultural bias

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)
**More Direct Tablet**

- Stylus direct onto output surface
- Inking
- Recognition

**Hypertext**

- 1945 – Vannevar Bush and the memex
- Key to success in managing explosion of information
- Mid 1960s – Nelson describes hypertext as non-linear browsing structure
- Hypermedia and multimedia
- Nelson’s Xanadu project still a dream today

**Computer Supported Cooperative Work (CSCW)**

- CSCW removes bias of single user / single computer system
- Can no longer neglect the social aspects
- Electronic mail is most prominent success

**Groupware Taxonomy**

<table>
<thead>
<tr>
<th>Same place</th>
<th>Different place</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>“Synchronous, co-located”</em></td>
<td><em>“Synchronous, distributed”</em></td>
</tr>
<tr>
<td>- Whiteboard</td>
<td>- ICQ/IRC chat</td>
</tr>
<tr>
<td>- Lecture/tutorial</td>
<td>- MS Netmeeting</td>
</tr>
<tr>
<td>- Meeting</td>
<td>- (Internet) Phone</td>
</tr>
<tr>
<td>- Decision Support Systems</td>
<td>- Video conferencing</td>
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</tbody>
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<tbody>
<tr>
<td><em>“Asynchronous, co-located”</em></td>
<td><em>“Asynchronous, distributed”</em></td>
</tr>
<tr>
<td>- “Sticky notes”/annotations</td>
<td>- Email, Newsgroups</td>
</tr>
<tr>
<td>- Whiteboard, cabinet</td>
<td>- ICQ message</td>
</tr>
<tr>
<td>- Shared PC</td>
<td>- Document repository</td>
</tr>
</tbody>
</table>
The World Wide Web

- Hypertext, as originally realized, was a closed system
- Simple, universal protocols (e.g. HTTP) and mark-up languages (e.g. HTML) made publishing and accessing easy
- Critical mass of users lead to a complete transformation of our information economy
- Browser centric desktop

Agent-based Interfaces

- Original interfaces
- Commands given to computer
- Language-based
- Action based
- Agents - return to language by instilling proactivity and "intelligence" in command processor
- Avatars, natural language processing

Ubiquitous Computing

"The most profound technologies are those that disappear." — Mark Weiser, 1991

- Late 1980's: computer was very apparent
- How to make it disappear?
- Shrink and embed/distribute it in the physical world
- Design interactions that don't demand our intention

Sensor-based and Context-aware Interaction

- Humans are good at recognizing the "context" of a situation and reacting appropriately
- Automatically sensing physical phenomena (e.g., light, temp, location, identity) becoming easier
- How can we go from sensed physical measures to interactions that behave as if made "aware" of the surroundings?