Wall and Table Displays

Abhinav Kalra- B00715340
Syed Shahzeb Hasnain- B00715330
Wall Displays

from https://en.wikipedia.org

from http://about.pdpsolutions.com

from http://www.ratkoj.com
Classification of Wall Displays

• Visualization Technology
  • Front/Rear projection Displays
    • Use of projection and display surface such as wall or canvas.
    • Projector lies either in front or behind the screen
  • Monitors
    • Backlit LED/ LCD or Plasma displays
Classification of Wall Displays

• Display Setup
  • Vertical – Display positioned vertically
  • Diagonal – Positioned diagonally at an angle to the user
  • Chained Displays – Flexible placement of Vertical Displays
    (Koppel et.al, 2012)

Chained Displays

from Ardito et.al, 2015
Classification of Wall Displays

- Interaction Mechanism
  - Touch
    - Use of hands, fingers etc. for interaction with display
    - Single or multi touch
  - Input devices
    - Use of devices such as tablets, smartphones or pointers. e.g. MD UI
    - Useful for large displays or when user not in proximity to display.
    - CSCW and collaborative usage environment.
  - Body Proximity and gestures
    - Detection of user presence in proximity to display. e.g. Interactive Mannequin
    - Sensors such as RFID, pressure sensors, camera etc.
    - Recognition of user gestures, facial expressions or gaze.
Classification of Wall Displays

• Application Areas
  • Productivity and Collaboration
  • Entertainment – Foster entertainment and enjoyment for users.
  • Advertisements.
  • Public Spaces. e.g. airports, railway stations.
  • Schools, classrooms or Universities.
Enabling people and teams to collaborate on accomplishing tasks through the use of technology.
Collaboration

• Promotes collaboration between co-located and disparate teams.
• Interact in proximity or at distance from the display.
• Allows provisioning and viewing of shared information.
• View and annotate information concurrently.
• Large display area allows teams to work in parallel.
Co-located Collaboration

The Proximity Factor: Impact of Distance on Co-located Collaboration (Hawkey et al., 2005)
Co-located Collaboration

• Communication amongst collaborators affected when separated.
• Resolving of physical gestures (e.g., Pointing) from afar can be problematic.
• Near/far collaboration scenario involve usage of direct or indirect input devices to wall display.
• Interaction with display may be dominated by single user or promote fluid exchange amongst collaborators (Hawkey et al., 2005).
• Visual attention switching governed by factors such as:
  • Spatial location and distance from user
  • Size of Display: Panoramic vs field wide displays
  • Use of input device: direct vs indirect
Impact of distance from Display

- Distance from display affects comfort and ease of use.
- Large display provide sense of immersion. (Hawkey et al., 2005).
- Presence of person in front of display may obstruct view.
- Proximity to large display makes it harder to view whole display.
- Design ergonomics: harder to reach parts of large display.
- Impacts how teams collaborate and communicate amongst each other.
- Install display at a height near to that of average person for ease of access (Azad et al., 2012)
Interactive Displays: User behavior and territoriality

- Interactive public displays often used concurrently by people.
- Azad et.al, 2012 classify the user interaction space with display as:
  - Personal: Area of screen where user directly interacts with display.
  - Storage: Surrounds personal space. Objects or information that may be referred.
  - Communal: Beyond Storage space. Used by other people interacting with display
Audience Interaction with interactive Displays

- The Audience Funnel
- Study of audience behavior with interactive public displays by Michelis and Muller, 2011.
• Passing by: People in vicinity of display.
• Viewing and Reacting: Shows interest in the interactive displays.
• Subtle Interaction: Show tentative interest in interaction with display or move towards it.
• Direct Interaction: Active engagement with the interactive display.
• Multiple interactions: Interact multiple times with adjacent displays. Also share space with other users.
• Follow up interactions: Follow up activity after interaction with display.
Connected Worlds.
Source http://nysci.org/connected-worlds/
Table Displays

Syed Shahzeb Hasnain
Microsoft Pixel Sense
Table Displays

- Visual mediums, embedded or projected onto a flat surface
- Usually an interactive display with various input functions
- Larger than the regular monitor displays
- Mobility is limited
Type of Displays

- Ceiling mounted projectors/Rear mounted projectors
  - Computer embedded on to the projector or separate unit
  - Allows for odd shaped displays
  - Input mechanism depends upon the technology
  - Allows for over the top gestures
- Embedded Screens
  - Computer embedded underneath the display
  - Allows various forms of input
  - Usually higher quality display
  - No poor light issues as in Projection
Types of Input Mechanism

- Direct Inputs
  - Uni Touch
  - Multi Touch
  - Multi user – Multi Touch
  - Voice Recognition
  - Touch Gestures

- Indirect inputs
  - Conventional Keyboard and Mouse
  - Gestures
  - Stylus
Pros and Cons

Direct Inputs
- **Pros**
  - Natural Human behavior
  - Fluid Input
  - Noticeable Gestures
- **Cons**
  - User can get tired
  - Items on far side of table are difficult to reach
  - Gestures may distract
  - Users may unintentionally obstruct each other

Indirect Inputs
- **Pros**
  - Far side of the table is accessible
  - In terms of mouse, the pointer isn’t obstructive
  - People are already familiar with this input
- **Cons**
  - Lesser awareness for intention of interaction
  - Multiple input pointers can be confusing
  - Decreases collaboration
  - Reduce the amount and range of gestures

Direct Intentions: The Effects of Input Devices on Collaboration around a Tabletop Display
Vicki Ha†, Kori M. Inkpen†, Regan L. Mandryk‡, Tara Whalen
Why Table Displays?

• Larger screen estate
• Larger work area
• Collaborative workspace
• Multiuser support
• Direct Touch/Multi touch
Usages of Tabletop Displays - Survey

Figure 1. Side-by-side comparison of votes for top-five rankings for each of the three usage scenarios.

<table>
<thead>
<tr>
<th>Collaborative use</th>
<th>Long-term individual use</th>
<th>Appeal to novices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-user support</td>
<td>57</td>
<td>Direct touch</td>
</tr>
<tr>
<td>Large display</td>
<td>53</td>
<td>Standard applications</td>
</tr>
<tr>
<td>Multi-touch</td>
<td>49</td>
<td>Multi-touch</td>
</tr>
<tr>
<td>Direct touch</td>
<td>42</td>
<td>Large display</td>
</tr>
<tr>
<td>Horizontal orientation</td>
<td>28</td>
<td>Standard input devices</td>
</tr>
</tbody>
</table>

Figure 2. Aggregated top-five rankings for each of the three usage scenarios.

Where can you find Table Displays?

- Educational Environments
- Collaborative friendly offices
- Research oriented group places
- Information Kiosk at public areas
Factors Affecting Tabletop Displays

• Ergonomics
• Accessibility
• Gesturing
• Awareness of Action and Invalid Inputs
• Collaboration
• Privacy
Ergonomics

- Flat Displays
  - Allows touch controls to be embedded
- Dimensions
  - Usually large in terms of dimensions
  - Requires space
  - Mostly rectangular but can be of an odd shape
- Orientation
  - Depends upon the design of the display
  - Length and width design for square/rectangular shaped displays
  - Limited rotate-ability
Accessibility

• Large size of display limits the reach of user hands.
• Tables placed in length renders most of corner spaces and top spaces unusable
• Tables placed in width doesn’t allow corners to be reachable if table is of a large size
• The height of a person and their proximity to the display.
• Physical disability may hinder difficulty reach farther locations of the screen
• In a multi user environment, the personal space needs to be accessible
Accessibility


Gesturing

• Recognition of hand movements
• Head mounted Cameras or intelligent touch surfaces
• Can detect various actions

Room Planner

- Developed by University of Toronto
- Used for designing architecture of rooms and houses
- Achieves gestures by touch
- Touch surface of 31” by 19” in a 8:5 form factor
- Various gestures and multi-finger interaction for various inputs

Room Planner Gestures

Multi User Input

• Table Displays designed for multiple inputs from multiple users
• Detection of users on the table can help in defining screen estate
• Users limited to sides of the table
Awareness of Action and Invalid Inputs

- Inputs performed on table top screen can hinder screen visibility
- Viewing angle affects position of the hindrance
- Invalid inputs can be performed if not positioned properly
- Haptic feedback as a source of input confirmation
Awareness of Action and Invalid Inputs

Collaboration

- Table Displays allows co-located teams to work fluidly
- Easy to share common space for tools and documents
- Information is shared face to face and on the system
- Leverage work space for complex or tightly integrated task
Joint vs Segregated Collaboration


Research - Cambiera

**DISC:** Active discussion about the data or task. Limited system interaction (e.g., pointing to items or scrolling in documents).

**VE:** View engaged. One person is actively working; the other watches and engages in conversation and comments on the observed activities, but not interacting with the system.

**SV:** Sharing of the same view of a document or search result. Participants either look at the same document reader or the same search result list together at the same time (= SPSA code in [18]).

**SIDV:** Sharing of the same information but using different views of the data. Participants for example read the same document but using their own copies (views) of the document.

**SSP:** Work is shared to solve the same specific problem. Both read different documents from a shared set. For example, participants issued a search for “injured driver,” and then divided the results so each person read one half of the documents.

**SGP:** Work on the same general problem but from different starting points. E.g., both participants search for docs to find information on a collision but start from different searches (e.g., “accident” & “obitaries”) and consider different sets of documents.

**DP:** Work on different problems, and hence different aspects of the task. For example, one person is interested in the injured driver, the other searches for events around the missile silo.

**D:** Disengaged. One person is actively working, the other is watching passively or is fully disengaged from the task.

---

Research- Cambiera

• Required teams to work closely
• Collaborative search, organization and sharing
• Findings
  • Teams that collaborated more had better and quicker results
  • Teams were more successful in tasks
  • Working face to face help in solved complex problems
  • Task success and time spent closely together were intertwined
  • Integration depends on the medium of interaction(Table Displays)

Privacy

• Privacy may be affected by
  • Location
  • Screen size
  • Accessibility

• Very less privacy as table displays are focused for collaboration
• Augmenting personal devices for privacy considerations
Device Augmentation

- Table Displays can interact with various devices on the platform
  - Phones
  - Wallets
  - Credit/Debit Cards
  - Augmented Reality
  - NFC enabled devices
Future of Table Displays
Holographic Table Displays
Not Quite there yet!

Questions?
References


Activity
0.3% of Delhi uses bicycle.
DILLIWALI
1,432 SQ.KM

PRIVATE VEHICLES VS ANNUAL INCOME

AVG MEDIAN ANNUAL INCOME (INR)

- MUMBAI: 4.6 LAC INR
- SURAT: 4.3 LAC INR
- DELHI: 4.1 LAC INR
- CHENNAI: 3.4 LAC INR

3RD HIGHEST ANNUAL INCOME, BUT IS 1ST WHEN COMPARED WITH PRIVATE VEHICLE OWNERSHIPS.
The Big Picture

Thankyou!