Topics

- Styles of layout
- Discrete uses of lenses
- ZUIs
- Magic Lenses
Styles of Layout
1\textsuperscript{st} group: Charts (Scatter Plots, Line Graphs)

- When correspondences can be established \textit{between} \\
  - all the divisions of \textit{one} component and \\
  - all the divisions of \textit{another}
Second group: Networks

- When correspondences can be established among
  - all the divisions of the same component

  steps
  1. record correspondences
  2. deduce simplest structure

Supposing one group speaks, one listens
-> diagrams such as fig. 6 or fig. 7.
Third group: Maps

- When correspondences can be established among
  - all the divisions of the same component
  - and can be arranged according to geometric order

steps
  1. Reproduce geometric order
  2. record correspondences

fig. 9 - map of towns and roads
fig. 10 - network of this information
fig. 11 - diagram of this information
Fourth group: Symbols

- When correspondences are not established in the representation but between the marks in the representation and the reader
  - learned
  - culturally tied - meaning comes from agreement

- diagrams, networks, maps support internal processing
- symbolism (language) relies on external processing
### Use of Space

<table>
<thead>
<tr>
<th>GROUPS OF IMPOSITION</th>
<th>IMPOSITION</th>
<th>TYPES OF IMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARRANGEMENT</td>
<td>RECTILINEAR</td>
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<tr>
<td>DIAGRAMS</td>
<td></td>
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<td>NETWORKS</td>
<td></td>
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<tr>
<td>MAPS</td>
<td></td>
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<tr>
<td>SYMBOLS</td>
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</tbody>
</table>

- **Diagram 1**: Arrangement examples for diagrams, networks, maps, and symbols.
- **Diagram 2**: Rectilinear example for diagrams, networks, maps, and symbols.
- **Diagram 3**: Circular example for diagrams, networks, maps, and symbols.
- **Diagram 4**: Orthogonal example for diagrams, networks, maps, and symbols.
- **Diagram 5**: Polar example for diagrams, networks, maps, and symbols.
Traffic accident victims France 1958

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>pedestrians</td>
<td>28,951</td>
</tr>
<tr>
<td>bicycles</td>
<td>17,247</td>
</tr>
<tr>
<td>motorcycles</td>
<td>74,887</td>
</tr>
<tr>
<td>4 wheel vehicles</td>
<td>63,071</td>
</tr>
</tbody>
</table>
Traffic accident victims France 1958

- Pedestrians: 28,951
- Bicycles: 17,247
- Motorcycles: 74,887
- Four-wheeled vehicles: 63,071
Traffic accident victims France 1958

- Four-wheeled vehicles: 34, 25%
- Pedestrians: 15, 75%
- Motorcycles: 40, 6%
- Bicycles: 9, 4%
Traffic accident victims France 1958

- 17,247 Bicycles
- 28,951 Pedestrians
- 63,071 Four-wheeled vehicles
- 74,887 Motorcycles
Traffic accident victims France 1958

- Motorcycles: 74,887
- Four-wheeled vehicles: 63,071
- Pedestrians: 28,951
- Bicycles: 17,247
Traffic accident victims France 1958

- Motorcycles: 40.6%
- Four-wheeled vehicles: 34.2%
- Pedestrians: 15.0%
- Bicycles: 9.4%
Traffic accident victims France 1958

- Four-wheeled vehicles: 63,071
- Motorcycles: 74,887
- Bicycles: 17,247
- Pedestrians: 28,951
Traffic accident victims France 1958

74,887 Motorcycles
63,071 Four-wheeled vehicles
28,951 Pedestrians
17,247 Bicycles
Traffic accident victims France 1958
Traffic accident victims France 1958

- Pedestrians: 15.75%
- Motorcycles: 40.6%
- Bicycles: 9.4%
- Four-wheeled vehicles: 34.25%
Traffic accident victims France 1958

- Four-wheeled vehicles: 63,071 (74,887 total)
- Motorcycles: 17,247 (28,951 total)
- Bicycles
- Pedestrians: 28,951 (74,887 total)
Traffic accident victims France 1958
Linear Construction

- Straight line represents the total
- quantities are shown proportionally
  - fig 1 - as given
  - fig 2 - sorted horizontal
  - fig 5 - sorted vertical
  - fig. 3 - spatially proportional
    - partial quantities related to same base
  - fig 4. - countable representation
- uses only 1 dimension of the plane - leaves the other free for ...
Orthogonal Construction

• Spatial differentiation of parts
• Juxtapose categories with quantity
  – Fig 6, 7 - categories horizontal, quantities vertical
  – Fig 9 - categories vertical
  – Fig 8 - proportion as % emphasized
  – Fig. 10 - linked categories … trends
• Total is not portrayed but separate quantities easier to compare
Rectilinear Elevation

- Quantity is represented by area.
- 2nd dimension is not used, variation in marks (vv -size) is used.
  - fig 11, 12 - areas lined up horizontally
  - fig 13 - diagonal arrangement
  - fig 14, 15 - superimposed
- Total is not portrayed but comparison of parts more difficult.
Circular Construction

- Circular version of rectilinear construction
- total is portrayed
- amounts designated by angle at centre and length of circumference
  - fig 18, is fig. 5 curved
  - fig 16, 17, 19 - portion or whole circle

- comparing centre angles is easier than circumference lengths (fig 19 vs fig 18)
Polar Construction

- Polar construction is a circular version of orthogonal construction
  - fig. 20, is fig. 6 curved
  - fig. 23 - visual measure of quantity added

- total not portrayed
- parts less easily comparable
Circular Elevation

- As in rectilinear elevation, areas are proportional to quantity
  - fig. 24, is fig. 11 curved
  - fig. 27 - uses area, fig 22 - uses length
  - fig. 26 area of circle, fig 23 - length of line
  - fig 25. - Nightingale Rose
Discrete and Partial Lens Use
Location

• Global

• Constrained
  • with respect to the focus
  • with respect to the image
  • with respect to the information
An Integrated Lens

A displacement-only, constrained, radial, Gaussian lens...
An Integrated Lens

A displacement-only, constrained, radial, Gaussian
An Integrated Lens

A displacement-only, constrained, radial, Gaussian lens.
Selectively Applying Displacement

Looking at edge congestion
Selectively Applying Displacement

Looking at edge congestion
Selectively Applying Displacement

Looking at edge congestion
An Edge Distortion Lens

An edge-displacement-only, constrained, radial, Gaussian lens
An Edge Distortion Lens

An edge-displacement-only, constrained, radial, Gaussian
Toolglass and Magic Lenses

• A see-through interface between the application and the cursor
• Toolglass – supports apply functionality via the see-through interface
• MagicLens – provides sight of alternate representations
Toolglass widgets

- Toolglass widgets: semi-transparent interactive tools that are used in an application work area, and appear on a virtual sheet of transparent glass called a Toolglass sheet.
- can line up a widget, a cursor and an application object with a two-handed gesture.
- can move sheet over application object or move the object to a widget (trackball can control both sheet and scrolling).

Figure 1. Click-through buttons. (a) Six wedge objects. (b) Clicking through a green fill-color button. (c) Clicking through a cyan outline-color button
The See-Through Interface

(Cursor
Toolglass
Sheet
Applications)

(Bier, 1994)
The Toolglass Sheet

(Bier, 1993)
Multi-Widget Sheet

(Bier, 1993)
Examples

• Shape and Property Palettes

Figure 4. Shape palette.
(a) Choosing a shape.
(b) Placing the shape.

Figure 5. Font face palette. The word "directly" is being selected and changed to bold face.
Examples (Cont.)

• Clipboards

Figure 6. Symmetry clipboard.
(a) Picking up an object.
(b) Rotated copies appear.
(c) The copies are moved and pasted.

Figure 7. Fill-color rubbings.
(a) Lifting a color.
(b) Moving the clipboard.
(c) Applying the color.
Clipboards

(Bier, 1993)
Clipboards

(Bier, 1993)
Sending Information

(Bier, 1994)
Undelete Lens

(Stone, 1994)
Examples (Cont.)

Previewing Lenses

Figure 8. An achromatic lens over a drop shadow lens over a knotwork. (Knotwork by Andrew Glassner)
Previewing Lenses

(Bier, 1993)
Selection Tools

(Bier, 1993)
Selection Tools

(Bier, 1993)
Examples (Cont.)

Selection Tools

Figure 9. Vertex selection widget.
(a) Shapes.
(b) The widget is placed.
(c) A selected vertex.

Figure 10. The local scaling lens that shrinks each object around its own centroid (Tiling by Doug Wyatt)
Toolglass widgets

- Many widgets can be placed on a single sheet
- Widgets and lenses can be composed to create a number of specialized tools from a basic set (e.g. an outline color palette over a magnifying lens, to point to individual edges)

Figure 2. A sheet of widgets. Clockwise from upper left: color palette, shape palette, clipboard, grid, delete button, and buttons that navigate to additional widgets

Figure 3. An outline color palette over a magnifying lens
Implementation of Toolglass Sheets

• Multi-Device Input and Screen Refresh
  – Handles simultaneous input from two pointing devices and updates the screen after multiple simultaneous changes

• Filtering Input Through Lenses and Widgets
  – Modifies pointing events as they pass through widgets

• Filtering Output Through Lenses and Widgets
  – Modifies graphical output as it passes up through each widget
Toolglass & Magic Lens

- See-through interface based on spatial modes
- Structured well for two-handed interaction
- May be integrated into any screen-based applications and tools
Composition of Widgets and Lenses

(Bier, 1993)
(Stone, 1994)
Shape and Property Palettes

(Bier, 1993)
Shape and Property Palettes

<table>
<thead>
<tr>
<th>Style</th>
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<tr>
<td>regular</td>
<td>by holding down a keyboard key with</td>
</tr>
<tr>
<td>italic</td>
<td>spatial modes. Because these spatial</td>
</tr>
<tr>
<td><strong>bold</strong></td>
<td>modes can be changed <strong>directly</strong> in the</td>
</tr>
<tr>
<td><strong>bold italic</strong></td>
<td>application work area, the cursor and</td>
</tr>
<tr>
<td></td>
<td>the user's attention can remain on the</td>
</tr>
</tbody>
</table>

(Bier, 1993)
Detail in Context

(Stone, 1994)
Font-size Tool

(Bier, 1994)
The mouse has three buttons named **LEFT**, **MIDDLE** and **RIGHT** corresponding to their physical layout. Here are the selection commands for each selection:

a. The act of selecting or the fact of being selected, choosing, choice.

b. That which is selected.

(Stone, 1994)
Inter-application Tool

(Stone, 1994)
Enhancing Dynamic Queries

(Fishkin, 1999)
Enhancing Dynamic Queries

(Fishkin, 1999)
Advantages of See-Through Tools

- Uses less screen real estate than fixed-position control panels.
- Tools can move with the user to stay close at hand.
- Combines multiple task steps into a single step.
- Modes are defined spatially rather than temporally.
Advantages of See-Through Tools

• Customized feedback for their operation.
• Customizable widgets.
• Can be combined with dynamic queries.
• Increase user interface consistency.
• Detail in context
• Enhance selection and editing operations.
• Applies to many different problem domains
References


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