Manipulate view
Design choices: how?

Encode

Arrange

Express

Separate

Order

Align

Use

Map

Define visual marks and channels

Manipulate

Change

Select

Navigate

Facet

Juxtapose

Partition

Superimpose

Reduce

Filter

Aggregate

Embed
Design choices: manipulate

• **Manipulate** design choices allow for:
  • **Change** any aspect of visual encoding.
  • **Select** elements of the visualization.
  • **Navigate** for changing the point of view.

• This type of manipulations involves an interaction that goes beyond the static visual coding.
Change view over time

• The set of options available to change a view covers all design options of visual analytics systems.

• The datasets are usually large enough and complex to justify dynamic changes in the view displayed.

• Basically, there are four options for change:
  • Dynamic changes in a single view.
  • Faceting the data by partitioning it into multiple juxtaposed views or superimposed layers.
  • Reducing the amount of data to show within a view.
  • Embedding focus and context information together within a single view.
Dynamic changes in a single view

• Possible changes:
  • Change the encoding.
  • Change the arrangement.
  • Change the order.
  • Change the viewpoint.
  • Change which attributes are filtered.
  • Change the aggregation level.

• It is relatively common to find in general-purpose systems that these systems are designed to allow users to control the visual encoding for the widest possible range of datasets (e.g. Tableau Software).
Dynamic changes in a single view: sorting

• One of the most common interactions with tables is the reordering of the rows according to the value of a particular column.

• The use of the spatial position in the reordering is what makes this interaction so effective from the visual point of view.

• Spatial rearrangement of data allows to discover patterns very quickly and check whether the new layout provides new information.

• It can be used with any categorical attribute, but it makes no sense with ordered attributes.

• System example: LineUp ([Gratzl13])
Dynamic changes in a single view: animate

• Many of the dynamic changes fall into the category of animation, but its use is not always justified.

• One of the best options is the animated transition as an alternative to the jump cut.

• It is often used in navigation, but in general, you can apply to any change that involves moving from an initial state to another final.

• The main advantage of this solution is that it helps users to perceive the context of the change instead of having to mental memorize it.

• They are more useful when the number of simultaneous changes is limited.

• Example: dispine.
Select elements

• Selection of elements is a fundamental operation which is included in any design option where there is interaction.

• A key decision in the select operation design is the definition of the target: items, links (graphs and networks), attributes, values or views (in applications with multiple views).

• The number of different selection types is also a design choice, but it depends on the input devices that we have available. For example, with a mouse: clicking, hovering, combined with the keyboard, by proximity or by movements over touch screens, etc.

• Another design option would be to determine the number of selectable items at any given time. Usually this is dictated by the task.
Select elements: highlighting

• The action of selecting elements is closely linked to that of highlighting the target selected, so that the selected elements modify their visual appearance.

• The selection should be highlighted to enable users to confirm that the result of the interaction is what they expected.

• Sometimes both operations are considered synonymous and are confused, but from the point of view of design, we should distinguish between how the elements are selected and how they are visually encoded after the selection.

• Any change in the strategy for visual encoding is applicable to highlight elements, provided that the change is perceptible in a preattentive way. For example: color, size, motion, incorporation of new marks, etc.
Select elements: highlighting
Navigate changing viewpoint

• For navigation we will refer you to change the viewpoint from which you view things.

• The navigation can be decomposed into three operations:
  • Zoom: zoom in/out the displayed items.
  • Pan: horizontal or vertical.
  • Rotation: rotation of the camera generating the viewpoint.

• The result of the navigation can be considered as a combination of the filter and aggregate operations.
Navigate changing viewpoint: zoom

- Choices:
  - Geometric zoom: the appearance of the object does not change, just change the size of its representation.
  - **Semantic zoom**: the representation of the object is adapted to the view area that is assigned to that element.
Navigate: reducing attributes

• Choices:
  • Slice: an attribute value to be removed is chosen and only items that contain that value will be selected. It is a very intuitive operation with spatial data.
  • Cut: a cutting plane that divides the dataset into two disjoint subsets is defined. In the case of volumes, the region closest to the camera that defines the viewpoint is not displayed.
  • Project: in this case all the items are still shown, but without the information corresponding to attribute/dimension that has been removed.
References


• Tableau Software Inc. www.tableau.com


<table>
<thead>
<tr>
<th>Metric</th>
<th>Graph</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU used (Total)</td>
<td><img src="image1" alt="Graph" /></td>
<td>Shows the total CPU usage over time.</td>
</tr>
<tr>
<td>Load</td>
<td><img src="image2" alt="Graph" /></td>
<td>Displays the load distribution across various processes.</td>
</tr>
<tr>
<td>Memory</td>
<td><img src="image3" alt="Graph" /></td>
<td>Tracks memory usage over time.</td>
</tr>
<tr>
<td>Swap used</td>
<td><img src="image4" alt="Graph" /></td>
<td>Illustrates swap usage.</td>
</tr>
<tr>
<td>Inputs</td>
<td><img src="image5" alt="Graph" /></td>
<td>Visualizes input activity.</td>
</tr>
<tr>
<td>Outputs</td>
<td><img src="image6" alt="Graph" /></td>
<td>Displays output activity.</td>
</tr>
<tr>
<td>Paging</td>
<td><img src="image7" alt="Graph" /></td>
<td>Shows paging activity.</td>
</tr>
</tbody>
</table>

**LiveRAC**

[McLachlan]