

Towards Combining Mobile Devices for Visual Data Exploration

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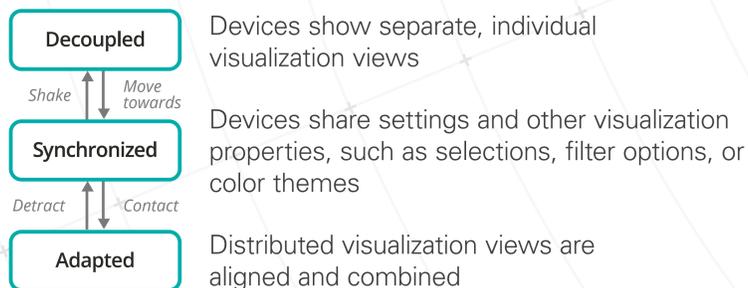
Introduction

- Many visualization systems (multiple coordinated views in particular) use traditional desktop environments → only little use of mobile devices
- Our goal: Developing a visualization interface that makes use of multiple mobile devices such as smartphones and tablets
- Concept:** Distribute, connect, and coordinate multiple visualization views across a number of mobile devices
- Managing visualizations: focus on the dynamic placement, spatial arrangement, and combination of visualizations

Concept for Tangible Visualization Views

Device Proximity and Combination

- Three proximity-based coupling states describe the type or coupling intensity of a logical connection between devices



- Synchronization and adaptation of coupled devices also depends on the views that are displayed

Selection Views

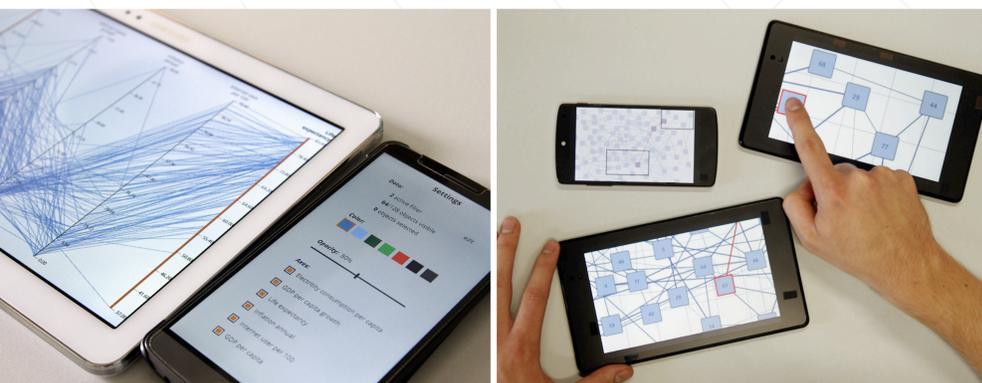
load a specific application case or data set, select a visualization technique

Vis Views

linked brushing, zoom and pan, visually align views or data objects, or synchronize visual properties

Settings/Parameter Views

adjust data mapping (attribute to visual variable), show/hide elements of a visualization



- Distribution of Views:** By offloading menus or distributing different views across multiple devices we improve display usage.



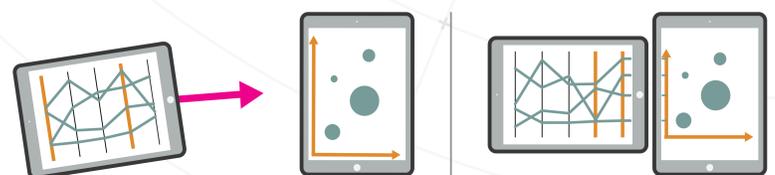
- Synchronization & Adaptation:** VisTiles can adapt the visual properties, scales and orientations of visualizations.



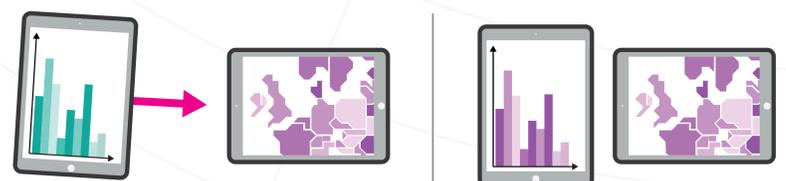
Visualization Use Cases

Multivariate Data Visualizations

In the *synchronized* state, linked brushing is activated and if applicable, shared axes are highlighted. When combined side by side (*adapted*), the views are aligned to improve readability, here by rotating (bar charts) and/or scaling (parallel coordinates, scatter plot).



In the *synchronized* state, the visualizations share their color theme.



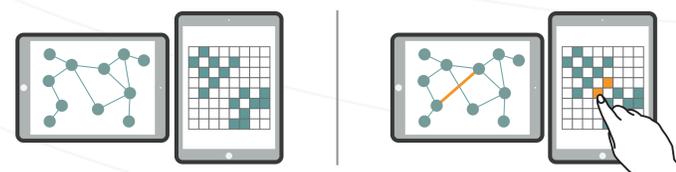
Map-based Visualizations

A simple overview and detail setup can be achieved by moving multiple map views close to each other (*state synchronized*). Maps combined with other views can be used to filter objects.



Network Visualizations

Similar to maps, overview and detail is important in node-link visualizations. The combination with an adjacency matrix enables an easier manipulation of relations within the displayed graph.



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