Exploring Temporal Granularities and Structure with Hierarchical Visualization

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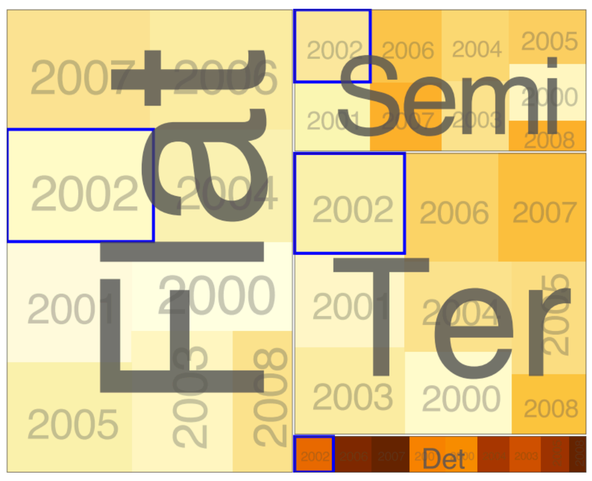
Rafael Henkin, Aidan Slingsby, Jason Dykes - giCentre, City University London

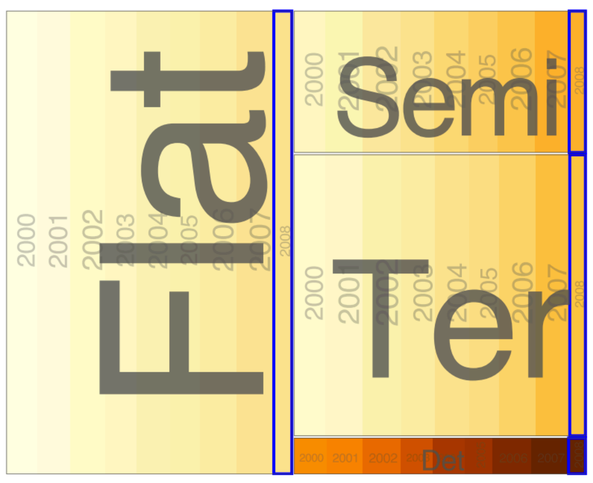
We are extending an existing framework for describing and reconfiguring hierarchical layouts to support visual analysis of temporally varying data.

Reconfiguring hierarchical layouts [1] is an established structured means of conducting visual analysis. Our aim is to describe and specify hierarchical graphics that involve time.

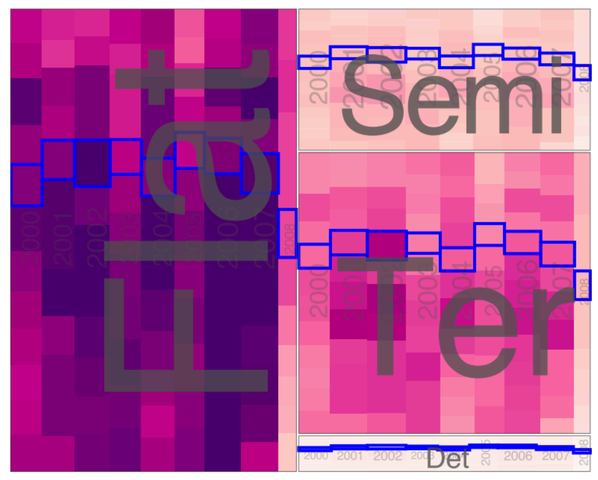
For example, the HiVE language [3] for describing nested graphics enables us to specify space-filling (and other) rectangular layouts at different granularities with different levels of hierarchy. Here sales data for types of housing, are sized by number of sales and colored by average price:



1) House type and year



2) House type and year, ordered by year



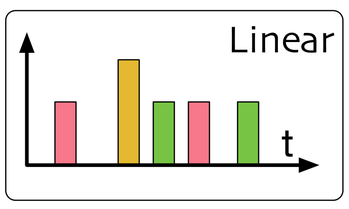
3) House type, year (ordered) and month (ordered), colored by sales

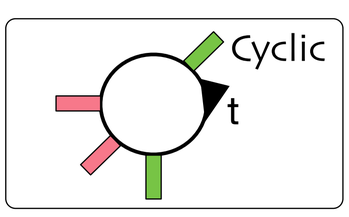
Different data types can be nested - particular characteristics of time [2] can be used in reconfigurations to vary emphases, reveal structure and help with temporal analysis.

We are working towards a richer set of descriptions and graphics that account for the granularities and characteristics that are associated with temporal datasets to enable us to specify and create hierarchical temporal views through which we can analyse & compare temporal data:

Switching between cyclic or linear view of time

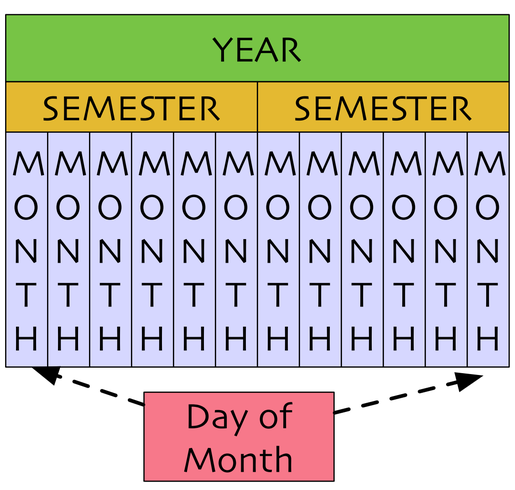
Time period must be cut and/or rotated accordingly for cyclic view:





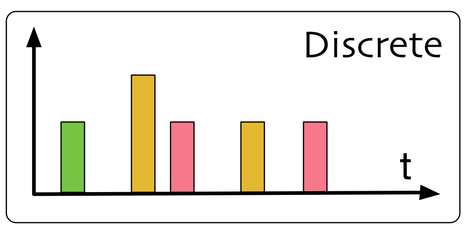
Reconfiguring hierarchies with different temporal granularities:

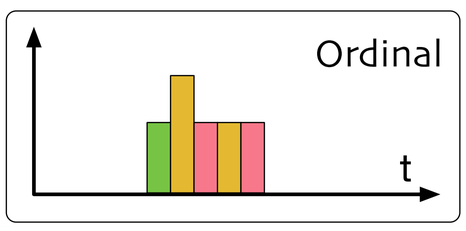
Patterns of events or objects may change across different units of time:



Switching between ordinal or discrete scale of time

Events or objects are positioned in time or by sequence:





The Hierarchical Visualization Expression language [3] provides a framework for reconfiguring hierarchical layouts. We are designing new states and operators that reconfigure layouts based on these and other aspects of time, evaluating how users engage with them in order to solve temporal tasks in a range of temporal and spatio-temporal contexts

References:

[1] W. Javed and N. Elmqvist, "Exploring the design space of composite visualization," in IEEE Pacific Visualization Symposium 2012, PacificVis 2012 - Proceedings, 2012, pp. 1–8.

[2] W. Muller and H. Schumann, "Visualization methods for time-dependent data - an overview," Proc. 2003 Winter Simul. Conf. 2003., vol. 1, 2003.

[3] A. Slingsby, J. Dykes, and J. Wood, "Configuring hierarchical layouts to address research questions," IEEE Trans. Vis. Comput. Graph., vol. 15, no. 6, pp. 977–984, 2009.

CITY UNIVERSITY LONDON

EST 1894

giCentre