
Coordinated Multiple Views: a Critical View

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July 2, 2007

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CMV: a young discipline?

- Brushing was introduced almost 30 years ago:
Newton, C.M.: Graphics: from alpha to omega in data analysis.
In: *Graphical Representation of Multivariate Data*, ed. by Wang, P.C.C. (Academic Press, New York 1978) pp. 59–92
- CMVs are still rarely implemented in commercial systems and used by outsiders

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Scalability problem

- A typical CMV system works
 - with a single table
 - having $<10^5$ data records
- Today's requirement:
 - making grounded decisions on the basis of voluminous, heterogeneous, and dynamic data sets

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Scalability problem: 4 aspects

1. Amount of data
2. Dimensionality of data
3. Complexity of data
4. Dynamic data

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Scalability: amount of data

- ✓ Visualization of individual data
=> overplotting
- ✓ Visualization of aggregates
=> multi-level abstraction; but
information loss, sensitivity to parameters
- Is it possible to implement dynamic query
and brushing without loading complete
data to RAM (e.g. using DBMS)?

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Scalability: dimensionality of data

- multi-dimensional data + geographical
space and time that require special
attention:
 - Space includes 2 or 3 coordinates plus the
geographical context (difficult to formalize)
 - Time has two models, linear and cyclical;
often necessary to consider simultaneously
several temporal cycles (monthly, weekly,
daily etc.; these cycles may overlap)

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Scalability: complexity of data

- Example: data about moving entities
- Multiple tables: moving entities; spatial positions; relevant objects in geo-space; relevant events and processes in time
 - cf. multi-relational data mining
- Interplay of geography, time and entities:
 - e.g. a {dynamic} query should operate characteristics of movement such as speed, acceleration, direction, turn; all in geographical and temporal context

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Scalability: dynamic data

- Static data Vs. continuous data streams
- Moving entities example:
 - take into account movement history;
 - link data related to different time moments/intervals;
 - stress changes;
 - highlight items that already moved away or changed their characteristics

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Visualization Vs. Visual Analytics

- ✓ B.Shneiderman's Information Seeking Mantra
"Overview, zoom & filter, details-on-demand"
- ✓ D.Keim's VA Mantra:
Analyze First –
Show the Important –
Zoom, Filter and Analyze Further –
Details on Demand
- need for tight integration of visualization and computations

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Purpose of CMV

- CMV alone have a limited value and are useful only together with other tools:
- for Exploratory Data Analysis
 - integration of CMV with statistics and data mining methods
- for Decision support
 - combining CMV with simulation and optimization

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