Dynamic Cartography: Map–Animation Concepts for Point Features

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Extended Abstract

Since the late 1970s new software environments and tools (e.g. BRYNJOLFSSON & MCAFEE, 2012) have been providing interactive visualization techniques by allowing to efficiently map real-world and abstract objects and time-dependent phenomena (FRIEDHOFF & BENZON, 1989). Since then, computer animation has become an integral part in all aspects of everyday life. Computer-based cartography has been proven to be an important tool, especially as developments caused an improvement in dynamic data visualization and animation (e.g., Dransch, 2014). The conventional approach of map-frame-based visualization representing individual animation frames by fully-equipped maps has been changed towards a map-element-oriented animation concept in which time is stored as attribute for each object. Cartographic animations can then be implemented as an extension of existing data models.

Our contribution deals with data structures that allow depicting spatial data primitives (OGC 2011) as time-dependent objects in order to access, statistically evaluate and cartographically animate map features. To achieve this we here concentrate on point features as they provide the highest level of abstraction but the lowest level in geometry and topology. In contrast to line and areal features only the position of a point feature is related to geometry which provides an additional level of freedom in modelling as a point's size has only a cartographic and no geometric meaning. Thus, if the lowest level of geometry can be modelled in time any higher-level or derived object can be modelled equally well.

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Time is an attribute which controls the behavior of properties represented by graphic variables. Changes of states occur in (1) composition, (2) size metrics, (3) orientation, or a combination of these variables.

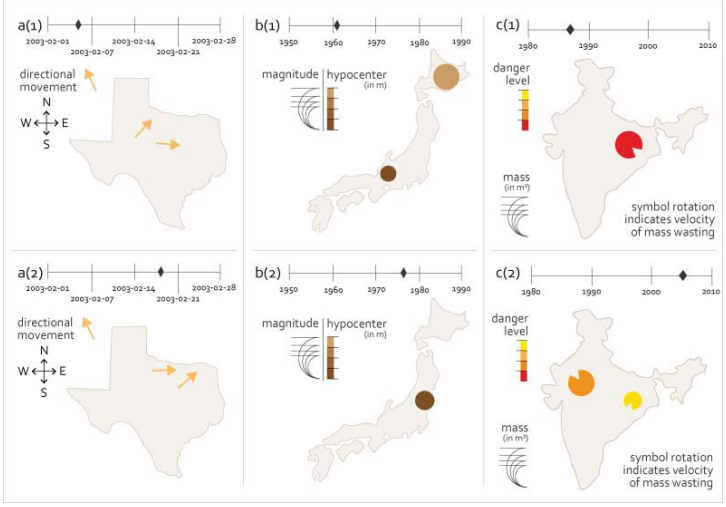

Figure 1: Point features and dimensions in map representations .

A change within a temporal framework defined by two instances provides change rates or velocities. Possibilities of how changes can be displayed depend on complexity and number of attributes but also on the level of measurement (BERTIN, 1983). Figure 1 provides fictitious examples of multi-dimensional point animation represented by symbols carrying various attributes and visualized using different methods (sizes, colours, and angles).

References

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