U-turn in map making to overcome shortcomings of territorial visualisations

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Abstract:

Historic data is complex and multidimensional. Looking at the historic maps of the Holy Roman Empire one can see inhomogenous space with clearly defined borders and areas that resemble the so-called 'Flickenteppich' ('patchwork quilt'). These highly fragmented territorial units of the Holy Roman Empire are characterised by overlaps of different dominion rights (such as manorial, ecclesiastical, and judicial) resulted from political fragmentation and partially person-related complex administrative as well as social organisation. Taking into account multiple overlaps of historical dimensions and affiliations, it is essential to question conventional cartographic approaches commonly used in historical maps (mainly area-based visualisations) that insufficiently capture the multidimensional character of historical spaces (Gambashidze & Moser, 2022). In the ongoing interdisciplinary project 'Digitale Kartenwerkstatt Altes Reich' (DigiKAR) which combines historical research, information science, and cartography, we question traditional notions of spatial representations of early modern spatial data from the Holy Roman Empire.

In the DigiKAR project, together with the data collection and modelling stages, we are focusing on investigating, developing and testing interactive multiperspective web-based visualisations for different dimensions of historical datasets. One of the central parts of our research is to model point-based (location-based) visualisations instead of the area-based representations of territories that are often seen in conventional historical maps and provide a homogenous territorial perspective. In this experimental study, we turn theoretical concepts into prototypes for further development through an iterative user study process leading to integrating them into a web-based visualisation. Our approach combines a map with a point-based graphical representation to illustrate multiple spatial overlaps of complex historical dimensions and dominion rights attached to certain places.

The point-based visualisation is derived from a geometrical shape, similar to the approach used in the map of 'Kleinstädte 2001' (Bode & Hanewinkel, 2002) (Figure 1). We have developed seven different types of symbols, which communicate relevant information through shape, colour, and saturation. These symbols will be tested in the first user study to find out the one which works the best in terms of readability, aesthetics, overall performance, etc (Figure 2). Subsequent user studies will focus on testing this selected symbol in-depth and usability aspects (including interactions and the interface).
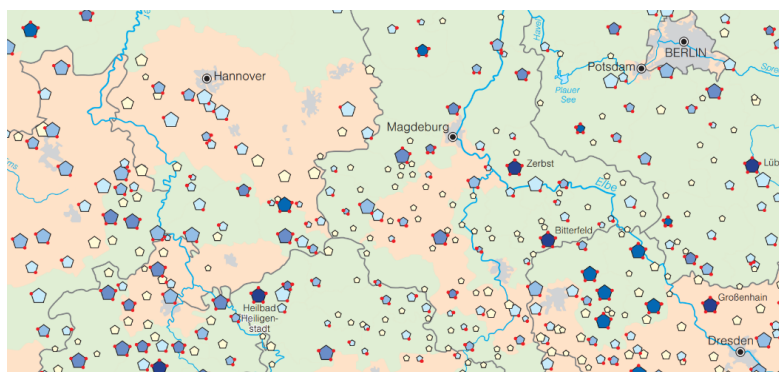
Figure 1. Kleinstädte 2001, a section from the map shows the functions of the small towns represented with red dots at the edges of the pentagon shape. The more functions the place has, the more dots (maximum five) are presented. Functions have fixed locations, additionally, their number is colour coded (from yellow to dark blue) and assigned to the pentagon shape (Bode & Hanewinkel, 2002).
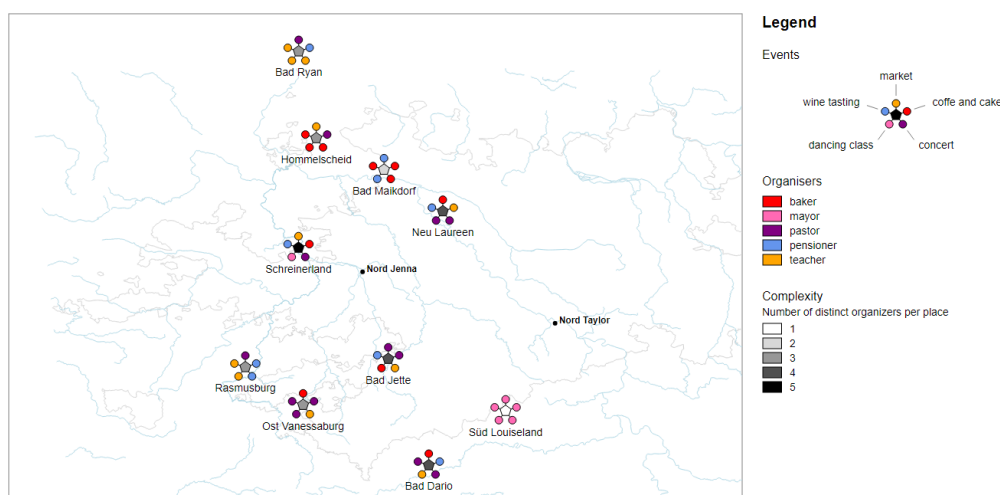
Figure 2. Example of the test visualisation based on sample data. Each symbol represents a certain place; circles stand exemplarily for five different *Events* (weekly market, coffee meeting, concert, dance class, wine tasting) which have fixed places and are colour-coded based on assigned *Organisers* (baker, mayor, teacher, pastor, pensioner); the centre of the symbol shows the complexity of the place (the higher the number of Organisers, the darker the grey shade). This storyline is chosen for the first user study only. In the next stages, the *Events* will be replaced with *Historical Affiliations* and the *Organisers* with the *Right Holders*.

Taking into account the advantages of web-based representations, our visualisations will be interactive. One of the examples of illustrating historical data on the web with point-based visualisation is RAG - Repertorium Academicum Germanicum (Bayerische Akademie der Wissenschaften et al., 2006–2019), which represents social and biographical data of scholars of the old kingdom from German and foreign universities. However, the RAG map views are largely based on conventional visualisations which can not sufficiently capture the complex nature of the phenomena. Moving further in the direction of interactive and somehow more complex diagrams, Hanewinkel & Specht (2010) suggested a conceptual band diagram to visualise the flow of commuters for the respective sector with a hierarchical structure that enables activation of further diagrams up to the smallest unit. The use of interactive hierarchical diagrams will reduce the visual overload and complexity of the map and will increase opportunities for dealing with and comprehending manifold historical data. Additionally, we are addressing the issue of visualising uncertainties which is as complex as historical data itself. Within our research, great attention is given to integrating visualisation techniques that can apply different categories of uncertainties, such as space, time, and attribute components.

The innovative character of our research lies in its interdisciplinary approach to visualising the complex structure of historical spaces. Synthesis of the exploratory and experimental nature of the study contributes to enriching cartographic techniques used with historical data and offers new perspectives and a deeper understanding of early modern territoriality. We aim to make such a kind of symbology, which might come from various topics and disciplines. Due to its interdisciplinary nature, our research will contribute not only to the field of cartography, but to history, and digital humanities at large.

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