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Geschichte im Netz: Praxis, Chancen, Visionen

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Vom 22. bis zum 24. Februar 2006 veranstaltete der Kooperationsverbund Clio-online in Berlin die Tagung „.hist 2006: Geschichte im Netz – Praxis, Chancen, Visionen“. Dies war bereits der zweite große Kongress an der Humboldt-Universität zu Berlin und der Berlin-Brandenburgischen Akademie der Wissenschaften, der sich mit „Geschichte im Netz“ und mit den Möglichkeiten und Grenzen der Nutzung von Kommunikationsnetzwerken durch die Geschichtswissenschaft in theoretischer Reflexion wie praxisbezogener Diskussion beschäftigte. Der Austausch zwischen Geisteswissenschaftlern/innen, die mit netzbasierten Medien arbeiten, Archivaren/innen, Bibliothekaren/innen, Museumsmitarbeitern/innen und Informatikern/innen zielte auf die Überwindung disziplinärer und institutioneller Grenzen, was sich auch in den vorliegenden Bänden widerspiegelt.

Die Konferenz bot in zwölf Sektionen und Workshops, zwei Podiumsdiskussionen und an zahlreichen Projektständen mit insgesamt etwa hundert Vorträgen, Diskussionsrunden und Präsentationen mehr Informationen, als die zahlreichen Besucher/innen aufnehmen konnten. Umso mehr freuen wir uns, im vorliegenden Doppelband schriftliche Ausarbeitungen der meisten Referate, bereits über H-Soz-u-Kult veröffentlichte Querschnittsberichte zur Tagung sowie eine Zusammenfassung der Abschlussdiskussion vorlegen zu können. Die Teilbände 1 und 2 des Historischen Forums Nr. 10 bündeln mit insgesamt über 80 Beiträgen die Mehrzahl der auf der Tagung „.hist 2006“ präsentierten Vorträge und machen sie allen Interessierten zugänglich.

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Beiträge der Tagung .hist 2006

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http://edoc.hu-berlin.de/e_histfor/10_II/
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by David J. Bodenhamer

Of all modern information technologies, GIS has great potential for breaching the wall of tradition in history. It maps information, thus providing both a format and a metaphor with which historians are conversant; and it integrates and visualizes information, making it possible to see the complexity historians find in the past. Historical GIS provides context for our study, allowing us to ask new questions, develop new perspectives, and gain new insights into our various national pasts. The challenge we face is how to employ this new tool, especially its expression in such national projects as the German Historical GIS, and, with it, to create a new history.

Since the late 1980s we have heard increasingly about the so-called “spatial turn” in the social sciences and humanities. By this term, commentators mean the reintroduction of space and spatial analysis as a framework for scholarly investigation and creation of knowledge. Although it was unclear that space (or place) had in fact disappeared as an explanatory variable during earlier decades, it also is true that we in the research community were more enamored of other casual factors than we were in geographic explanations of change over time.

Historians are increasingly aware of the importance of geographic information. We can point to a number of reasons for this development – the emergence and rapid maturation of geographic information systems as a core technology, the convergence of technologies that moved spatial data

and its manipulation beyond the realm of specialist tools, and the explosive growth of a global knowledge-based economy. We also discovered that spatially oriented software, such as that represented by geographic information systems (GIS), facilitated the integration of data that is so essential to support our shift toward interdisciplinary research. We have become aware of the power of the map to display information cartographically in a manner that provides fresh perspective and new insights into the study of culture and societal processes.

National historical GIS projects are one manifestation of this nascent interest. These specialized information systems are developing the foundation for allowing us to look at old problems in new ways. They have three common elements: spatial data in the form of base maps; boundaries that delineate the various spatial units or government jurisdictions used throughout a region's history; and the demographic data collected by government over time. For the first time, a wide array of historical data can be brought together within a powerful spatial technology capable of integrating and visualizing information. These systems provide context for our study, allowing us to ask new questions, develop new perspectives, and gain new insights into our various national pasts.

Although historical GIS promises a new era of scholarship, for many of our colleagues in the humanities and social sciences this revolution in knowledge discovery has begun without them. Why is this so and what are the implications for the future of spatially informed scholarship? Understanding the potential for historical GIS and especially national historical GIS, however, first requires an assessment of geographic information systems as an appropriate tool for history.

Of all modern information technologies, GIS may have the most potential for breaching the wall of tradition in history, for at least two reasons: it maps information, thus providing both a format and a metaphor with which historians are conversant; and it integrates and visualizes information, making it possible to see the complexity historians find in the past. At its core, GIS is a mapping technology – a visualization tool – with properties that should appeal to historians. Its fodder is location and all attributes that coexist with it. The ability to integrate data makes GIS

attractive as a platform for history. Indeed, many scholars who use the technology do so primarily to manage evidence of different types – qualitative, quantitative, image-based on the common space they share.¹ This mixing of formats is nothing new to historians. What is different is the technology's ability to parse large amounts of disparate data quickly and to keep them in relationship with all other information from the same place.

This integrative ability means that historians are able to construct multiple perspectives, much as we might in our verbal descriptions of the past. Multiple perspectives and shifting scales may cause problems for the cartographer but not necessarily the historian. The historian's impulse is to understand an event by reference to another, similar event, regardless of origin or circumstances, a stance that invites the development of multiple views, from local to global, for the same problem. Visualization, a key feature of GIS, is perhaps more problematic for historians than for practitioners of other disciplines. We are far more comfortable with words and narratives than with images. The problem is not a lack of appreciation for visual communication. We too live in an age of visual information. Our difficulty comes when we seek to communicate visually. We construct word images that we embed in our story, but we struggle to create visual images that convey our interpretation.²

As a technology GIS is not yet a facile visualization tool, at least not as experienced by most historians. This circumstance inhibits its use in history, except as a mapping engine. The result is ironic: more than most computer-based technologies, GIS seems well suited to history: through integration, it permits the use of multiple perspectives; its mapped display of information facilitates the recognition of patterns; its concept of spatial proximity prompts intuitive inference in much the same way that other proximate relationships do, for example, as in the exchange of letters

1 Gregory, Ian N.; Kemp, Karen; Mostern, Ruth, *Geographical Information and Historical Research. Current Progress and Future Directions*, in: *History and Computing* 13 (2003), p. 7-22.

2 An excellent introduction to visual thinking in history may be found in Staley, David J., *Computers, Visualization, and History. How New Technology Will Transform Our Understanding of the Past*, Armonk, NY 2003.

between historical figures. In sum, its ability to integrate disparate information drawn from the same place at the same time mimics the complexity of history.

Given its potential for the discipline, why are historians slow to embrace this tool? Certainly, exemplary projects exist. Many of them, such as those noted in *Past Time, Past Place* (2002)³ involve extensive data collection and creation within a historical GIS, including major national historical GIS projects in Germany, United Kingdom, China, United States, and Netherlands chief among more than a dozen such projects. An international consortium, the Electronic Cultural Atlas Initiative, begun in 1997, has sought to speed the development of such compendia for cross-cultural research. These national historical GIS systems help frame the international, national, or regional comparative context in which most scholars work. They contain strategic or contextual datasets, such as censuses and historic base maps that provide a common framework for large geographies, thus allowing useful comparisons among and across locations.

How to represent time, an essential variable in history, is another obstacle to wide adoption of GIS within the discipline. For historians, time is both static (e.g., a fixed date) and dynamic (e.g., change over time), but GIS treats time only as a fixed attribute. The problem of dynamic data representation is a major problem for the use of GIS in the humanities. Much of the data used by humanists are qualitative and text-based, represented most often in linear form, such as the creation of a book. This characteristic creates difficulty when these data must be abstracted and represented in a static, non-linear digital world. In addition, qualitative data often represent a dynamic interaction between the object and subject, where the reader is the author. How, then, does one represent this individual interaction in the static digital environment of the GIS? The issue of dynamic representation also highlights one of the weaknesses of GIS, in that it is difficult to model a fuzzy concept such as temporality in a GIS environment.

Other impediments relate less to the nature of data or tools and more

3 Knowles, Anne Kelly (ed.), *Past Time, Past Place*, ESRI Press 2002.

to the culture and costs of GIS. Mastering spatial methods and software is, in effect, learning another discipline, another way of thinking. It also means developing expertise in a complicated technology that is continually evolving. The lack of financial and technical resources presents another obstacle to the development of historical GIS. The technology requires time and money, often lots of it. For many projects, the process of GIS means collaboration with technical and domain experts. Working in a team, itself an act foreign to historians, places a premium on management skills. The cost of this GIS process is high and can only be justified by the analytical benefit performed with the data. Most historians would be hard pressed to make this calculation in their favor at present.

A more significant barrier, perhaps the largest one, is the absence of spatial questions in history. As historians, we understand the importance of place. Yet for all our allegiance to contextualization, we still treat space and the events associated with it primarily as cultural markers. This lack of interest in spatial problems is, in the main, a product of the last half-century. Spatial concepts informed the work of historians from Herodotus to Fernand Braudel. But as the modern world collapsed our notion of distance, space became less visible to students of the past. With few exceptions – the Annales school, for instance – we long ago ceased to raise spatial questions, and the ones we do pose rarely admit measurement, except in the most elemental sense.

Fortunately, recent advances in GIS may mitigate some of the burdens of adapting spatial technologies for historical research. Large national GIS-datasets and historic maps are becoming more readily available.⁴ Digital gazetteers are emerging as one answer to issues surrounding uncertainty, at least as it relates to the location of places, many of which have gone by a variety of names over time. Data mining offers new opportunities for the analysis of humanities-related data, with the spatialization of this information allowing researchers to view data in new ways and identify patterns and relationships not readily apparent using more traditional statistical methods.

4 See, <<http://www.davidrumsey.com>>.

Much work is occurring as well in managing time dynamically and in creating new ways to view data. Considerable effort is going into creating spatio-temporal browsers and other tools for managing time more effectively, a quest that has importance for fields far beyond history. Similarly, new visualization techniques and strategies are the object of numerous research initiatives. Among the most exciting new directions are multimedia-GIS and spatial multimedia and the use of Virtual GIS and Virtual Worlds as qualitative virtual reconstructions of geographic spaces and places. The goal of this new research is to make GIS a more natural medium for contextualizing data, allowing its output to affect the senses in a direct response that would guide the end user, whether it was the more traditional view shed visualization or other sensuous input such as sound, smell, or touch. All of these developments hold great potential for making GIS more compatible with the needs of historians, at least for a new generation of scholars who, as members of a post-computer age, eagerly take up new tools and methods.

These advances in technology and methods create exciting possibilities for historical GIS. In no area is this future more filled with potential than with the various national historical GIS initiatives. They will provide a platform – a test bed – for advancing new theories and new interpretations and for probing traditional views of national identity against the measure of place as well as time and culture. Even more potential exists when we imagine a scholarly resource that links the various national historical GIS with each other in a transnational framework. Then we can look anew at questions like migration, demographic and cultural diffusion, technology transfer, economic exchange, epidemiological phenomena, imperial and military history and other genres of the past that do not respect national boundaries. Numerous methodological problems must be solved, and some technical ones as well, but the potential for revolutionizing our understanding of the past may be greater in the arena of transnational historical GIS than in any of the newer blends of history and technology.

Ultimately everything depends on the fit of GIS in history. Here, it is possible to construct at least two views – one of GIS as a means and one as

a medium. In the first scenario, historical GIS is a powerful tool in the management and analysis of evidence, contributing primarily by locating historical exegesis more explicitly in space as well as in time. It aids but does not replace narrative: it finds patterns, facilitates comparisons, enhances perspective, and illustrates data, among other benefits, but its results ultimately find expression primarily in traditional word-forms. In this scenario, historians employ GIS to give geographical context and depth to their interpretation of the past.

In the second scenario, historical GIS has the potential for a unique post-modern scholarship, an alternate construction of the past that embraces multiplicity, simultaneity, complexity, and subjectivity. Postmodernist scholarship has sharply challenged the concept of objectivity in history, which has been the lodestar of so-called scientific history since the late 19th century.⁵ In its epistemology, history is not a grand narrative – an authoritative story of a society's past – but instead a fragmented, provisional, contingent understanding framed by multiple voices and multiple stories, mini-narratives of small events and practices, each conditioned by the unique experiences and local cultures that gave rise to them.

Perhaps, then, historical GIS makes its best contribution in this way, not as a positivist tool but a reflexive one: integrating the multiple voices and views of our past, allowing them to be seen and examined at various scales; creating the simultaneous context that historians accept as real but unobtainable by words alone; reducing the distance between the observer and the observed; permitting the past to be as dynamic and contingent as the present.⁶ In sum, it offers an alternate view of history through the

5 Although the attack on objectivity is a centerpiece of postmodern criticism, historians have fought bitterly over this issue for decades, as Peter Novak discusses in his prize-winning monograph: Novak, Peter, *That Noble Dream: The 'Objectivity' Question and the American Historical Profession*, Cambridge 1988.

6 In geography, much of the critical discourse on postmodernism and GIS occurs in the sub-field known as Public Participation GIS. A useful critique from the perspective of feminist research is Kwan, Mei-Po, *Feminist Visualization. Re-envisioning GIS as a Method in Feminist Geographic Research*, in: *Annals of the Association of American Geographers* 92 (2002), p. 645-661. This potential path for GIS parallels the proposed applications of virtual reality (VR) and its application to the humanities and social sciences. See, for instance, the *Journal of*

dynamic representation of time and place within culture, a view that is visual and experiential, fusing qualitative and quantitative data within real and conceptual space. It stands alongside – but does not replace – traditional interpretive narratives, inviting participation by the naïve and knowledgeable alike. Historical GIS is not yet at this point, of course, but some day it could be. It is a vision worth pursuing.

David J. Bodenhamer is Executive Director at the Polis Center and Professor of History, Indiana University-Purdue University, Indianapolis. E-Mail: Intu100@iupui.edu

EXPLORING ‘WORLDS OF STATES’ THROUGH TIME AND SPACE –
SOME NOTES ON THE ONLINE INFORMATION SYSTEM
‘HGIS GERMANY’

*by Andreas Kunz**

HGIS Germany grew out of an interest in the construction of digital historical maps of the development of German and European states. Such thematically arranged map series, covering important benchmark years, have been placed on an interactive mapserver operated by the Institute of European History (IEG) at Mainz.¹ However, map series only show a limited amount of information for selected dates at fixed scales, and it is generally not possible to attach a large variety of thematic data and historical information to them. A solution involving a Geographical Information System (GIS), using an ArcGIS platform, was designed in order to cover this gap. It led to a new project, “HGIS Germany”, now being developed by the IEG in conjunction with the Institute for Spatial Information and Surveying Technology (i3mainz) at Fachhochschule Mainz/University of Applied Sciences. A prototype of the GIS information system is online already.² The project team is headed by Andreas Kunz (IEG Mainz), Wolfgang Böhler and Alexander Zipf (i3mainz). Major funding for an initial three-year period (2004-2007) has been secured from the Alfried Krupp von Bohlen und Halbach Foundation of Essen, Germany; additional funding comes from the Ministry of Science of the German federal state of Rhineland Palatinate. This paper gives an introduction to the various aspects of the information system as viewed from the historian's side. It

the Association for History and Computing 6 (September 2003), for several articles about the possibilities in history for VR and other immersive environments.

* The co-authorship of Dorlis Blume, Bettina Johnen, Monika Krompiec, and Silke Marburg is gratefully acknowledged and marked in the respective sections.

1 See <<http://www.ieg-maps.uni-mainz.de>>.

2 See <<http://www.hgis-germany.de>>.

also raises some questions regarding its applicability as a model for an overall European historical GIS.

Introduction and General Overview

HGIS Germany is an historical information system focused on the development of Germany's states and territories during the nineteenth century. In addition, it contains cursory information on Germany's adjacent countries, thus covering a large portion of central – and parts of southern, southeastern, western and northern – Europe. Powered by a GIS engine, it enables the user to select specific territorial units – such as states, provinces, and districts – and explore their “life histories” over a period of one hundred years.



Figure 1: What states, what provinces, what time span? The entry page of HGIS Germany

At the core of the system are data on changes in the spatial development of the units under investigation, basically the 41 states comprising the German Confederation of 1815 and their successor states up to 1914. All boundary changes that occurred between and within these states (to the level of the governmental district, or *Regierungsbezirk*) are being recorded in the GIS's database on a yearly basis, creating a complete record of area

changes for even the smallest of the German states – or “statelets” – of which there were quite a few prior to Germany's unification in 1871. Moreover, the design of the database and its input make it possible to display administrative linkages of the nearly 500 areas that comprised the German Confederation in 1820. This is done in a hierarchical fashion, providing a foundation for a comprehensive administrative history of Germany that will be far more flexible and more easily accessed than existing print histories.

Besides the spatial development of territories, the information system will offer additional geographical and contextual information related to the units, such as the name and location of the seats of government, the attachment of units to supra-national bodies such as customs unions, or whether an area was ruled by more than one state as a so-called “condominium”. Moreover, special attention has been given to the recording of some 140 very small enclaves and exclaves, all of which can be accessed through the database in conjunction with some 130 administrative divisions of the 41 German states. At present, this data has been placed online for the period 1820-1870, but eventually such information will be provided on an annual basis from 1820 up to 1914.

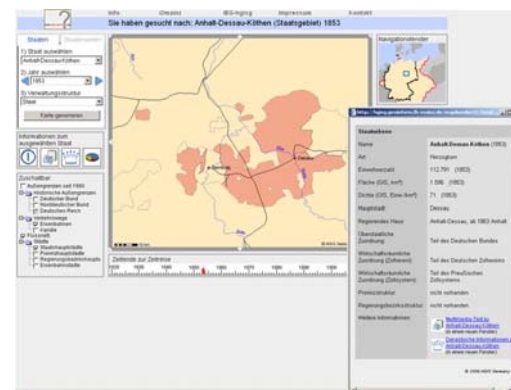


Figure 2: Selecting a journey through time and space: The Duchy of Anhalt-Dessau-Köthen in 1853

The information system serves as a platform for historical statistics as well. Numerical data will be integrated directly into the GIS database, so that scholars can use the data in statistical calculations or to generate thematic maps. Naturally, within a project of limited financial resources only selected data and limited functionalities can initially be placed at the disposal of the user. Initially, the system will include figures on population, textile production (to 1850), the production of iron and steel (as of 1850), the mining of coal and iron ore (as of 1850), and – in the realm of socio-political history – on the ruling families of the German monarchical states. The data on population and production will, if possible, be made available at the lowest territorial level now used in the system, that is, for governmental districts. Finally, multimedia presentations on each state, as well as on administrative units and special territories, are already available from the GIS website. The presentations contain explanatory texts and visual documents such as historical maps, manuscript documents, images, tables, and graphs.

Much work in this project is done rather independently in “modules”. For the remaining part of this contribution we shall take a closer look at the work done within the various modules on the side of historical research. At the end, we shall take a look at prospects of building an historical GIS for all of Europe, using the German example as a possible model.

Boundaries and Spatial Data (co-author: Bettina Johnen)

Research on the development of boundaries and the (historical) space they contained is closely connected to the construction of the HGIS geodatabase. Two items are of immediate relevance: (1) the boundary changes themselves, which have to be minutely researched per year, and (2) the allocation of historical units comprised by boundaries to spatial constructs like sovereign states or upper administrative units. For 1820, the initial year, HGIS Germany is comprised of some 500 spatial units, nearly three-fourth of them being “artificial units” created by changeable boundaries. All changes related to these political and administrative units, but likewise some that are relevant to natural boundaries like changing coastlines, have to be ascertained for the 31 December of each year between 1820 and 1914

– a formidable task! A special form has been devised by the historians in the project in order to record those changes after they have been researched and to submit them to the geographers, i.e. the database builders, in an already well-structured fashion mirroring the structure of the database.

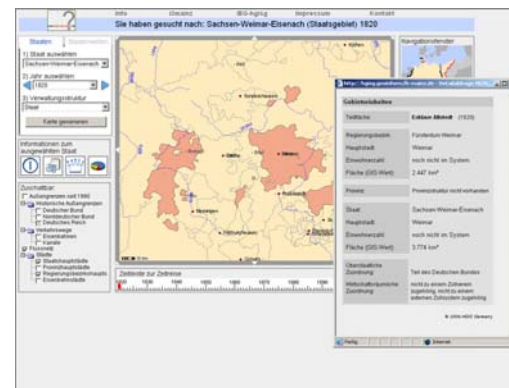


Figure 3: Small territories: Queried information on the exclave of Allstedt situated to the north of Weimar

Particular care is taken to gather information on small territorial units, such as enclaves and exclaves, which in some parts of Germany still played an important role then, particularly as parts of smaller territorial states. With the creation of larger (and supra-national) economic unions like the *Zollverein*, the fate of these small units became an important item on the agenda in territorial negotiations between states at the time. It is in this area of work, therefore, where most of our research is really “primary research”, being based on the records of the territorial negotiations and on the agreements reached. Altogether, some 130 small units are under this type of “constant surveillance” within the project.

One of the most difficult parts in researching for a geographic information system is the conversion of historical information (mostly in text form and not geo-referenced) into “spatial”, i.e. geo-referenced and thus “visual” information. Historical maps are our main source here, and now-

days many of these can fortunately be accessed via the internet.

Dynastic Information (co-author: Silke Marburg)

All but four of the 41 sovereign states of the German Confederation were monarchies. Thus, a considerable proportion of their “life stories” even during the nineteenth century was still dependent on their ruling families. From this – quite simple – thought we derived the idea to include data on these monarchical dynasties in our information system.

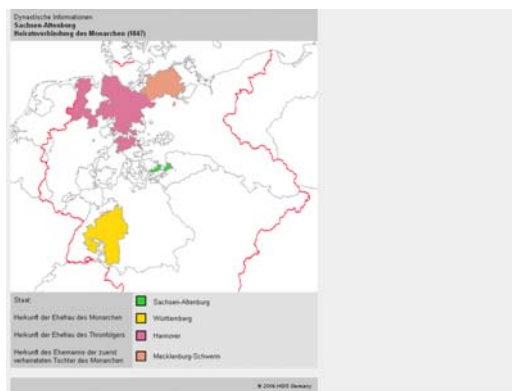


Figure 4: Who is married to whom? Dynastic information, derived through direct mapping, on the House of Saxe-Altenburg in 1847 (Technical production by courtesy of Leo Dietze)

In the center of attention stands the “ruling house” of a territory or state, on which altogether twelve data sets are being compiled. Eight sets pertain to the dynastic attachment of the ruling monarch and of three of his closest members of the ruling house, and four data sets explore the changing conditions of monarchical rule in its transition from autocratic to constitutional forms. All information is encoded and integrated in the geodatabase. This allows the user – we believe for the first time – to actually *map* and spatially analyze complex social and political information of high relevance to the development of the nation states of Europe.

The following section is a brief description of the content of the dynastic information as contained in HGIS Germany:

- We focus on the *marriage patterns* of the monarch, the spouse of the monarch, the spouse of the heir to the throne and of the husband of the first married daughter of the monarch. These four members of the ruling family are attached to a house – as the major dynastic structure – and to a line – as the minor dynastic structure.
- We investigate *the bound between the ruler and his territory*. It tells the user whether the rule was undivided, combined with rule over another territory in a so-called personal union, or if the monarch shared his rule with another ruler in a so-called condominium.
- We gather information on the *ascription of rule*. Was the monarch ruling directly – the usual ascription of rule to a monarch – or was he only administering the observed territory?
- We provide further information on the *forms of rule*, i.e. on the question of whether the monarch ruled alone, whether he had a co-regent, or whether he was only administering. In some rare cases the monarch’s position can not be identified, it remains “unclear” who exactly ruled in a given year. Moreover, historic situation sometimes shows monarchs being “suspended” from rule, for instance by revolutionary movements or by outside interventions as during the German War of 1866.
- Finally, we observe the *constitutional conditions of rule* as they develop over time. The scheme consists of five types of rule: autocratic, absolute, constitutional (weak form), constitutional (strong form), and parliamentary rule. To us this is a very important type of encoding, because it will lead to clues on the constitutional progress (or lack thereof) within the German states and territories during the “constitutional century”.

It should be emphasized that all data is collected per year over the entire period of investigation, starting in 1815 and moving up to 1918, the year the German monarchies were swiped away by revolution. The user of the online version of HGIS Germany will have access to the encoded data for the 1820-1914 period through look-up tables as well as by direct mapping.

Historical Statistics (co-author: Monika Krompiec)

One of the important functions of HGIS Germany will be its potential as a platform for spatial historical statistics. Since it contains the spatial units for which statistical information was collected in the first place, these data can now be linked directly to any spatial unit in the system and thus be queried by the user accordingly. For example, a query on the Prussian governmental district (*Regierungsbezirk*) of Arnberg returns data on its population in a given year, and, on the basis of the spatial extension of this district – a value calculated by the system itself – the population density can be calculated automatically as well. This can be done for any given year for which data has been made available; inter-census years having been interpolated by the compilers. In the future, automated mapping of query results will be made available as well, enabling the user, for example, to generate population density charts for any given year “on the fly”.

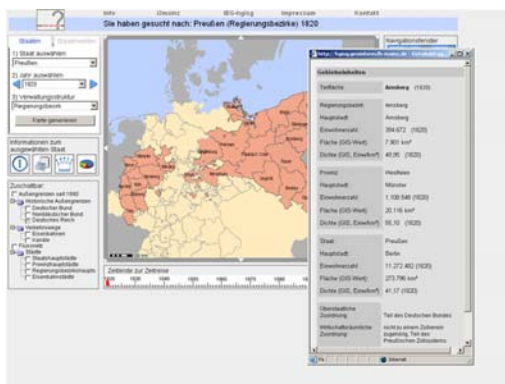


Figure 5: How many inhabitants? Population figures on the governmental district of Arnberg, on the province of Westphalia, and on the Kingdom of Prussia in 1820

It goes without saying that in a project of limited duration a fully completed set on historical statistics cannot be assembled, and only a limited number of categories could be selected. However, these are focused on a

specific theme: Germany’s transition from a primarily agrarian to an industrial society, mirrored by the following categories:

- Population (1820-1914)
- Textile industry (1820-1850), initially only for Prussia, but planned for other textile regions as well (e.g., Saxony, Bavaria)
- Coal mining (1850-1914)
- Mining of iron ore (1850-1914)
- Production of raw iron and steel (1850-1914)

It is planned that data on other subjects researched at the IEG Mainz, as, for instance, the confessional structure of the German population, will later be integrated in the database as well. Whether HGIS Germany will eventually become a target for outside uploading of statistical data by external scholars cannot be decided as of yet. At present there are no immediate plans – and no built-in facilities – for such a complex and complicated service. Finally, it should be mentioned in passing that all statistical data can also be accessed in form of time series from the multimedia pages of the system, and can be downloaded as Excel worksheets from the IEG project website.³

Multimedia (co-author: Dorlis Blume)

The multimedia pages are an important addition to the HGIS database. They contain background information on the states and territories of the system in form of concise hypermedia texts and linked objects like photos, scans of texts, etc. They also lead the user to complementary information like time series or genealogical tables. At the core of the multimedia sphere are the descriptions of the 41 states of the German Confederation existent in 1820, of seven states that were created after 1820 in the course of the nineteenth century, and of several special “state-like” entities that were not sovereign states in their own right, like the Danish-ruled Duchy of Schleswig or the Dutch province of Limburg. A specific contextual structure has been developed to portray these 55 or so states. They are all treated equally, regardless of whether they were large territorial states like

3 See <<http://www.hgis-germany.ieg-mainz.de>>.

Prussia, or small ones like Mecklenburg-Strelitz. After an initial *Introduction* to the state or territory in question, a kind of “historical travel guide” unfolds, exploring the following themes:

- Geography and topography
- History prior to 1815
- Form of government and ruling dynasty
- Territorial divisions and administrative structures
- Population, economy, and transport
- Culture and education
- Membership in unions of states or in customs unions
- Territorial development and cultural heritage

The last item, cultural heritage, is of considerable importance, because one goal of HGIS Germany is to emphasize the continued importance – and relevance – of historical space in today’s world. While most of the states and territories portrayed in the HGIS system do not exist anymore, their traces are still with us, be it in names like today’s county “Duchy of Lauenburg”, or in historical buildings like castles, princely residences, or governmental halls.

While the descriptions of the individual states are at the core, further texts will be provided on the alliances and unions of states – “worlds of states”, as they are called in HGIS Germany terminology. These include political unions like the German Confederation, or economic associations like the German customs union, the *Zollverein*. Furthermore, brief multimedia texts will be written on the provinces of Prussia and on other administrative districts contained in the system.

The multimedia module has been developed in close cooperation with the German Historical Museum (DHM) in Berlin, not least because there are plans for a “museum version” of HGIS Germany to be installed there once the project has been completed.

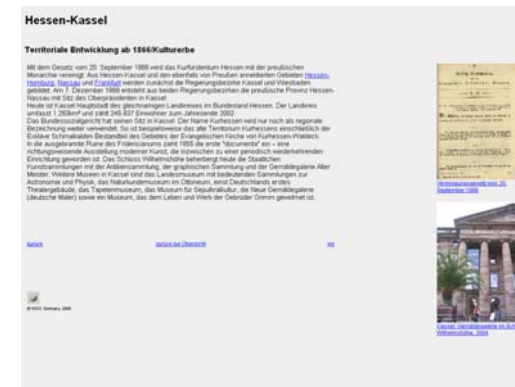


Figure 6: By and large, photos have been used within the multimedia pages to attest to the share of the historical German states to the cultural heritage of Germany (and of Europe) today.

The European Dimension

As has been mentioned already, HGIS Germany really is not a “national” GIS, but an information system on a multitude of states and territories. Furthermore, it is not confined to Germany in her present boundaries, but covers a much larger portion of Europe, i.e. the area that was once the German Confederation. To put in numbers: of the 65 sovereign states existing in Europe in 1820, 41 are contained within the HGIS information system. Thus it makes some sense to ponder if the “German” GIS could serve as the nucleus for an overall European historical GIS. Building such a European GIS has been on the agenda for some time, but thus far little progress has been made in the attempt to in a sense “unify” existing national GIS projects at the European level. Technically this can be done, as the example given in the screenshot below shows. As long as the geographical data is geo-coded it can be integrated into the existing geography of Europe.

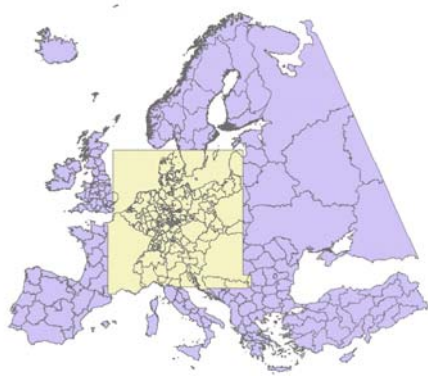


Figure 7: European integration: The historical coordinates of HGIS Germany integrated within a modern digital map of Europe (Technical production by courtesy of Christine Wachtendorf)

But even in the realm of historical content, the switch to the European level seems fairly easy and plausible if the German model is applied. A comparison of the subsequent summaries will stress this point:

A) HGIS Germany now contains:

- Spatial statistics on German states, provinces and districts
- Dynastic information on some 35 ruling German dynasties
- Multimedia pages on German states, provinces and districts
- Information on interactions between German states in the political and economic realms
- Information on the development of the German transport network

B) A new HGIS Europe may contain in the future:

- Spatial statistics on European states, provinces and districts
- Dynastic information on some 50 ruling European dynasties
- Multimedia pages on European states, provinces and districts
- Information on interactions between European states in the political and economic spheres
- Information on the development of the European transport network

A proposal for the construction of an historical GIS on the development of

the European rail, road, and waterway system during the 19th and 20th centuries, which has just been filed by a group of European scholars – with the participation of this author – under the European Science Foundation's "Inventing Europe-Scheme", may be a step into the right direction. We should go ahead with a project of this type, and, in times of European integration, it would certainly be worth the attempt!

Andreas Kunz, Ph.D. (University of California, Berkeley), is an economic historian working at the Institute of European History, Mainz, Germany. His fields of interest are: the history of European transport, the spatial history of central Europe, historical statistics, digital mapping, and historical information systems. E-Mail: kunz@ieg-mainz.de

PERSISTENCE OR TRANSCIENCE? TRACKING THE EVOLUTION
OF PLACES OVER TIME WITH
HISTORICAL GEOGRAPHIC INFORMATION SYSTEMS (GIS)

by Merrick Lex Berman

Numerous implementations for modeling geographic information across time have been developed, many of them specifically tuned to a particular kind of data or analysis. In the field of historical geography, several large-scale national projects have been undertaken, and each of these has demonstrated the sharp contrast between scientific solutions for handling time series datasets and the ad-hoc methods created to deal with amorphous objects known as "historical places." This paper examines the nature of those "historical places" as they change over time and whether they should be defined as persistent historical entities or as transient entities formed from an interconnected series of historical instances.

Time Series in GIS

The appearance of theoretical models for dealing with change over time in GIS began to accelerate in the early 1990s¹ and showed no sign of slowing down ten years later.² Even today, there are more theoretical models and experimental implementations than there are practical tools for time-variant data in GIS. Indeed, the leading GIS software companies still do not provide any out-of-the-box solutions for dealing with the storage or visualization of time-variant geographic data. For example, ESRI Corporation offers a means of versioning complete layers, or the ability to track

1 Langran, Gail, *Time in GIS*, New York 1992.

2 Ott, Thomas; Swaczny, Frank, *Time-Integrative GIS*, Berlin 2001.

histories of revisions for individual features stored in a geodatabase. However, the visualization of time series data in ESRI products relies on a Temporal Analyst extension from another vendor.³

During the same period of time, other types of applications that can display time series of data across space have been quite well developed. For example, meteorologists and physicists make use of the Unidata netCDF standard (first released in 1990), which provides a generic multi-dimensional format for modeling any type of data.⁴ The analysis and visualization tool, GEMPAK⁵, is widely used for processing meteorological instrument readings into colorful animated weather maps. And the TimeMap project, based at the University of Sydney, provides a means of easily navigating GIS objects that have unique time extents.⁶ With such tools available, why is it difficult to create time-variant GIS for capturing and displaying data related to human history?

To put it plainly, human history is neither experienced nor recorded with any degree of measurable accuracy. Unlike the instruments of meteorologists and nuclear physicists, which can be tuned to particular frequencies and can be recorded at known intervals, historians need a fundamentally different kind of data-collecting apparatus. Historians create narratives of history out of the available evidence, and with no small amount of interpolation for gaps in their sources.

Consequently, when we reconstruct the geographies of the past, we are working from various kinds of historical evidence but with no reliable gauge of their accuracy or consistency. In more recent times, this evidence may include accurate maps, census and statistics, government documents, and so forth, all of which can be utilized to demarcate particular areas on the ground and to associate those spatial extents with jurisdictional relationships and other useful attributes. When we have such good evidence

3 Temporal Analyst for ArcGIS. DHI Software, see: <<http://www.dhisoftware.com/time/>>. All Screenshots were last checked on August 30, 2006.

4 netCDF (network Common Data Format). Unidata, see: <<http://www.unidata.ucar.edu/software/netcdf/>>.

5 GEMPAK (General Meteorology Package). Unidata, see: <<http://www.unidata.ucar.edu/software/gempak/>>.

6 TimeMap. University of Sydney, see: <<http://www.timemap.net>>.

available, the construction of historical GIS appears at first to be a very practical endeavor. Nonetheless, even when working from fairly complete and reliable sources, the correlation and digitization of map data is highly labor-intensive, while the construction of jurisdictional relationships among the objects in the database proves to be an equally daunting challenge. For example, the construction of the Great Britain Historical GIS, built up from official statistics and with voluminous documentation about the districts involved, took nearly a decade to complete – and that was only for the period of two hundred years for which the source materials existed.⁷

Whenever historical GIS attempts to delve farther into the past, that is to say into the period for which maps are less accurate and incomplete, into the times when official statistics were sporadic or have since been lost, a whole new crop of problems arises. In this case, historical GIS must bring the conclusions of historians past and present into their data collection process, and it becomes obvious that the degree of accuracy and completeness that is inherent to GIS applications founders in a morass of uncertainties, conflicting interpretations, and scarcity of primary sources.

At first it may seem that GIS is simply the wrong tool for the task. How can a software which demands to know the planimetric accuracy of a dataset measured in meters, be used to depict locations only vaguely described in the source materials? What can be done with measures of distance and direction that are at best dubious, and quite possibly hopelessly adrift? And yet, as long as each spatial object is adequately documented with some kind of historical justification for its location or extent, GIS is a perfectly suitable tool. In other words, we may never be able to say that a particular historical location is accurate within 500 meters, but we can provide a full citation of the historical source and a note on how the evidence in that source justified the spatial object created to depict it. As long as the historical GIS is internally consistent in showing the sources of its spatial objects, incompleteness and hypotheses expressed in the sources

7 Gregory, Ian N.; Bennett, Chris; Gilham, Vicki L.; Southall, Humphrey R., The Great Britain Historical GIS Project. From Maps to Changing Human Geography, in: *Cartographic Journal* 39 (2002), p. 37-49.

and commentaries are plain for all to see. New evidence or interpretations can justify moving or editing the spatial objects, so there is no harm in asserting hypothetical locations, testing them, then revising them as our knowledge is advanced. By contrast, it should be obvious that any historical GIS which lacks some textual notes and citations about how each of the historical locations was derived is both incomplete and impossible to evaluate.

If we accept that GIS can in fact be a useful means to represent individual historical places, what then shall we do to model those places as they change over time? Let us return to the existing scientific models for time series data, which are essentially a defined set of variables, for which unique values exist at specific moments in time. Such data can be represented with multivariate time series graphs, for example (Figure 1).

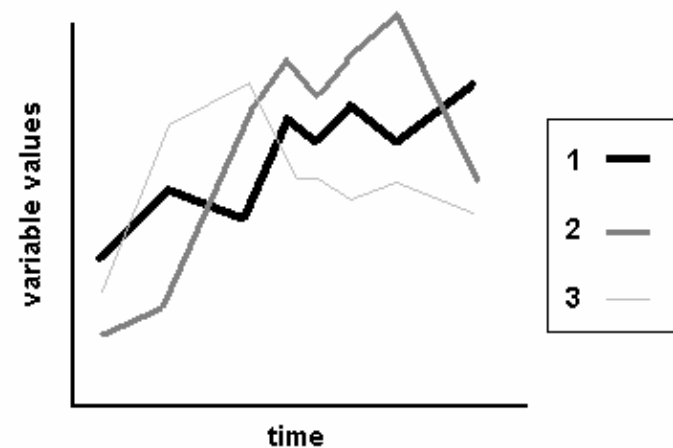


Figure 1: Time series graph

Time series graphs typically represent cross-sectional values collected at the same time for a group of variables. In historical GIS, if each variable

was to represent an historical place, the variables might or might not change at the same time. Instead, the variables are essentially asynchronous, each one having an independent series of changes over time. In a graph showing historical places, the break points would represent the times of change, and they would not necessarily align with any of the other historical places' break points. For example, Place 1 might be created at Time 1, then have subsequent changes at Time 4 and 5, then cease to exist at Time 7. Meanwhile Place 2 could have its own unrelated history, a creation at Time 3, no changes at all, then abolition at Time 8. If we used the same sort of graph to represent the changes for historical places the results would be markedly different (Figure 2).

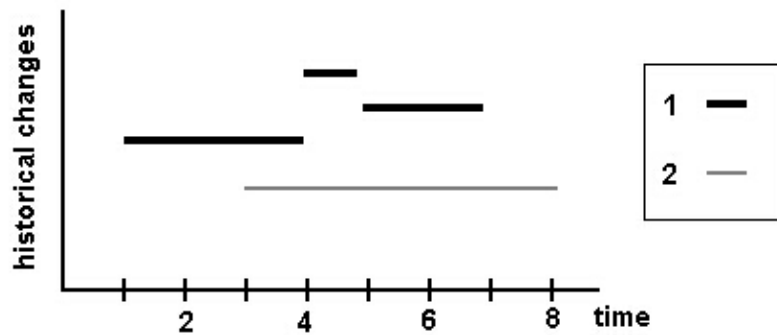


Figure 2: Changes in historical places over time

Note that for changes in historical places we are not plotting the vector of change from one value to another over time, instead we are plotting “historical instances,” which have known times of origin and conclusion, and which may be followed by a subsequent instance. Think of a practical example for Place 1 in Figure 2: a county seat is established at Time 1; the location of the county seat is moved at Time 4; the county seat is promoted to a municipality at Time 5; the municipality is abandoned due to a flood control project at Time 7. What we are modeling are the “steady states,” or the periods of time for which the attributes of the historical place remained

constant, and each new instance is created when those basic attributes are changed.

The way historical instances are depicted in Figure 2 is essentially aspatial. Differences are shown as values on the y-axis, but these values have no inherent meaning. A better way to depict the situation for a series of historical instances would be a 3-D graph, showing planar coordinates on the x and y axes, with time depicted as the z-axis (Figure 3).

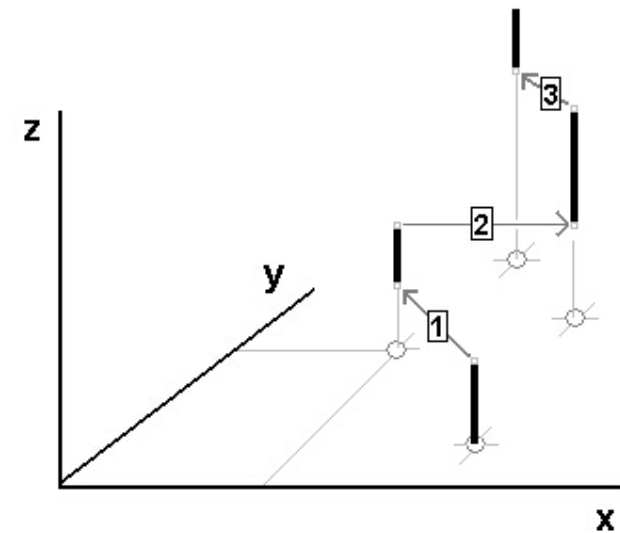


Figure 3: Time graph of historical instances as points

In the example shown in Figure 3, there are four geographic locations (shown as circles plotted on a horizontal plane), and each instance has a period of time for which it existed (shown as lengths of the instance vertically). In addition, the graph shows transitions from one instance to another (numbered 1 to 3). This type of graph has been used to show the

places of residence of a single individual for their medical history, for example.

Of course, historical instances may not be limited to point objects, in which case the depiction of change over time in a graph becomes more of a challenge (Figure 4).

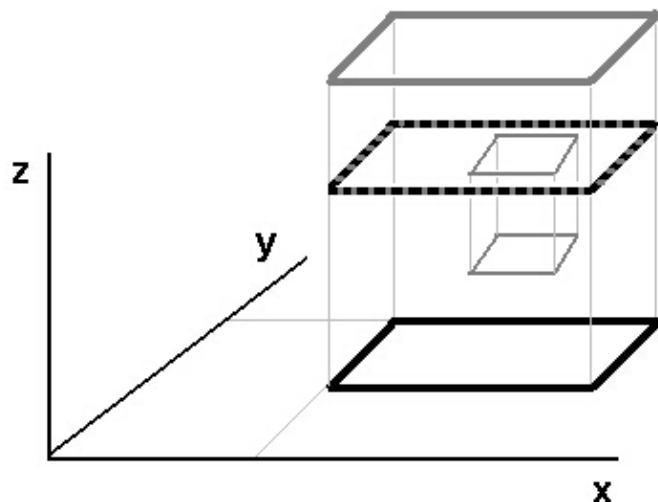


Figure 4: Time graph of historical instances as polygons

In Figure 4 an area shown as a black rectangle, is used to represent a parcel which has an extent shown on the horizontal plane and a period of time rising vertically. Let us suppose that at some point during the existence of the parcel, a building was constructed, shown as a light gray footprint. Then let us suppose that at a certain time the building was torn down and the entire black parcel was abolished, with a new gray parcel being created in its place. In fact, this is an overly simplistic scenario. In the real world, single areal units get subdivided, or several units get merged into single areas, and these changes can occur at any time without necessarily affecting any adjacent areas.

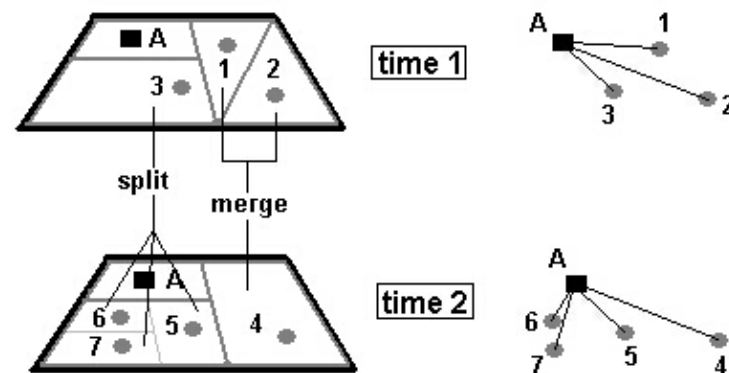


Figure 5: Time slices showing transformation of objects and relationships

Visualizing such changes over time becomes somewhat problematic, forcing us to select “slices in time” to show the state of affairs at any particular moment. In Figure 5, we see a group of historical spatial objects as they existed at Time 1 and Time 2. At Time 1 a parent jurisdiction A had subordinate units 1, 2, and 3. Between Time 1 and Time 2 (though not necessarily at the same moment!), units 1 and 2 merged together to form a single unit 4; while unit 3 was itself split up into three new units 5, 6, and 7. Indeed, these are exactly the sort of events that occur frequently in administrative geography. In the left half of the illustration, the units are shown as areas with defined boundaries. On the right, the same units are shown simply as points, with their parent to subordinate relationships indicated by simple lines. In today’s world, we are accustomed to depicting administrative units as bounded areas. We dislike gaps of no-man’s land and fuzzy peripheries. But as we delve into pre-modern times we have no means of determining such cleanly defined adjacent areas, therefore I believe that a network model, which can be carried down through any number of levels of iteration, is more appropriate for modeling historical

geographies.⁸

Regardless of whether we visualize historical places as nested areas or networks of points, the example shown in Figure 5 demonstrates the need for clarity in how we perceive of historical places as they change over time. Look at unit 3, which exists at Time 1 and then splits into units 5, 6, and 7 at Time 2. Is the “place” which was defined as unit 3 the same as any of the new units? Is it equal to the sum of the new units? Or are they all unique historical places unto themselves? Although the functional logic of spatio-temporal changes can be described⁹, there is no basic proof of an identity that persists from one state to the next. For example, if unit 3 in the preceding Figure 5 has the same placename as unit 7, does that prove that unit 3 is still the same “place” as unit 7, while units 5 and 6 are new?

<i>name</i>	<i>nation-state</i>	<i>begin-year</i>	<i>end-year</i>
Nanjing	Liao	938	1152
Zhongdu	Jin	1153	1215
Dadu	Yuan	1267	1402
Beijing	Ming	1403	1420
Jingshi	Ming	1421	1643
Shuntianfu	Ming	1421	1643
Beijing	Qing	1644	1911
Beijing	Republic	1912	1928
Beiping	Republic	1929	1949
Beijing	PRC	1949	present

Figure 6: Historical instances of Beijing

During the years I have spent working on the China Historical GIS, I have come to the conclusion that persistence of identity for historical places cannot be shown to exist. A case in point is the geographic space that now

8 Berman, Merrick Lex, *Boundaries or Networks in Historical GIS*, in: *Historical Geography* 33 (2005), p. 118-33.

9 Hornsby, Kathleen; Egenhofer, Max J., *Identity-based change: a foundation for spatio-temporal knowledge representation*, in: *International Journal of Geographical Information Science* 14.3 (2000), p. 207-224.

exists under the jurisdiction of China’s capital, Beijing. We have extensive historical documentation about the administrative units that were established, abolished, re-named, or re-established in roughly the same geographic space as today’s Beijing.¹⁰ A brief (incomplete) sketch of this history is shown in Figure 6.

When presented with the facts, we must admit that when the state of Liao established an outpost at the southern part of their territory and named it Nanjing [Southern Capital], that there is no logical connection between that administrative unit and the subsequent administrative units that were established in roughly the same area later on by other peoples. For the Jin people, the place was roughly in the middle of their territory, so the name Zhongdu [Middle Capital] is appropriate in the context of the state of Jin at that point in time. Then the city was sacked and destroyed by the Mongols in 1215. Only fifty years later did the Mongols themselves establish a capital city there, called Dadu [Great Capital] in Chinese, which was called Khanbalik in their own tongue. Does Khanbalik = Nanjing = Zhongdu = Beijing? Frankly, the answer is no. They are not temporal aspects of a single identity differentiated by their temporal extents.

If we are to take the sum of the information about what transpired at a particular geographic location over the course of time, we must realize that what we are not observing a single persistent identity, but a series of historical instances. Each instance of an historical place, although it may indeed be seen as occupying a certain temporal extent and geographic extent, actually makes more sense in a political and cultural context which expands and contracts. This set of circumstances resembles series of waves lapping back and forth over the same space, each wave arising from a set of circumstances unique to itself. In my view it does not make much sense to model one aspect of a wave of human activity in terms of a single point on the ground. Instead I believe that the wave itself should be mapped as a network of nodes that spreads and articulates across the landscape over time.

10 Hou, Renzhi (ed.), *Beijing lishi dituji* (Historical Atlas of Beijing), Beijing 1988.

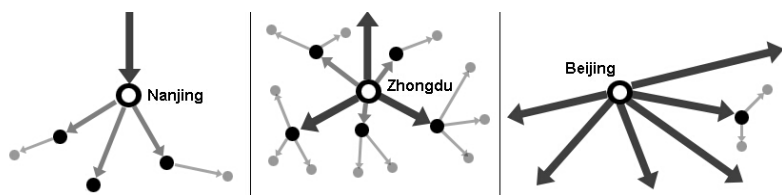


Figure 7: One location has different roles depending on its historical context

In Figure 7 several snapshots, or slices in time, are shown as hypothetical scenarios for the geographic location now known as Beijing (depicted here as a black circle with a white center). On the left side is the Liao city Nanjing [Southern Capital], shown as a southern node from a larger political system radiating from the north. In the center is the Jin city Zhongdu [Middle Capital], here shown as the central capital of a much smaller political system, surrounded by its subordinate units. Note that bolder or lighter lines can be used to depict various types of relationships among the nodes. On the right hand side, we see the Qing city Beijing [Northern Capital] which was the seat of the central government for a much larger political system, shown radiating beyond the extent of the map.

These three slices in time demonstrate the very different roles that administrative units played at the same geographic location. In this case, the administrative units were not even part of the same political system, therefore it is not reasonable to presume that they maintained a single persistent historical identity over the long course of time. Rather, I would argue that geographic location exists as a stage upon which a series of transient events occur. Following this line of reasoning, a more realistic way to model historical geographies would be as a series of networks, within which each historical place gains its identity more from its relationship to the historical context of each specific network, rather than its location in space and time. Nor is there any reason that networks cannot overlap and either compete or co-exist while sharing some of the same nodes.

Allowing for overlapping roles in historical GIS is particularly useful in the case of Chinese history, which presents us with the problem of

administrative jurisdictions that were simultaneously occupying the same space as military commands, or circuits of surveillance. The way in which data is collected and modeled in historical GIS must be flexible enough to handle the intermingling and overlapping of political spheres of influence and the movements of peoples across time. It is not correct to look backwards from the present state of affairs and to say that the place we now call Berlin, or Beijing, or Bogota, had such and such earlier incarnations. Those earlier states can be easily discovered with a spatial query. What we must do is to avoid the mistake of building out historical GIS from the present going backwards in time, as if each place has some sort of persistence of identity that lasts for eternity. Yes, history itself is continuous, and yes, locations have histories that aggregate into what we think of as “places.” The problem we face is that we are trying to capture the waves of historical influences lapping to and fro over space and time, and the residual influence of these waves is made up of a hodge-podge of artifacts: historical documents, dialects, cuisines...characteristics that are difficult to measure and map. To reconstruct the authentic history of places, we need to think of each place as transient not persistent. By thinking of historical places as a sequence of events, by defining them as points of interconnection, and by modeling the relationships each place has to the larger geopolitical context for specific periods of history, we can begin to establish an extensible and global historical GIS.

*Merrick Lex Berman is Project Manager at the China Historical GIS, Center for Geographic Analysis at Harvard University.
E-Mail: mberman@fas.harvard.edu*