[DA-011] GIS&T and the Digital Humanities

Abstract

This entry reviews the use of GIS&T in the digital humanities and in the spatial humanities, highlighting opportunities for interdisciplinary collaborations between GIScientists and humanities scholars, including in history, archeology, and literary studies. Challenges are highlighted as well, including epistemological and ontological differences between the spatial, abstract, and quantitative view of the world of GIS&T and GIScience and the humanities emphasis on place and qualitative methods. The potential of mixed methods to bring together different epistemological perspectives is discussed in this context. Scale is identified as a promising geographical framework for humanities research, both in its metaphorical aspects and as intended in cartography. Examples of the use of GIS&T and GIScience in the humanities are provided, including historical GIS, geohistorical gazetteers, archeology and GIS, and GIS in literary studies. The entry is framed historically, with reference to the work of Bakhtin, Braudel, and Hägerstrand, who are early influencers of the spatial turn in the humanities. Among the research directions briefly explored are the GIS of place, deep maps, and qualitative GIS, which exemplify how the collaboration between GIScience and the humanities can be strengthened.

Keywords: chronotope, deep maps, digital humanities, geohistoire, GIS of place, historical GIS, qualitative GIS, spatial humanities, spatial turn in the humanities, time geography

Author & citation

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Explanation

1. Introduction
2. GIS&T in the humanities: challenges and opportunities
3. GIS&T applications in the humanities

1. Introduction

This entry describes the use of GIS&T in the digital humanities. Broadly intended, the term “digital humanities” refers to the use of digital technologies in the humanities—the fields of literature, English, history, art history, linguistics, classics, archeology, philosophy, and religion. The main reason for bringing the digital into the humanities is the computer’s ability to discover patterns and trends in massive amounts of data: for example, the corpus of British newspapers in the 20th century. This ability to explore entire archives is what the literary scholar and critic Franco Moretti has famously termed “distant reading” (2013; Taylor et al. 2018). “Spatial humanities” refers to the use of GIS&T, and especially GIS, in the field of the humanities, specifically in the context of exploring large databases

characterized by the presence of a geographic attribute. The interest of the humanities in GIS&T is relatively recent when compared to the social and physical sciences, although its epistemological roots can be traced to the adoption of a geographical perspective—the "spatial turn"—in the humanities. This is not new, and in fact key to the spatial turn are two concepts—the "geohistoire" and the "chronotope"—developed in the context of historical studies and literary studies. The term geohistoire, variously translated in English (including with geohistory or even historical geography), was coined in the 1940s by the French historian Fernand Braudel (1949 and 1995) and was a guiding principle of the Annales school of history. The concept of chronotope, another neologism (literally, "time-space"), dates to the 1930s writings of the Russian philosopher and literary critic Mikhail Bakhtin. As Bakhtin puts it, (1937-1939, English translation 1981, 84), chronotope refers to the "intrinsic connectedness of temporal and spatial relationships that are artistically expressed in literature," and as such it "expresses the inseparability of space and time." Similarly, the idea of geohistoire refers to the impossibility of studying history without also studying geography, and vice versa. A third, more recent and related concept, is time-geography, theorized in the 1960s by the Swedish geographer Torsten Hägerstrand. Famously, Hägerstrand (1970) set out to map the life paths of individuals by building 3-D space-time prisms. His work set geographic research on a multi-decade exploration of the relationship between space, place, and time in geography and GIScience.

In closing, three considerations are worth making. First, the epistemological and ontological status of the relationship between space, place, and time, and in particular the relationship between history and geography, clearly predates the development of GIS. Understanding these relationships is key to understanding what contributions GIS&T and GIScientists can make to the humanities and with the humanities—here, interdisciplinary collaborations are crucial. Second, and perhaps naturally given the longstanding cognate status of the disciplines of history and geography, much of the academic debate on the relationship between GIS&T and the digital humanities revolves around the concepts of time, space, and place. Third, geographers have approached the relationship between these three concepts from two quite distinct perspectives: the "geohumanities," with emphasis on place and qualitative methods, and the "spatial humanities," with emphasis on space and quantitative methods. Although the two perspectives are coming together, as will be discussed below, this entry focus on the latter.

2. GIS&T in the humanities: challenges and opportunities

In their edited volume on the spatial humanities, Bodenhamer, Corrigan, and Harris (2010, X), state that, compared to the social sciences and the physical sciences, "the humanities pose far greater epistemological and ontological issues [to GIS]," including how to deal with uncertainty, as a distinct and more intractable problem than the accuracy of geographical data, which can be measured. Another difficulty arises (2010, X) from "the use of time as an organizing principle, and the mutually constitutive relationships between time and space," including—and this is not a new problem in GIScience—how to deal with relative rather than absolute space. From an epistemological perspective, the major obstacle to the successful integration of GIS&T in humanities research arise from the emphasis of the latter on qualitative data and methods, as opposed to the quantitative data and methods of GIScience. Quantitative methods follow a scientific positivist research paradigm, which typically begins with a research question in which hypotheses are tested, explanatory

models are proposed, data are measured along interval or ratio scales, and methods are employed to measure or estimate the accuracy of the analytical results. Qualitative methods, on the other hand, frequently have no formalized research question and focus on categorical data that are often open to interpretation and to a high degree of individual speculation, with uncertainty and issues of completeness the major concerns. Most importantly, qualitative research is often presented as a narrative. A cursory review of journal articles in the humanities vs. the physical sciences is quite striking in this respect, starting with the structure of the articles itself, as it is also apparent in geographical journals, especially the more generalist (including the Annals of the AAG). Mixed methods analysis is a more recent development that shows a way out of this dichotomy. Mixed methods, the integration of quantitative and qualitative methodologies in the same study, have been embraced by some in GIScience, and in fact an emphasis on mixed methods analysis is at the core of the "qualitative GIS" idea and its application. In this context, Kwan and Ding's (2008) "geo-narratives" model is an example of attempts within the GIScience community of tackling the issue of using GIS to tell a story.

From an ontological perspective, the humanities tend to be concerned with place rather than space. (Confusedly for GIScientists, in the humanities the concepts of place and space are usually collapsed into the generic "space," perhaps because of the influence of French thinkers such as Braudel, Foucault, Lefebvre, and Latour in shaping the debate on the relationship between geography and history—in French, the term "espace" is used to signify both space and place). Thus, while GIS&T and GIScience are anchored in a spatial and geometric view of the world, including a coordinate system, a univocal and unambiguous location, and quantitative methods centered on the measurement of distances, the humanities bring a geographic perspective to their research primarily for its insight into the idea of place and its relationship with time. While a discussion of the history of the concept of place is beyond the scope of this article (see Adams 2017 for a review), among the geographers that have been especially engaging with the humanities are Yi-Fu Tuan (1977), Donald Meinig, and Doreen Massey. What is important is that place is defined a dynamic entity, a product of social processes, individually experienced, and constituted by the triad of location, locale, and sense of place (Agnew and Duncan 1989). This definition incorporates the idea of space and the physicality of place (location), the social, cultural, and economical dimensions of place (locale), and the behavioral and emotional component of place (sense of place, theorized by Yi-Fu Tuan).

In addition to place and space, geographic scale is taking an increasingly meaningful role in humanities research. Scale is generally intended in a metaphorical sense, as in the idealistic tradition, rather than a real tangible entity one can see as in the materialist tradition (Herod 2011). Thus, for example, historical events are examined through the prism of scale by looking at how they unfold at different scales and at what can be learned by shifting the scale of analysis (Knowles, Cole, and Giordano 2014). This, too, is not new, as scale was already, implicitly or explicitly, fundamental to the chronotope, the geohistoire, and space-time prisms. Two additional considerations are worth making in this context: the first concerns the flexibility of the "scale as metaphor" idea, and in this sense, scale can be conceptualized metaphorically as a ladder, a network, or a series of concentric circles (Herod 2011). Because of this flexibility, the various metaphors can be effectively deployed to tackle a variety of research questions. Second, and perhaps counterintuitively, the mathematical definition of cartographical scale as the ratio between the map and the ground is an example of scale that can be "seen," which is indeed very appealing to the humanities, as scale is at the core of the mapmaking process. In other words, scale can be

conceptualized for both place AND space, and herein perhaps lies its epistemological and ontological appeal to the humanities in general and the digital humanities in particular.

It is no wonder, then, that the primary motivation for the use GIS&T in the digital humanities is to make maps, both static and dynamic, and to use maps, both metaphorically and in practice, as the organizing principle to build geohistorical datasets around. Less explored is the avenue leading to the use of the spatial analytical functionalities of GIScience, for the epistemological and ontological reasons exposed above. One exception to the rule is archeology, as discussed below. More recently, the idea of a GIS of place, or platial GIS, has been proposed to try and bridge the gap between GIScience and the humanities, with qualitative GIS a precursor to these efforts (Giordano and Cole 2018). Although the questions tackled are not new, examples of published research on the GIS of place are relatively recent and few. Some trends have emerged, though, including: a) an emphasis on mixed methods and interdisciplinary collaboration; b) a case-studies approach; c) a topological perspective in the design, analysis, and visualization of geographical databases, as opposed to the more traditional topographical perspective of GIS (perhaps a GIS of place does not need a “traditional” map?); d) an emphasis on networks as ontological metaphors; and, finally, e) an explicit incorporation of social networks and social relations as the constituents of both space and place at multiple geographic scales.

To close this section, we should note that reflecting, and self-reflecting, on the limits of GIS and its relation to other fields of knowledge is not a new exercise. In fact, the representation model and the worldview of GIS came under scrutiny as early as the late 1980s and early 1990s from within academic geographic and under the general umbrella of “critical GIS” (see Thatcher et al. 2016 for a summary and an historical overview of the debate.) Self-reflection on the ontology and epistemology of the field was alive and well in the GIScience community, too, as shown by NCGIA Technical Papers from the 1980s and 1990s that explored topics such as the language of spatial relation, cognitive science and GIS, the ontology of GIS, and public participation GIS. This led to a flourishing of studies on alternatives to then dominant paradigm of GIS, including Kwan’s feminist GIS (2002), the already mentioned efforts to propose and build qualitative GIS (Cope and Elwood 2009), and others.

3. GIS&T applications in the humanities

This section highlights a few selected applications of GIS&T in the humanities, with the purpose of showing the scope of the research and its possible directions.

Historical GIS refers to the use of the geospatial technologies, and especially GIS, in historical research (Knowles 2008), with an emphasis on mapping, geovisualization, and the construction of large geohistorical datasets and gazetteers. As concerns the former, notable projects include the National Historical GIS project in the United States, the Great Britain Historical Geographical Information System, and the China Historical GIS project. About the latter, notable geohistorical gazetteers include the World-Historical Gazetteer at the University of Pittsburgh. The linkage between gazetteers, historical GIS, and humanities research is noted by Peter Bol of the China Historical GIS project, according to whom humanists need “a gazetteer” and a “world historical GIS” (2011, 303 and 305). Finally, the

Spatial History Project at Stanford University has been especially active at the intersection of GIS, geovisualization, and the humanities, including history, literary criticism, the Holocaust, and other topics.

Archeologists have been early adopters of GIS&T and also early users of spatial analytical techniques in their research, dating back at least to the early 1990s. The use of GIS&T and GIScience in archeology is characterized by its traditional attention to scale and by a certain breadth of applications, with studies ranging from the single site (e.g., a tomb) to the archeological area or region, for predictive purposes or for mapping and cataloging, using viewshed analysis, 3-D modelling, cluster and network analysis, or other analytical methods. In addition to GIS, remote sensing is widely used in archeological research, most interestingly to aid archeological excavations thanks to the ground-penetrating capabilities of radar remote sensing. In the humanities, this has led to such disparate discoveries as Sarah Parcak's new archeological sites in ancient Egypt (2017) and Caroline Sturdy Colls' reconstruction of the Nazi extermination camp of Treblinka (2015), among others.

Much of the conversation above has revolved around the use of GIS&T in history and archeology, and historians and archeologists have indeed been at the forefront of spatial humanities research, often in collaboration with geographers and GIScientists. However, geospatial technologies have had a broader impact in other fields of the humanities, as seen for example in Charles Travis' 2015 volume "Abstract Machine: Humanities GIS," which reflects on the use of GIS to study literature (see especially, pp. 45-118), with examples on GIS and poetry, as well forays into the work of Homer, Dante, Joyce, and Beckett.

Finally, Bodenhamer et al. (2015) have proposed a representational model—the "deep map"—to try and bridge the gap between the humanities and GIS&T and GIScience. (Efforts to conceptualize and design a "GIS of place" and the discourse around qualitative GIS also go in this direction.) As Bodenhamer et al. put it (2015, 3), a "deep map is a finely detailed, multimedia depiction of a place and the people, animals, and objects that exist within it… Deep maps are not confined to the tangible or material, but include the discursive and ideological dimensions of place… they are also topological and relational, revealing the ties that places have with each other and tracing their embeddedness in networks that span scales and range from the local to the global… A deep map is simultaneously a platform, a process, and a product." Deep maps—as well as Kwan's "geo-narratives" (2008), ESRI Story Maps, and other projects—are examples of possible directions in the integration of GIS&T and GIScience in the humanities.

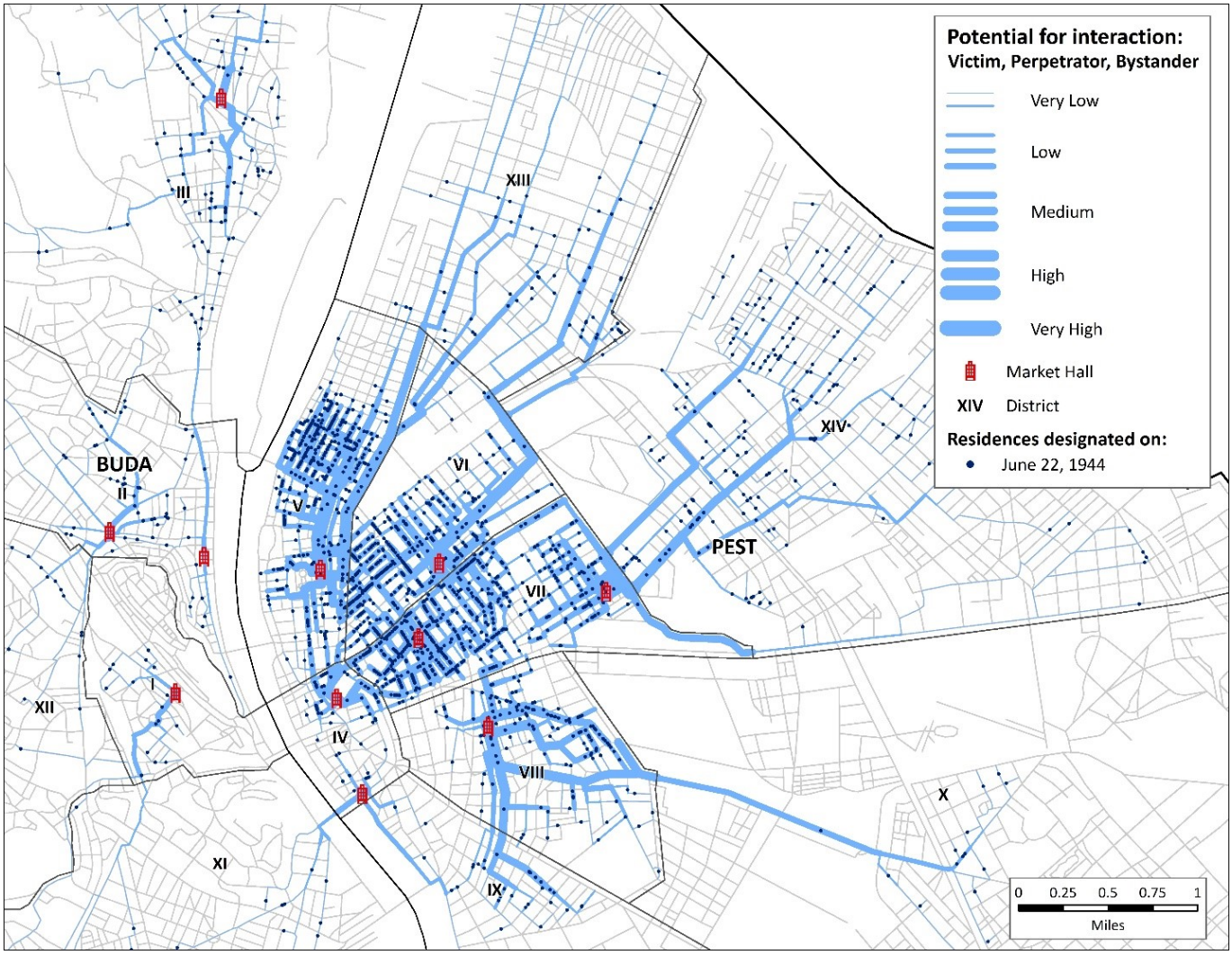


Figure 1: The image above was created for the Historical GIS of the Budapest Ghetto project. It shows the potential for interaction between Nazi perpetrators, Jewish victims, and civilian bystanders as Jewish victims rushed to buy food at designated times of the day and in the designated places (Market Halls). It is an example of use of GIS&T and GIScience to study history, in this case the Holocaust. I am the author of the map and own the copyright. Source: author.

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