

The value of GIS for scientific progress, part 1: Historical Science

‘Questions on the Salem Witch Trials conclusively answered?’

Only a small number of historians consistently use GIS for their research. Quantitative methods are generally not favoured in this discipline. How can ‘location’ be useful if the study of ‘temporal issues’ is your expertise? But in some cases, the unfamiliarity with GIS is clearly a wasted opportunity. Spatial analyses can indeed contribute to a better understanding of historical phenomena. A study into a series of witch trials in the late seventeenth century, for which GIS was used, illustrates this well.

The fact that our first article in this series is dedicated to the historical science is no coincidence. There are strong indications for a growing interest in GIS among historians. In the past five years, in the Netherlands and England, guides appeared on how to use GIS in historical research and ESRI published an excellent collection of articles, in which examples of successful applications of GIS by historians are given. At least two journals came with special editions on historical GIS and conferences on this topic are well attended. Also, in 2005 in Britain and the United States, and in Belgium a few years earlier, new editions of extensive historical GIS-databases were released. *Historisch GIS Frysland* (a province in the North of the Netherlands), which has been on-line since last month, is a good example of a similar, but regional initiative. Thus, historical GIS is clearly on a high.

Despite all this, the application of GIS in historical research remains limited. Only a small group of historians worldwide actually use GIS. Strikingly, it is mainly scientists from other disciplines who take the initiative. Digitalising historical data is predominantly done by historical geographers, demographers and sociologists. How can we explain the relative absence of historians?

Art

According to Peter Doorn, one of the co-editors of *Historisch GIS Nederland* (HGIN) and himself originally geographer, it is not so much a dislike of computers that stops historians from using GIS, but more a matter of methodology. Quantitative research methods, to which GIS may also be accounted, are not popular in most areas of the historical science. Many historians see their discipline more like an art than a science. Moreover, they are almost naturally concerned with the aspect of ‘time’. The ‘spatial’-dimension, which is central to GIS, is an unknown and thus undesired area.

Doorn argues that this is, in many ways, a missed opportunity. On the one hand, GIS has plenty to offer to historians. Visualising research data in digital maps can throw a whole new light on a historical problem. Furthermore, linking data to their ‘real’ location (*geo-referencing*) offers the possibility to analyse historical information on different scale-levels – local, regional, national or even global. Finally, in the long run, GIS could be used to carry out spatial analyses on historical phenomena. This is a method that is already being used in archaeology, and with fruitful effects.

On the other hand, historians from their expertise of temporal processes can also be valuable to the further development of GIS. The current systems are particularly struggling with the visualisation and analyses of ‘temporal differences’. Once historians become a more pronounced target group, the incorporation of the time dimension in

GIS will become a more urgent matter for software companies. This could also be of value to other disciplines, such as sociology or political sciences.

From our explorations it seems that a full integration of GIS in the historical sciences is not within reach. Peter Doorn argues that only the small group of historians who treat their discipline as a social science are an exception to this rule. They are generally more inclined towards a positivist approach and their historical data can be digitalised fairly easily. This is not to say that cultural or political historical issues *cannot* be analysed with GIS. A great example of a successful application of GIS for studying a cultural phenomenon is the research into a series of witch trials, coordinated by the American historian Benjamin C. Ray.

Witch trials

Ray had been lecturing on a notorious series of witch trials in the American village Salem in 1692 for many years, when he decided to digitalise authentic sources related to the trials. In the past years his archive has turned into an extensive online database, the *Salem Witch Trials Archive*¹, which contains over 850 documents, including court records, pamphlets, books and maps that appeared shortly after the trials.

While putting together the archive, Ray almost accidentally ended up using GIS. One of the bodies funding his project required Ray to label the documents in the archive not only chronologically, but also geographically. For every person that he came across in the documents, he collected information about age, gender, family ties, social and economic stand, political preference, place of residence and the dates and ways in which they were involved in the trials. Because he *integrated* all this information in *one* database and labelled them to time and location Ray could then, using GIS, analyse the relations and non-relations between the different factors. These spatial analyses resulted in new perspectives and conclusions on the nature of the trials.

One of the first historians to use maps for researching the witch trials was Charles Upham, himself a native to Salem. In 1867 Upham made a detailed map of his village at the time of the trials, in which he included the places of residence of accusers, accused and defendants. His analysis suggested that the majority of the accusers lived in the Eastern part of the village, while the Western part was predominantly lived in by accused and defendants. Later historians tried hard to explain this geographical difference. They collected as much information as possible on different factors, such as the social-economic position of those involved in the trials, their political preference and faith. Their analyses, however, did not come up with conclusive answers.

The reason that Ray *has* succeeded in doing so is the fact that his way of collecting and integrating information made it possible to carry out spatial analyses. By applying ‘*geo-referencing*’, connecting points on a historical map to real locations (longitude, latitude), Ray was able to stipulate the location of people and objects. In this way he could refute some of the explanations put forward by his predecessors. More importantly, the integration of different layers of information made it possible to analyse the interaction between different factors. This so-called *overlay* is the key to spatial analyses.

¹ The digital archive can be found at: www.iath.virginia.edu/salem/home.html

Dynamic visualisations

The results of Ray's research are in many ways ground breaking. The fact that all the information in his database was connected to a location and time made it possible to map the witch trials day by day. These dynamic visualisations showed that the witch trials were not restricted to Salem – like historians before Ray had always asserted. Although they originated in this village, they quickly spread to surrounding villages and towns. Thus, the trials were not a local, but a regional phenomenon.

Ray's database also made it possible to analyse the trials on different levels – from individual trials to all trials in the whole region together. Ray was therefore able to give a much more complete and diverse picture. Comparing trials in different villages, for example, showed that the conflicting groups were *not* the same everywhere. This means that the causes for the trials differed between villages. This conclusion stimulated Ray to look for a comprehensive explanation. How was it possible that all these conflicts came together around the same time?

Ray found a possible explanation in the decline of the old colonial institutions (both church and civil bodies) due to a new royal charter in 1692. Since historians before him had always looked at the trials as a local phenomenon that had closed their eyes for the role of such overarching explanations.

Ray believes that he could have done most of the calculations, using hand-drawn maps. However, the use of GIS made it possible to integrate a far more extensive set of data, and to analyse these data on many different spatial and temporal levels. This not only improved the accuracy of his findings, but also opened his eyes for new perspectives and factors, which would have kept hidden if GIS had not been used.

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