Digital Translations in Southeast Asian Area Studies: Problems in the Mapping of History

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Visualizing change over time in a digital environment presents a number of challenges. Historical data is subject to interpretation, or may be altogether unavailable. Technology options abound, but each approach has its limitations as well as strengths. This paper describes the development of a digital project visualizing the spread of Islam in Indonesia from its earliest penetration through the end of the eighteenth century: why this topic was addressed, problems of data representation, how the project was compiled, and why the cluster of technologies used was selected. Finally, the paper addresses issues of data integration and visualization in Southeast Asian studies as well as in area studies generally.

Keywords: Cultural Studies, Southeast Asia, GIS, Mapping

The process of generating an interactive digital project visualizing the spread of Islam in Indonesia raised a number of issues concerning translating information from one medium to another: translating text to digital visualization, translating hard-copy maps to an interactive interface, and finally, grappling with persistent problems in Southeast Asian studies as well as area studies generally.

This presentation discusses some of the issues and challenges surrounding the development of a digital project entitled "Mapping the Spread of Islam in Indonesia." The project was intended to suggest, through spatial and temporal visualization, some of the broad historical contours and specific events in the transmission and growth of Islam.

Why Islam? Why Indonesia? Why is a digital mapping approach suitable to this topic and how was it adapted for this specific project? Where did the data come from? Was it reliable? How were the technologies used chosen? What were their advantages and disadvantages? What are the most significant remaining problems? These are among the questions to be addressed in this paper.

Rationale

Islam is one of the world's great religions. Indonesia is now the world's largest Muslim nation, yet it is located far from the origin of Islam and from most of the other strongly Islamic nations of the world. How did this process happen? "Mapping the Spread of Islam in Indonesia" was intended to visualize this change over space and time.

The project, supported primarily by the Al-Falah Program at the Center for Middle Eastern Studies, University of California, is not intended to provide hard answers, but to suggest patterns in space and time. Visualization has an immediacy and impact that the written word arguably lacks. Through digital visualization, the project hoped to make a few overall points clearly and decisively; against this backdrop smaller details could be contextualized.

Mapping Pre-Modern Southeast Asian Trade

A particular characteristic of the spread of Islam in Southeast Asia that made it an attractive subject: was the link between the spread of Islam and Southeast Asian trade routes. Long before traders from Europe ventured into Southeast Asian waters, Southeast Asia had thriving local and long-

distance trade routes. The fabled "silk road" had its marine component in the vessels that hugged the coastlines of Southeast Asia. Chinese chronicles attest to the presence of Southeast Asian emissaries at their courts and trading in their markets. Along these well-established trade routes followed the people, the texts, and the ideas that fostered the growth of Islam.

The UC Berkeley Geographic Information Science Center, where this project was primarily developed, had been working on digital visualization of trade in Southeast Asia prior to this project. For example, the GIS Center had mapped Southeast Asian shipwreck sites using Geographic Information Systems, or GIS, on behalf an expert on Southeast Asian trade ceramics, Dr. Roxanna Brown. (Fig. 1)

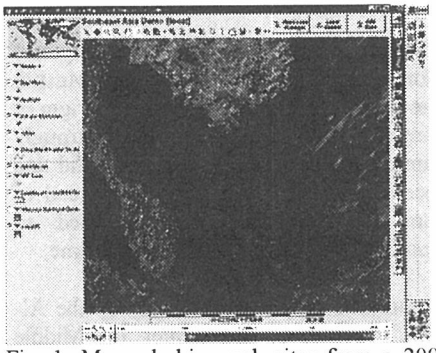

Fig. 1: Mapped shipwreck sites from a 2002 GIS Center project.

What do shipwreck sites have to do with trade? The mapped ships were all carrying loads of trade ceramics. Time and place play key roles in the utility of these data for the understanding of both ceramics history and trade history. For example, the dates of shipwrecks provide a final date prior to which the ceramic must have been created. The pattern of shipwreck locations suggests patterns of maritime trade. We believed the mapped data relating to the spread of Islam in Indonesia might also yield interesting patterns, and contribute to a larger understanding of the dynamics of exchange in goods and ideas in Southeast Asia.

GIS in the Humanities

A larger agenda was at work in this project as well: exploring and promoting the use of spatially-intelligent technologies, including GIS, for the humanities. From the perspective of the GIS Center, the lead collaborator on the project, this was the primary goal. While the GIS Center generally works with projects typically associated with GIS, the Director is strongly supportive of projects that explore new applications of GIS, such as projects from the humanities.

It may be hard to find any issue in the humanities that does not have a spatial dimension, sometimes multiple dimensions. Yet the humanities have been resistant to the use of GIS. Why? The two most consistently cited reasons are, one, the at best imperfect representation of time in GIS; and two, the problem of representing uncertainly. This paper will not explore the larger debate about these two issues; they have been dealt with extensively elsewhere. But both issues did impact this project, and problems of modeling time and uncertainty will be cited below.

Data Sources

The content, including direct incorporation of spatial data, was primarily drawn from Robert Cribb's *Historical Atlas of Indonesia*, and supplemented with additional sources, both text and online. The polygons Cribb provided in his *Atlas* were digitized in order to display Islam's spread in Indonesia as a series of incremental developments..

The *Historical Atlas of Indonesia* covers Indonesia up to the present, and in fact its emphasis is twentieth century. However, it was decided to terminate the digital project with the close of the eighteenth century, as by this time the transition to Islam via intra-Asia trade routes had been largely accomplished. Moreover, the closer to the present, the more resources on Islam's development in Asia already abound.

While the *Historical Atlas of Indonesia* was the source of most of the spatial data, supplemental sources were heavily consulted in the development of the data layers for the central component of the project, "Historic Data: Mapping Events in the Spread of Islam." These are listed in the bibliography component of the project. In the *Atlas*, religion is only one element of many. But for the reasons cited above, this was the element extracted for the purposes of the project.

Nor does the project address any religion in Indonesia other than Islam, though Hinduism, Buddhism, Christianity, and many indigenous religious practices exist. Particularly in the outer islands, Nusa Tenggara, Islam does not always hold the sway it does in Sumatra and Java. The project did not have the resources to extend to visualizing other aspects of Indonesia's religious history.

Format

The format of "Mapping the Spread of Islam in Indonesia" is a digital project on CD with several components.. In visual design there was an attempt to parallel book format in several respects. The three main content interfaces are offered as "chapters." As in a published book, these "chapters" are framed by supplementary and explanatory material on separate "pages." As a book is linear in its successive pages, so too one opens the project at the frontispiece, proceeds to cover page, then table of contents.

Here the linear structure ends. From this page, the only linearity is provided by the arrangement of links on the Table of Contents page (Fig. 2). The Table of Contents lists a preface, introduction, chapters, bibliography, with the added feature in this case of an on-line bibliographic search. In this case there are pages for acknowledgements at the "end" rather than the beginning, accompanied by a separate page for "credits" for the digital project. The preface explains the project and the introduction lays out the issue to be addressed. The main "chapters," the three stand-alone components, utilize overlapping spatial data but highlight different aspects of the project: spatial (for which Calmap tools were used and which requires an internet connection for real-time spatial data download), temporal (for which TimeMap animation tools were used), and an integration of space, time, and historical events (TimeMap). A discussion of these technologies follows.

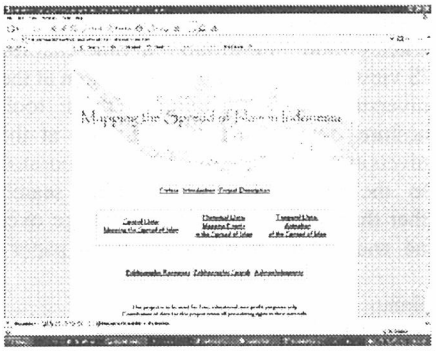

Fig. 2: Table of Contents from "Mapping the Spread of Islam in Indonesia." The core components of the project are in large boxed links at the center: spatial visualization (at left), temporal (at right), and historical events (center).

After the initial project was compiled, an additional element was contributed: an animation of trade routes with sample trade goods indicated on the map interface. Additional textual sources were used for this part of the project. These are noted in the on-screen references (Fig. 11), though not included in the bibliography of the original project.

Technology

In technological design, the project assembles several approaches in one project, both internet-enabled and stand-alone, each selected for different characteristics. In this way it exemplifies the future of technology for scholars, a future in which a range of options are open for selection according to

the user's needs. In fact this composite of technologies is both promise and compromise. It is a promise in the sense that there is a wide variety of technologies to select from, and while many have overlapping capacities, each has its own set of advantages and disadvantages. The composite is a compromise in that it was not ultimately possible to visualize everything we wished on a common interface.

The primary tools used were "Calmap," a spatial data editing tool developed by Howard Foster at the GIS Center, UC Berkeley, and "TimeMap," a time-enabled GIS viewer, developed by Ian Johnson at the University of Sydney. A third tool, Cheshire, developed by Ray Larson at the University of California, was incorporated into the project for bibliographic search rather than for visualization of change over time, and will not be discussed in this paper.

Calmap

Calmap was used for the "Spatial Data" section of the project (Fig. 3). Calmap spatial data editor was developed for the State of California as a field data input tool. It has a user-friendly interface that requires no special training in GIS to operate. Calmap requires internet access, as its backdrop data selections chosen by the viewer (topographic maps, satellite images) are downloaded in real time from remote servers.

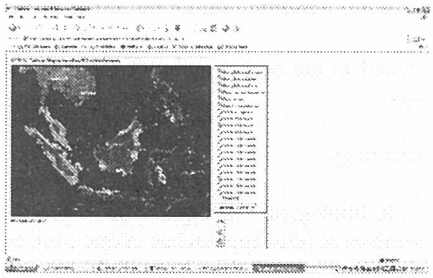

Fig. 3: "Calmap" spatial data editor utilized for "Mapping the Spread of Islam in Indonesia." The layers for the spread of Islam at different dates are listed at right. Layers checked are visualized in green on the map.

NASA's satellite data, accessed from the Minnesota Map server, permits users to zoom in from an image of the whole of Indonesia (Fig. 3) through scales at which cities are indicated as point data and at which islands are differentiated and labeled, to the point where features on the ground—rivers, hills, agricultural areas, urban settlements—can be discerned (Fig. 4).

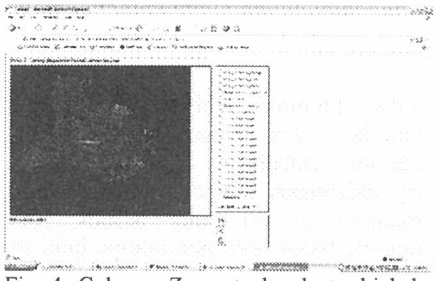

Fig. 4: Calmap: Zoom to level at which land features, such as rivers and settlements, are visible. At this scale, we see the inexactness of the yellow polygon boundary line.

Why Not Google?

At present, Google Earth dominates discussions of online spatial data. Since its unveiling Google Earth has commanded enormous attention, primarily for its its high quality imagery and user-friendly interface. Google Earth also uses NASA satellite imagery, which has been enhanced with superior rendering and supplemented with aerial photography. The public accessibility of Google and ease of use have made it the technology of choice for many.

The original project was proposed before Google Earth was announced; even so, incorporating a Google-based component for point data was discussed, and Google Earth imagery considered (Fig. 5). The primary problem was that Google Earth did not offer interoperability with other GIS formats. It was a fundamental principle of the project that however limited the immediate goals of the project would be, that the data would be in a format that would be interoperable with other GIS projects, thus leaving open the possibility of incorporating data in other

contexts or projects. However, Google's attractive imagery would be useful, and the possibility remains open either to attempt to acquire Google's imagery as backdrop spatial data or await some possible future time when Google's technology may evolve to be more GIS-friendly.

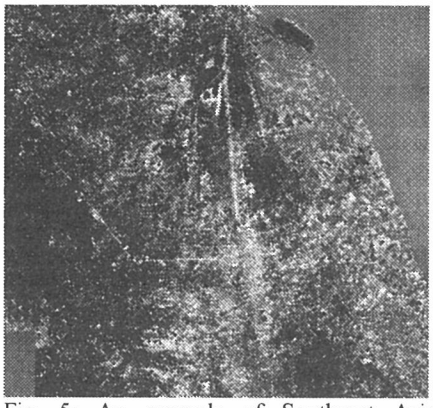

Fig. 5: An example of Southeast Asian imagery from Google Earth showing the high degree of spatial detail. This image shows the eastern side of the southern Thai isthmus near the Malay border.

TimeMap

The other spatial data tool used in the project was "TimeMap." Based on ESRI products, TimeMap is a tool designed with humanities data in mind. It can be used to represent time as well as location (see http://timemap.net).

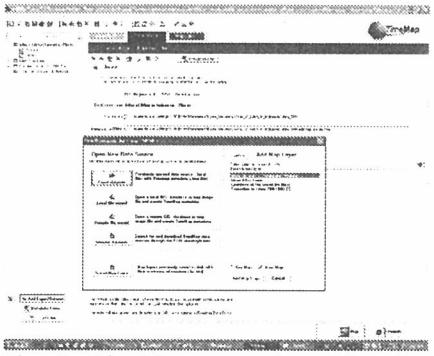

Fig. 6: TimeMap menu for adding local, internet, or Clearinghouse datasets.

The technology permits users to seek datasets not only locally, but on the internet or registered in the TimeMap Metadata Clearinghouse (Fig. 6). Like Calmap, TimeMap is available at no charge over the Internet. Metadata registered at the Clearinghouse allows other users to discover available and interoperable data (Fig. 7).

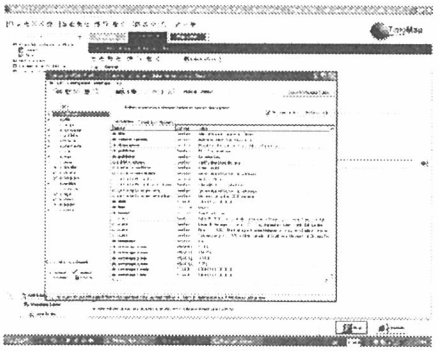

Fig. 7: Metadata page from TimeMap project.

Modeling Time

TimeMap was used to model time in two ways for this project. One was a high-impact short-duration animation of the spatial spread of Islam in Indonesia, in which a millenium of development is encapsulated in a matter of seconds (Fig. 8 and Fig. 9).

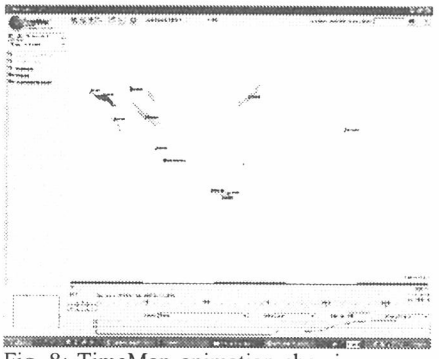

Fig. 8: TimeMap animation showing areas of Islamic influence in green. Across the bottom of the frame, a time bar indicates the period visualized. This screen shot shows early Islamic influence in Indonesia and on the Malay peninsula, circa 1500 C.E.

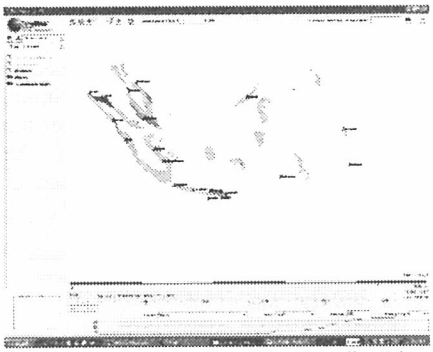

Fig. 9: Animation in "TimeMap": Islamic influence about a century later than Fig. 8. The animation shows the spread of Islam as a coastal phenomenon in the early period, suggestive of maritime and trade-borne exchange.

Trade Routes

As mentioned above, trade routes were a particular interest. A supplementary animation was added to the project by the University of Sydney showing some of the trade routes as they have been drawn for the region, as well as locating some of the trade goods by location. The supplement uses the same basic spatial data polygons showing areas manifesting Islamic influence by date, with each route as a separate time-stamped layer.

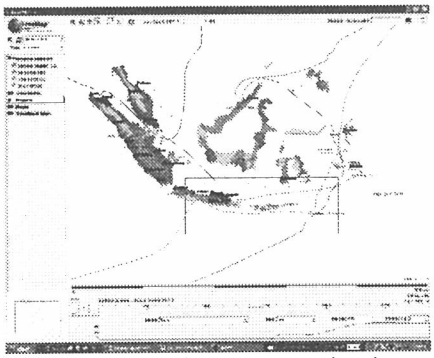

Fig. 10: Supplementary animation in "TimeMap": trade routes and trade goods. The bounding box launches a query as to the data and references to data sources within the bounded area (see Fig. 11). Individual data layers are listed at left.

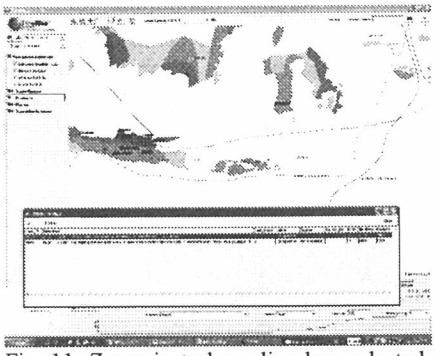

Fig. 11: Zoom in to bounding box selected in Fig. 10, with attribute table. The table shows data source references.

TimeMap tools were used for the key component of the project: "Historic Data: Mapping Events in the Spread of Islam." This component comprises a framework for data layers visualizing historic developments over time. Layers include dates recorded for rulers converting to Islam, important dates in the lives of individuals credited with furthering the spread of Islam, and global links related to Islam's historical development.

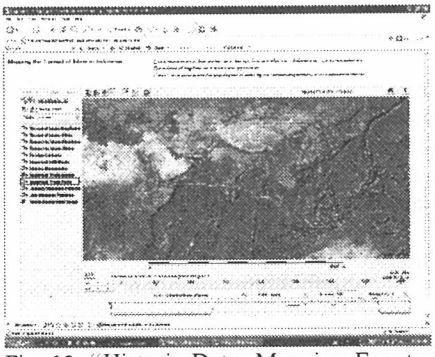

Fig. 12: "Historic Data: Mapping Events in the Spread of Islam" component, created in TimeMap, with trade routes layer displayed.

A drawback of TimeMap was the background imagery. In the animations, the imagery was clear but not as interesting or helpful as satellite data would have been. In the Historical Data section, the interface is attractively rendered but not necessarily geographically accurate, and for large scale

data the pixilation issue becomes severe (see Fig. 13). A goal of the next iteration of the project is improved imagery for the Historical Data component.

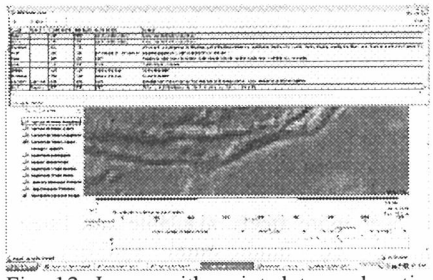

Fig. 13: Layer with point data on locations of conversions to Islam, with attribute table.

Problems of Uncertainty in Visualization

This project did not conduct independent research in Southeast Asia, but instead borrowed its data from the research of others. As any researcher of pre-modern Southeast Asia knows, data availability is at best uneven. In the area of trade, much trade was conducted without surviving documentation. In many cases we can only guess what and where and how trade was conducted by piecing together fragmentary evidence, such as current informal trade patterns, the constant of the monsoon winds, the comments in travelers' diaries, and so on. Uncertainty exists in all three core aspects of the project: spatial, temporal, and historical events.

The most difficult issues arose in connection with the "Historical Data" component of the project. Among these were criteria for selection of specific data elements to be included as layers and attribute data, the problem of inconsistently available categories of data for any given layer, and the problem of defining a polygon for areas whose actual boundaries are not only unknown but as visually defined may be highly misleading.

The most fundamental, and ultimately unanswerable question, is a simple one yet infinitely complex: defining what makes a region "Islamic." how can one measure Islam? Who is Muslim? What constitute markers of Islamic identity? If a headman converts, does that make his village or region Islamic? Is there any measurable dimension to his terrain, even if a source provides a place-name? And what constitutes conversion? Does the adoption of the exalted term "sultan" along with imported trappings of nobility constitute Islamic identity?

This project found no fully satisfying answers to these questions. For the purposes of this project, the loose guideline was that any example of influence from Islam in any form was enough to be considered an aspect of the spread of Islam.

Though ambitious in conception, the project was developed with limited resources, which severely restricted both data research and editing. It remains a demonstration project, suggestive of possibilities in the digital approach to historic visualization in time and space, and not a complete or comprehensive resource. However, though the project could be vastly improved with greater resources, there are some questions beyond purchase, their answers lost to time.

Area Studies

Among the issues raised in the creation of "Mapping the Spread of Islam in Indonesia" were implications relating to the field of Southeast Asian studies itself. The digital visualization illustrates the spread of Islam in a manner primarily suggestive of influence coming into Indonesia, and only in the details was any suggestion of indigenous participation and development evident. This evokes some of the earliest paradigms in Southeast Asian studies, from which Southeast Asian studies moved away in the course of the latter twentieth century, in which Southeast Asia was a passive recipient of influence rather than an active player in historical processes. In the visualization of "Mapping the Spread of

Islam in Indonesia" a danger is that the uninflected color-coded mapping masks myriad local developments, variations, reinventions.

The primary reason only Indonesia was chosen was that this was the limit set by Professor Cribb's atlas. But it is certainly true that the Malay side of the straits of Malacca, especially the entrepot that gave the straits its name, were early and critical centers of Islamic presence in Southeast Asia. Indonesia, created as a nation by colonial accident, was in that creation also cut off politically from Malaysia and the Philippines, with which adjacent areas of Indonesia have strong cultural affinities, including the growth of Islam.

This speaks to one of the oft-debated issues in Southeast Asian studies, and in fact an issue for area studies as a whole—the issue of boundaries and borders. Not only is the issue of Southeast Asia as a discrete "area" debated, but also, in terms of cultural continuities, the arbitrary—but for the logic of colonial dynamics--demarcation of contemporary national borders. Indonesia has only been known by this name for the past half-century; yet this project reaches back a millennium illustrating the same spatial area defined by the contemporary political entity known today as Indonesia.

The issue of uncertainty notwithstanding, the flexibility of the digital environment holds great promise in area studies. In this project, we see an interface that can range from global to extremely local. Borders can be redefined, diverse regions compared, transnational links visualized. Even more important than the collection of data represented in any one project is the possibility of collective resources, such as that represented in the TimeMap metadata clearinghouse, or spatial data resources retrieved in real time through CalMap. "Mapping the Spread of Islam in Indonesia" should not be seen as a final word in any sense, but as an exploration and possibilities for the visualization of time and place.

Conclusion

"Mapping the Spread of Islam in Indonesia" is an exploration of the use of spatially-enabled technologies to illustrate historical processes and suggest historical patterns local, regional, and global. The project raises questions related to content visualization, change over time, and issues related to both the technologies utilized and to larger issues in Southeast Asian and area studies. Though the future promises spatial data ever more freely available and finely grained, the fundamental problem of uncertainty in historical data will persist. A key development for the future is the pursuit of effective visualizations for representing uncertain or conflicting data, while at the same time preserving and uniting in a common interface what evidence history has left us.

References

[1] "Calmap"website: http://www.gisc.berkeley.edu/projects/calmap.htm

[2] "TimeMap" website: http://timemap.net

[3] Cribb, Robert, *Historical Atlas of Indonesia.* Honolulu: University of Hawaii Press, 2000.

[4] Gregory, Ian, *A Place in History: A Guide to Using GIS in Historical Research* (2nd Edition). Centre for Data Digitisation and Analysis, Queen's University, Belfast, Belfast, Northern Ireland, 2005.

[5] Jessop, Martyn, "Dynamic Maps in Humanities Computing," in *Human IT,* 8(3), 2006, pages 68-82.

[6] Szanton, David L., ed., *The Politics of Knowledge: Area Studies and the Disciplines.* Berkeley: University of California Press, 2003.