A Spatial Information System for Use in Sociological Field Surveys: Prototype Experiments in Northeast Thailand

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ABSTRACT

I have been developing an integrated spatial information system for social archaeology in Northeast Thailand, which provides academic information on archaeological sites through its Web page. In addition, I have started to develop a prototype navigation tool for use in sociological field surveys. This tool aims to assist the user in accessing a site. Some local researchers have started to evaluate the tool to improve the Web page and the navigation tool.

1 INTRODUCTION

I have been developing an integrated spatial information system for social archaeology in Northeast Thailand, namely EcoNETVIS, in collaboration with Thai researchers in this field. This provides academic information on archaeological sites through its Web page. To utilize this information in the field, I have started to develop a prototype tool, the EcoNETVIS navigation tool. This is an intermediate report of the development.

2 MATERIALS AND METHODS

2.1 EcoNETVIS

The EcoNETVIS, Northeast Thailand Village Information System: Eco-history, Web page provides academic information on about 1,000 archaeological sites with digitized images of topographic maps and aerial photographs. This allows the user to superimpose aerial photographs and topographic maps of a site and to view academic information on the same page, as shown in Figure 1. The Web page is rather designed for indoor use and a PC must be connected to the Internet.

2.2 GPS Navigation Tool

The EcoNETVIS navigation tool is a prototype tool using a notebook PC and a GPS receiver which assists the user in accessing a site. This tool also allows the user to superimpose aerial photographs and topographic maps of a site in a similar manner as with the Web page. This is of course designed for use in the field without connecting to the Internet.

Any commercial GPS receiver which communicates with a PC in NMEA-0183 protocol can be used in the EcoNETVIS navigation tool. The WGS-84 datum is used as a standard in most GPS receivers, and is the only datum supported in the tool at present. One important practical point to notice which is not widely known among local researchers in the humanities is that the geo-coordinate datum applied to topographic maps until less than a decade ago is different from the WGS-84 datum. The two differ by more than 400 meters in Northeast Thailand. Ignoring this difference may cause the user to wrongly locate a site in a nearby village, for example, for example, or to locate the northwest corner of a rectangular irrigation tank on the southeast corner.

To provide reliable navigation, locations of geographic material based on a legacy geo-coordinate datum must be adjusted to the standard datum before overlaying GPS information.

3 EXPERIMENTS

I have been experimenting with the tool at more than twenty sites in eight provinces in Northeast Thailand during the past year. In addition, two local researchers have started more intensive experiments around Maha Sarakham province in June 2006.

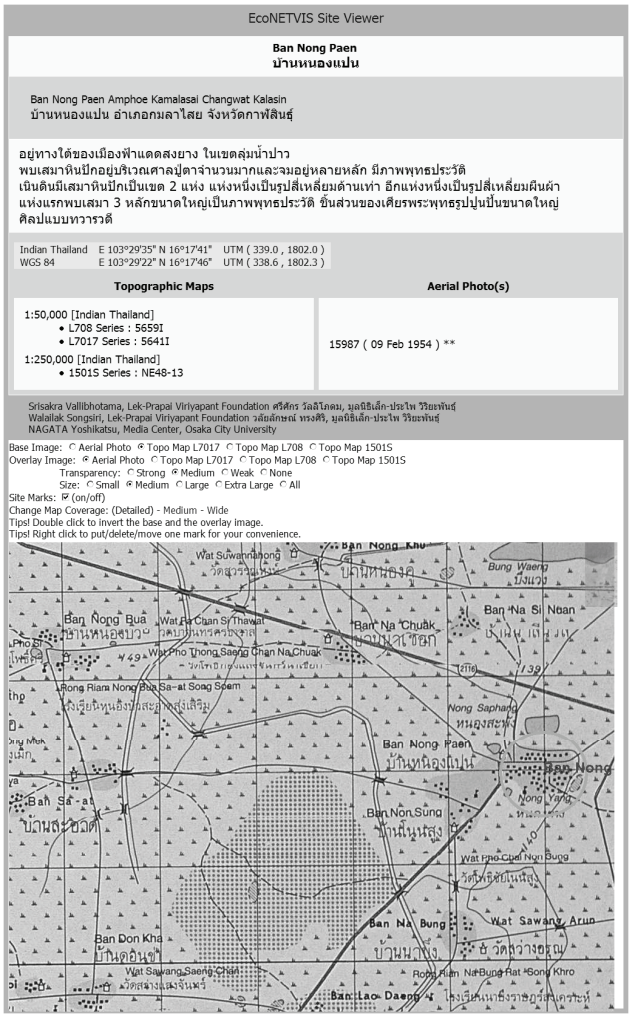

Figure 1 Ban Nong Paen, Kalasin

Figure 2 Ancient River Channels on an Aerial Photograph

Figure 3 A Rectangular Basin in Ancient River Channels

Figure 4 Rice Fields in Ancient River Channels

3.1 Examples

The first example is a site in Nong Paen village in Kalasin. The black dots in Figure 2 show my route marked on an aerial photograph. I passed across ancient river channels and along the west bank of a rectangular basin, Nong Saphang (Figure 3), in the channels. This rectangular basin also appears on the topographic map shown in Figure 1, but the ancient river channels cannot be identified on the map. Superimposing the image of an aerial photograph on the corresponding topographic map can easily show the existence of this geographic feature. The landscape shown in Figure 4 can be regarded merely as a typical example of the rice fields of this region, and the presence of ancient river channels cannot be noticed without careful observation. This example shows how the navigation tool can provide important information about the geographic surroundings of location that is not immediately apparent to the user.

Another example is the site in Muang Faek village in Buriram shown in Figure 5. According to academic information, this village is surrounded by a triple moat. When I visited there in the dry season, it was quite difficult to find any parts of the moat that were wet or had water. But with the help of the navigation tool, I could identify some parts of the moat that were very shallow and dry, as shown in Figure 6.

3.2 Accuracy

In my experiments, location information from the GPS on legacy topographic maps of 1 to 50,000 scale of which the geo-coordinate datum had been adjusted in advance was sufficiently accurate for me to reach my destinations, even taking me along an alleyway in a village. This proves the tool is useful for navigating to sites that are shown on maps. However, archaeological features such as ancient river channels are not always shown on

maps, because the difference in elevation between them and their surroundings is smaller than the minimum interval of contour lines. I experienced many cases in which aerial photographs were more suitable than topographic maps for use as base images of the navigation tool. But to use aerial photographs from decades ago in the tool, the laborious task remains of identifying their location as accurately as possible, since the flight paths shown on their index maps only allow us to locate them roughly.

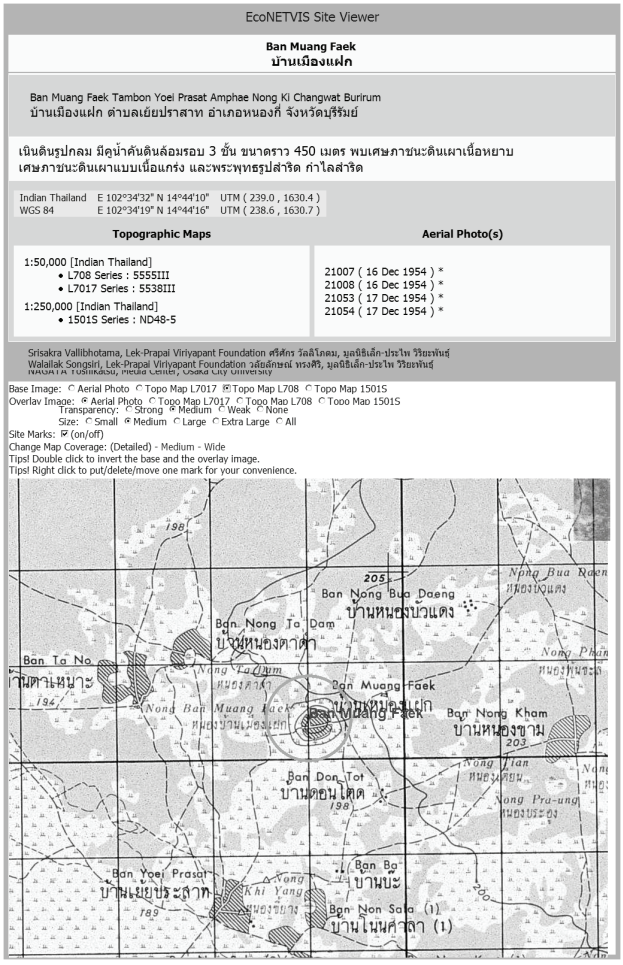

Figure 5 Ban Muang Faek, Buriram

4 DISCUSSION

Topographic maps and aerial photographs are essential basic geographic materials for sociological field surveys, but regrettably they have regrettably been disregarded due to difficulty of access in some countries. I believe that the EcoNETVIS, comprising its Web page and the navigation tool, can provide a practical tool to support local researchers and students.

Although we are now in the age of digital high resolution satellite imageries, legacy analog geographic materials such as topographic maps and aerial photographs from a half century ago remain important for academic use as they preserve information about the geographic features of their time, some of which have now disappeared or changed in shape, either by the forces of nature or modern human developments.

Figure 6 Dried Shallow Moat

The development of this navigation tool for field surveys is a step towards sharing academic information in a scientific way as possible with local young researchers, who should succeed to and review the academic knowledge of senior researchers. The next step of the development is to support users so that they can maintain and update the contents of the system and appreciate its benefits, even though they have to acquire higher levels of skill in information technology than they need for simple word processing.

5 ACKNOWLEDGEMENT

Ms. Walailak Songsiri has been collaborating with me for many years and is one of experimental users of the field navigation tool. She has also coordinated introduction of the system to local researchers to find intensive experimental users. Mr. Srisakra Vallibhotama has always supported our collaboration warmheartedly. I would like to express sincere gratitude to them both.

6 REFERENCES

Srisakra Vallibhotama, Walailak Songsiri, and Nagata, Y., 2000-2006, EcoNETVIS Web Page, http://pladaek.media.osaka-cu.ac.jp/econetvis/