GIS APPLICATION FOR THE MAPS OF TOURIST ATTRACTIONS AND ETHNIC GROUPS OF NAN PROVINCE, THAILAND

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Abstract

This paper describes a GIS-based application to illustrate the maps of tourist attractions and ethnic groups of Nan Province in Thailand under a research project funded by the Thailand Research Fund (TRF). Various distribution patterns of languages and settlements of ethnic groups within Nan are mapped according to the collected village data. A questionnaire was designed to collect information from 902 villages. The questionnaire included questions about village background and environment, interesting cultural elements, village names, village history, local tourist places and schools, population, ethnic groups and languages. Nine-hundred questionnaires were distributed by well-trained staff from the Nan Community who conducted interviews of two or three senior people from each village. The data from the questionnaires was then entered into the village database via a developed user interface. In the meantime, a GIS database had been set up by combining map layers from several sources. The map layer set consists of administrative boundaries, roads, rivers, contour lines, as well as associated

locations of the villages. The information of each village in the village database was then linked to its location represented by points in the GIS database. With the customized GIS application, various types of interactive queries about village data, as well as tourist attractions or ethno-linguistic maps, can be accommodated. Logical block diagrams, user interfaces and results are detailed in this paper.

Introduction

Nan Province is located in the northern region of Thailand, about 668 kilometers from Bangkok. Seventy-five percent of its terrain is mountainous while the rest are plains bordering the Nan River. The north and east of Nan are adjacent to the Lao PDR and separated by high mountains. Nan attracts tourists with its peaceful communities and natural places. Nan consists of fifteen districts which are divided into ninety-nine sub-districts and nine hundred villages. At least thirteen languages are widely spoken by various ethnic groups in this province.

A geographic information system (GIS) is a computer system for storing, managing, and displaying geospatial data which describes both the locations and the characteristics of spatial features (Chang, 2008). GIS has been used by human and cultural geographers since the late 1980s and in its capacity as software to enhance understanding and increase control over human daily life (Schuurman 2003). GIS has been applied to a variety of areas such as geology, earth systems, natural hazard management, sales planning, site suitability analysis, urban planning, geodemography, decision system support

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as well as linguistics (Birkin, et. al 1996, Luo, et al. 2000, Longley, et al. 2005, Harris, et al. 2005). ArcGIS, which has been employed in this research, is one of the advance off-shelf GIS software packages from Environmental Systems Research Institute (ESRI), a leader in GIS development. Typically, the software provides a standard user interface which is ready for general use. However, for specific tasks or applications, customization of the user interface is required to provide short-cut menus as well as effective ways of using the system.

The geographic information system (GIS) application described in this paper is part of a research project, "Linguistic Diversity in Nan Province: A Foundation for Tourism Development" funded by the Office of the Thailand Research Fund (TRF) to celebrate the fiftieth birthday of Her Royal Highness Princess Maha Chakri Sirindhorn. The project has been a cooperation between three working groups: the Department of Linguistics and the Department of Geography in the Faculty of Arts, Chulalongkorn University and the Nan Community. As Nan is a province where people speak at least 13 different languages, the research project aims to produce a multilingual dictionary of Thai-English and other languages spoken in Nan as well as an ethno-linguistic map to encourage tourism of Nan. Furthermore, the developed GIS application also provides an interactive system for ad-hoc queries of various issues at village/sub-district/district/province levels.

Typically, making a map of tourist attractions and ethnic groups is a common practice of studies of languages spoken by people in a specific area. In Thailand, many linguistic geography researchers

have been studying languages in several provinces such as Sukhothai, Petchaboon, Lopburi, Saraburi, U-taradit and Pijit (Chaisakulsurin 1999; Burudpat 1992; Chunkeeree 1991; Maliwan 1987; Nakpantawong 1987; Weesakul 1983). Some of them have applied GIS as a tool to make sets of paper maps showing locations where languages are spoken, as appendices to research report. Instead of using paper maps to show spatial diversity, this paper demonstrates a new way of employing GIS tools to enable a user-friendly and easy-to-use interactive system for tourists as well as researchers to present and explore linguistic diversity. This paper also presents an example of how to use GIS as an effective and powerful tool to study and analyze social and cultural phenomena in terms of spatial variation.

As this research required a system to store spatial data such as roads, rivers and village locations, as well as non-spatial linguistic information gathered from questionnaires, GIS was selected as a development tool to manage and manipulate project data. Map data was categorized and separated into thematic layers such as roads, rivers and villages, thus allowing required map layers to be selected for display and analysis. The data flow of the system can be illustrated as shown in Figure 1. The collected data from questionnaires was computerized via the data entry application and stored in the village database. The GIS application then integrated the data from the village database and the map layers to produce a system that could be used by tourists and/or researchers alike to view, query and reproduce maps as required.

Figure 1: Diagram illustrating components and their relationship within the developed system.

Questionnaire and village database

The purpose of producing questionnaires was to collect information from each village, with particular focus on languages spoken and cultural/natural attractions. Because getting information from every village in a province can be quite costly and time-consuming, we designed the questionnaire to cover other areas of information, such as local people's needs and the number of unregistered inhabitants, for further use by governmental organizations in Nan Province.

The questionnaire contained nine parts covering village history, location and environment, population, attractions and unseen cultural/natural places, languages,

villagers' requests and comments, as well as the date when the data was collected. Our well-trained staff from the Nan community was sent out to interview representatives from each village and fill out one questionnaire per village. The representatives were selected by village leaders on the basis of knowledge of the area, people and history. After the questionnaires were entered into the system, they were verified and analyzed by one of our teams from the Nan community to ensure all information was fully correct. In this paper, only the procedures for gathering information and making use of it will be described.

A data entry system was developed for entering data from the questionnaires into the designed village database. The village data is stored in a relational database

(consisting of tables with relationships among them). The conceptual diagram of tables in the database is illustrated in Figure 2. The village data was then linked into the GIS application enabling tourists/researchers to view both map layers and village data at the same time.

Figure 2: Conceptual diagram shows the main data table (VillData) and other data within the database.

GIS map layers

Maps of Nan are required to display village locations with their spoken languages and/or other attributes throughout the study area. In the GIS arena, all real-world features can be mapped into three feature types which are point, line or polygon. GIS data are

separately stored in thematic layers such as a road layer and a river layer. Users can turn layers on and off at any time to display or hide the layers so that only required information will be shown and clearly seen on screen or a paper print-out. As only locations of the villages are needed, the village layer in this research is represented by point features. Additional

base map layers such as roads, rivers, administrative boundaries (province, district and sub-district levels), contour

lines and spot heights as shown in Table 1, are also included to facilitate users' comprehension of village location.

Table 1: Map layers used in the GIS application

No.	Layer Name	Feature Type
1	Village	point
2	Road (centreline)	line
3	River (centreline)	line
4	Administrative boundary	line, polygon
5	Contour line	line
6	Spot height	point

Map layer data is at a scale of 1:50,000 which means that one centimetre on the map equals 500 metres on the ground. Therefore, when a user interactively zooms in to see the data on a larger scale such as 1:10,000, s/he may discover that line features such as roads and rivers on the map are not as smooth as they would be in the real world. Since this research is only required to display the location of villages on the map with reference to the base maps, a larger scale such as 1:10,000 or 1:4,000 would be time consuming and costly, so an accuracy of 1:50,000 is acceptable at this stage.

The villages' coordinates are given by the Ministry of Interior in the form of a 100 square-metre UTM (Universal Transverse Mercator) system. The UTM is a grid coordinate system that defines the surface of the Earth into sixty zones, each of which is six longitude degrees wide (Chang 2008). In each zone, the central meridian divides the area into east and west, whilst the equator divides the area into north and south. To define a location, x coordinates are measured in meters from

the central meridian to east or west, while y coordinates are measured in meters from the equator to north or south. A location can also be represented as a grid which covers a specified area such as 100x100 sq.m. For example, a village located at 686422 east and 2069231 north is shown as PA864692, where PA is a location code of the given 100x100 sq.m. grid. When locating this coordinate pair on the map, it will be located at 686400 east, 2069200 north. Thus the accuracy of village locations is +/-100 metres. The accuracy issue should be carefully borne in mind when using this data set since a village near a road, a river or an administrative boundary may sometimes appear on the opposite side to where one expects. In this research, special care was taken with villages along sub-district boundaries to make sure that they are located in the right sub-district or district.

1) Defining an AOI (area of interest) which can be a district, a sub-district, or a village. This function brings users to the required area of interest.

3) Finding villages according to a specified attribute such as a tourist place type, an attraction type, an ethnic group, a spoken language or a nearby school. In Figure 3, villages whose people speak Hmong language are highlighted with triangles.

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Figure 4: Ethnic ratio of Mae Khaning Sub-district in Wiang Sa District.

4) Displaying information on each village according to a specified attribute: age, main ethnic group, ethnic ratio, utilities provided, number of spoken languages, and the language that villagers use in their daily lives. In Figure 4, a sample pie chart map of ethnic ratio of each village is displayed.

5) Displaying the main ethnic group or the ethnic ratio of each sub-district. A sample map of the ethnic ratio of each sub-district is displayed in Figure 5.

Figure 5: The map shows the main ethnic group of each sub-district in Nan Province.

Figure 6: The map shows the main ethnic group of each district in Nan province.

Figure 7: The map shows the ethnic ratio of each district.

6) Displaying the main ethnic group or the ethnic ratio of each district. A sample map of the main ethnic group of each district is displayed in Figure 6, whilst the ethnic ratio is shown in Figure 7. From the map, it is obvious that most people in each district are the Muang ethnic group (local Thai ethnic group) except in some districts in the north where there are the Tin and the Tai Lue ethnic groups. However, there are mixed ethnic groups in each district, especially in the northern part of Nan.

7) Displaying the English meaning and phonetic transcription of a selected word of a specified language, as well as a picture of the locals who speak that language as shown in Figure 8. A Thai word is selected from the drop-down menu, and then its English meaning and phonetic transcript of the selected language is displayed on the screen.

Figure 8: The English meaning and phonetic transcription of the selected words in the Lue language are displayed.

8) Reproducing, printing and exporting maps shown on screen.

All of these provided functions that facilitate the project is use of an interactive GIS application in order to supply information on various aspects and at various administrative levels. At the provincial level, users can search the location of villages with a specific type of attraction or of a specific ethnic group. At the district or sub-district level, users can make pie charts representing the ethnic ratio of each administrative area. At the village level, users can opt to see all information on a selected village. These are sample queries that users can work with through the system. Whenever the database or maps are updated, the results on screen will be regenerated automatically.

Conclusion

If a picture is worth a thousand words, a map is worth a thousand pictures. On the basis of this research, it can be said that a dynamic map produced with the customized GIS application is worth a thousand paper maps. The project demonstrates that applying GIS to linguistic studies enables users/researchers to view, analyze and output the linguistic data in various aspects easily and efficiently. Having such a system will help researchers acquire more useful information for analysis and synthesis, as well as reproduce result maps in a variety of aspects. The GIS application is not limited to this project alone but can be considered as an optional, prototypical methodology for future use in the study of linguistic geography.

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