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The Study of using Public Participation Geographic Information System in Indigenous Mapping

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***Abstract*—**Current practice of indigenous Mapping production based on GIS, are mostly produced by professional GIS personnel. Given such persons maintain control over data collection and authoring, it is possible to conceive errors due to misrepresentation or cognitive misunderstanding, causing map production inconsistencies. In order to avoid such issues, this research into tribal GIS interface focuses not on customizing interfaces for individual tribes, but rather generalizing the interface and features based on indigenous tribal user needs. The methods employed differs from the traditional expert top-down approach, and instead gaining deeper understanding into indigenous Mappings and user needs, prior to applying mapping techniques and feature development.

***Keywords*—**GIS, participatory GIS, indigenous mapping

I. Introduction

INDIGENOUS Mappingping development originated abroad, and is a recording of indigenous traditions and wisdoms. Indigenous Mappingping is a collective, continual work and is part of the greater plan to preserve tribal history and culture. However, tribal development overtime is in itself dynamic in nature, in terms of real environment, history, culture, population fluctuation, and other traditional fields, many changes occur over time. Therefore it was found after this research initiation, that current fields of research does not overlap entirely with traditional fields, and due to individual background differences, impressions of tribal history and culture were also different. It is necessary that tribal participation, discussion, confirmation, consensus be secured that indigenous Mapping work can then be approved. Therefore, it is a wish of this research to develop the concept of tribal participation and improve on the top down expert approach, in order to more accurately record traditional fields and knowledge imprint such information upon indigenous Mapping database. In Taiwan or other Asian countries, population household survey data is the most comprehensive address database. Using residence address information for address geocoding can build the most accurate database of address. However, when the residence address is missing, duplicate, and error, site investigation and follow-up in-house recover process is necessary. This study is to establish address database of twelve towns in Kaohsiung as an example, to bring up effective procedures of using census address coding and check system.

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II. Method

Mental mapping was developed by Tolman[1]. Mental mapping is interpreted as the pictorial mind representation of one's collective learning, organization, storage and processing of spatial information. In other words, mental mapping's generation is the human being's central spatial arrangements, and such spatial arrangement is the sense of geographical space which is crucial to our livelihoods. For example the relationships between position, inside or outside, near or far, direction, fore or post, or an abstract concept of height.Fig.1 shows the mental mapping's working flows.

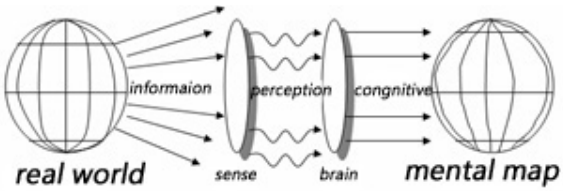

Fig. 1 Mental mapping

There is an important part in Marr's theory that large amount of different images must be constructed by the pictorial data present on the retina. The first step to an image is the primal sketch, capturing the two dimensional structure of the retina. The next image is the so-called 2.5 dimensional sketch. This sketch enables the representation of surfaces to the viewer. Lastly, Marr proposes that objects must be reconstructed over a three dimensional image. This final image is the so-called 3D model. Marr's processing of sight information and object recognition takes the retina's image and categorize by the parts with which they are made up. These parts are not named descriptions, but are rather simpler shapes. This process is similar to map generation, and map is a simple representation of reality. Therefore attention is devoted on almost identical processes and the process of simplification is confirmed over the process of psycho image research.

Taking the United States map as an example, Peterson [2] demonstrated the process of spatial cognition through image recognition. Stimulus is received through one's eyes, forming iconic memory and long term memory, leading to short term visual store, and generating visuo-spatial sketch pad. Post the recognition process, the image is recognized to be a map of Texas.

This research starts from the development of mental mapping, and upon the completion of mental mapping the participants are asked to publicly explain the mental mapping he or she has developed. The research then analyzes the mental mapping and creates the database needed by the system. With reference to Marr's visual theorem, the system model is

created. Using 3D model as the main demonstration platform, and applying analytical results from field trials collectively with Peterson's visual theorem for system tuning, the research is thence completed.

III. Study Area

1. *Maqwang tribe* : located in Yufong village in Gianshi township of Hsinchu county, consisting mainly of Taiya ethnicity.
2. *Smangus tribe* : located in Yufong village in Gianshi township of Hsinchu county, consisting mainly of Taiya ethnicity.
3. *Kuskus tribe* : located in Mudan township of Pingtong county, consisting mainly of Paiwan ethnicity.

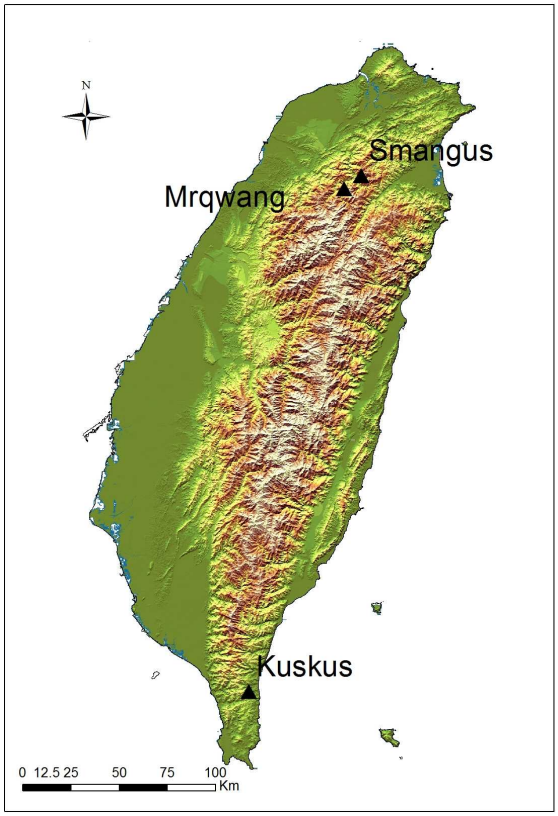

Fig. 2 The Study Area

IV. Data

A. Raster Data

Basic and Topographic Maps: demonstration image size can be controlled by the scale rule to select the area displayed. Generally speaking, a large scaled image's border lines are finer, and smaller scaled image's border lines become somewhat simplified. As an example, a small creek in a small scaled map may thus be neglected. Selecting the appropriate scale is based on user needs. Within the basic landscape database, the system provides the following scales: 1/100,000; 1/50,000; 1/2,500; and 1/10,000 landscape map.

Because indigenous people are mostly active in mountain forests, and are highly familiar with mountain terrains, animals, plantations and are mountainous natured, they generally have an aerial perspective when atop of mountain peaks[3]. Satellite and aeronautical images provide the aerial image information needed. Therefore the research utilizes 40m accurate aerial data, SPOT satellite image and aerial photographs from agricultural aerial surveys.

B. Vector Data

Point Data : area names, mountain heads and triangular points are screened from 1/25,000 scaled landscape map, and added to the system as basic point digital data

Line Data : roads, water system and administrative boundaries taken from transport research network data diagram, including Econo-Infrastructure landscape data file, 1/5,000 basic photographic data file, Quickbird satellite image, agricultural aerial colored orthophoto, and road maintenance data from various departments, supplemented by digitizing 1/10,000 basic landscape data.

Polygon data : Mainly referencing forest surveys and 2005 National Land Usage data. In Gianshi township field trials, the research found bamboo cultivation at the current and old habitats of Smangus tribe, therefore removing bamboo and fruit orchards from land usage data.

V. Result

The research uses commercially available software package ArcGIS's ArcScene module to create 3D model for the prototype system platform used in field trials. ArcScene has prebuilt zoom, flyover, navigate and other tools, therefore no further development effort is needed to achieve the demonstration of 3D modeling.(Fig.3)

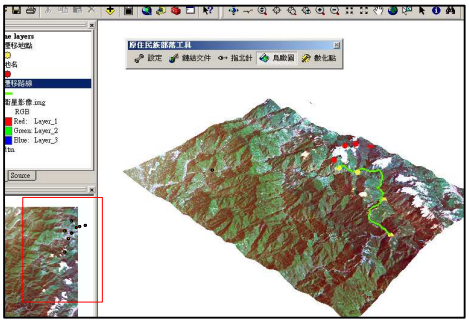

Fig. 3 Interface of the system

In field experience, the research uses single(Fig.4) and dual machine(Fig.5) operation to perform observational research.

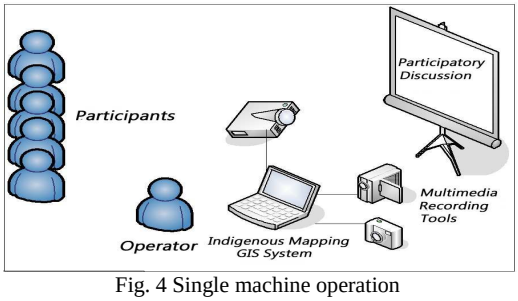

Fig. 4 Single machine operation

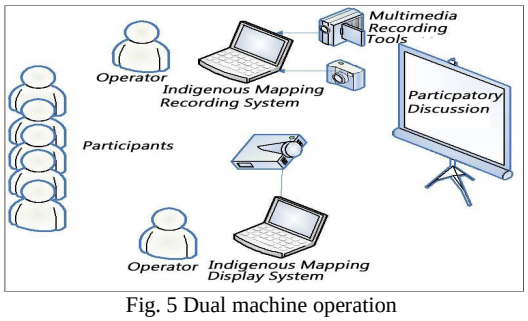

Fig. 5 Dual machine operation

VI. Conclusion

In recent years, the concept of general public involvement towards decision making has taken shape. Information proliferation and the maturation of GIS application technologies provide ground for research carried out under such environments. Starting from theory and field experiences, a development tool is created for participation-based mapping research using GIS. The tools developed by this research could provide future research into indigenous Mapping using GIS system, and the multimedia data provides a tribal account.

References

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