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Developing a UiTM (Perlis) Web-Based of Building Space Management System: A Preliminary Study in Locating a Specified Space/Room Area Using Open Source GIS Tool

K. Zainuddin, E.S. Mokhtar, K.Wan Yusof*

Department of Geomatics Science & Surveying, Faculty of Architecture, Planning & Surveying, UiTM (Perlis), MALAYSIA
Faculty of Civil Engineering, UiTM (Perlis), MALAYSIA

Abstract

Space management in building requires the spatial and database of the building. An open source GIS tool is used in this study to develop a web-based space management system of the buildings in the Universiti Teknologi MARA (Perlis) campus. Database management system was used to relate spatial and descriptive data of the buildings and space/room areas of the university. The objectives of the study is i) to develop a web-based system using open source GIS tool, ii) to guide the user identifying the space/area required and iii) to map the building space/room areas available. In this study, the existing template of the Graphical User Interface menu of the open source software is used to help and guide the user to visualize and determine the information of the building space. The preliminary result of the study shows that the spaces and room areas in the building can be mapped out digitally and it can also be made available to be accessed through the web for the resident of the university.

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Keywords: Open Source GIS; Web GIS; Space Management.

1. Introduction

The population of students and staff in the Universiti Teknologi MARA (Perlis) campus is rapidly increasing every semester. Currently, the student environment is nearly 9000 and it is projected that the students' enrolment will be 15,000 by the year 2015. Therefore, the number of academic staff need to be increased in order to support the teaching and learning process. With the limitation of academic buildings, the allocation of spaces especially for classrooms in the time-table scheduling management has become a setback.

* Corresponding author.

E-mail address: khairul760@perlis.uitm.edu.my

Thus, the UiTM (Perlis) Web GIS Space Management System (Geo-SMS) is being developed to meet the current advances in the information technology and to better the facility management in the campus especially in the space management. The development of Geo-SMS is intended to minimize the problems in locating the suitable rooms for the designated number of students for each program in the time-table scheduling process. The preliminary phase of the study is intended to demonstrate the use of open source web GIS in the space management of the university. For future work, the Geo-SMS will allow the university's administration, academic staff and the students to have access to an information system (with spatial and non-spatial attributes) for other space or facility management such as 'smart-booking registration' which is to register online for 'space/room bookings' for their academic and non-academic activities.

GIS (Geographic Information System) offers smart solution in managing the limited available spaces in the campus. The system integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. Open-source software is computer software that is available in source code form and some software license permits users to study, change, improve and at times also to distribute the software. Besides, open source software can be localised and customised to local languages and cultures [1]. The significance of Open Source software has grown in the development of GIS system recently. Open source software has a number of advantages for organisations with scarce resources, such as no software costs and software tools are easily learned by personnel with IT background [2].

There are a number of open source GIS systems available (OS GIS). This study chose the MapGuide software to develop the Geo-SMS system.

2. Study Area

The study area is in Universiti Teknologi MARA (Perlis), which is located in Arau, about 10 km from Kangar, Perlis, Malaysia. This campus is the largest branch campus with approximately 150 hectare area of which 61.6 hectare area are build-ups while the other are for farming activities. As a premier institution of higher learning in Perlis, the university is experiencing rapid academic development with seven academic faculties together with a continuous development in its physical infrastructure. The campus is currently facing the space/room area issues, while trying to minimize the expenditure for renting on one hand and developing new buildings on the other. Thus the management urgently needs a better database management system that can be easily accessed to help in making the right decisions. A Geo-SMS system is developed to facilitate this space management issues.

3. Methodology

The process of creating and integrating attributes and spatial data were accomplished by using relational database concept and existing template. The main software used in this study is the ArcGIS and the MapGuide Open Source. The ArcGIS is a suite consisting of a group of GIS software produced by Esri uses the concept of a GIS to build maps in which each category of spatial feature is a separate layer. All the data that is needed in the Geo-SMS is developed by using the ArcGIS such as data collection, geo-referencing, digitizing, topology building and data conversion (Figure 1).

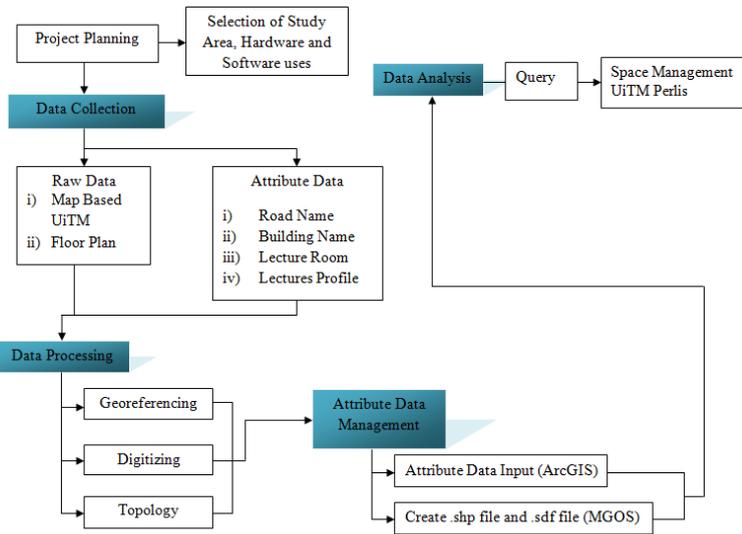


Figure 1: The study flow

The Geo-SMS spatial and attribute database from the ArcGIS then was packaged into the MapGuide format in order to deploy it on the web. The MapGuide Open Source is a free web-based platform that enables users to develop and deploy web mapping applications and geospatial web services. The MapGuide supports selection, property inspection, map tips, and operations such as buffer, select within, and measure feature. The MapGuide includes an XML database for managing content, and supports most popular geospatial file formats, databases, and standards [3].

In order to deploy the spatial information on the web, data need to be managed on the MapGuide Maestro software. This is a free application that allows the user to manage the spatial data in the MapGuide Open Source where specialized editor interfaces for editing the component e.g. Feature sources, Map Definitions, Layer definitions, Web Layouts and Fusion Layouts.

The existing standard template of web layout and graphic user interface (GUI) on the MapGuide Maestro is currently used in developing the Geo-SMS. Some of the functions e.g. query and properties were scripted in this software to suit with the purposes of this research. The AutoCAD 2007 was used to handle some of raw campus basemap and as-built plans. The paper maps were scanned and digitized before being converted to the ArcGIS format for topology building. The various layers in the present study include Campus layout plan, Building, Roads layout, Sports fields and Boundary.

4. Result

The Geo-SMS was developed in order to manage the campus spaces for current and future planning. This preliminary study focuses on classrooms and lecturers room management. By using the web menu, user may obtain information regarding the classroom locations and information. Besides, this study investigated their availability for 'smart room registration' in future development. Furthermore, the searching menu on the Geo-SMS web was made to facilitate the Academic Affairs Division in managing and planning space/room areas for the academic staff and students. Figure 2 and Figure 3 show the examples of layout and results of information.

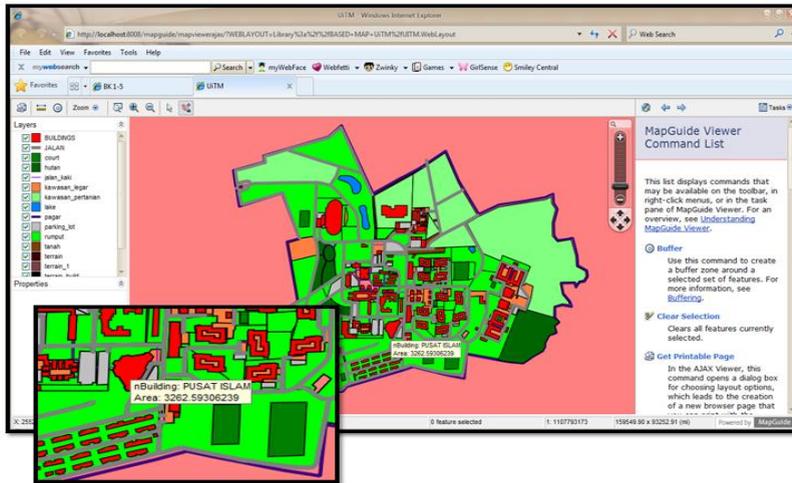


Figure 2: Geo-SMS web layout

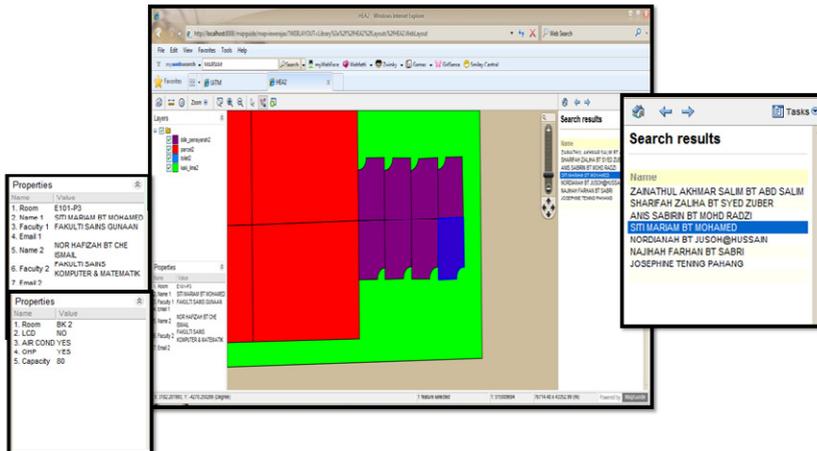


Figure 3: Sample of query results and space information

5. Conclusion

This paper demonstrates that open source web-based GIS is a useful tool for accessing distributed spatial data and conducting GIS processing among a particular user in the campus. This study also gives us a research insight of the capability of open source platform in developing spatial information and decision support system in managing and planning the available space. Even though the web layout, GUI and some menu in this study are using standard in-house software template, this on-going study is currently creating and developing a unique, flexible and user-friendly web layout. In addition, for future works, this open source GIS tools can also be used for other purposes of the campus management such as the facility management.

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