WEB BASED GIS FOR ASSET LOCATION DETECTION

MOHAMMAD ZULFIKRI BIN OMAR

A thesis submitted in fulfillment
of the requirements for the award of the degree of
Bachelor of Computer System (Software Engineering)

Faculty of System Computer & Software Engineering
University College of Engineering & Technology Malaysia

NOVEMBER, 2006

ABSTRACT

The Web based GIS for Assets Location System has been developed for Office of Development & Asset Management (PPH) to trace the assets in Kolej Universiti Kejuruteraan dan Teknologi Malaysia (KUKTEM). The system was built due to the current problem that arises from the Asset Tagging System that currently used by the PPH. The problem from the existing system is user cannot collect asset data for particular location. Because of this weakness this project is developed. The system is applying GIS technique to overcome the current situation. This technique can give a new version to user on accessing data in an interactive way in KUKTEM area. The usage of this system provide few function such as Zoom to Full Extend, Zoom to Active Theme, Zoom Out, Zoom In, Pan and search function which could help identifying of asset location process within a department. The success of implementation and development of this project is expected to help in reducing human power in allocate an asset.

ABSTRAK

Sistem Pengesanan Aset menggunakan Sistem Maklumat Geografi (GIS) berasaskan web dibangunkan untuk membantu Pusat Pengurusan Harta (PPH) bagi mengesan aset-aset di Kolej Universiti Kejuruteraan dan Teknologi Malaysia (KUKTEM). Sistem ini dibangunkan berikutan masalah yang terdapat pada sistem semasa iaitu Sistem Pelabelan Aset. Sistem semasa tidak menyenaraikan data-data aset bagi sesebuah lokasi tertentu. Bagi mengatasi masalah tersebut, teknologi GIS telah di implemen ke dalam Sistem Pengesanan Aset menggunakan Sistem Maklumat Geografi (GIS) berasaskan web. Penggunaan teknologi GIS berasaskan web ini dapat memberi satu suasana baru yang lebih interaktif kepada pengguna sistem untuk menyenarai data-data aset dengan lebih berkesan. Penggunaan sistem ini menyediakan beberapa fungsi seperti *zoom* ke pilihan tema, *zoom* semua tema, carian data aset, *zoom* lebih dekat atau jauh pelan bangunan dan juga fungsi *pan* yang dapat membantu proses mengenal pasti lokasi aset di dalam sesebuah bangunan. Sistem ini dijangka dapat membantu mengurangkan tenaga manusia dalam mengesan aset-aset di KUKTEM.

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBREVIATIONS

CAD	-	Computer Aided Design
FSKKP	-	Fakulti Sistem Komputer dan Kejuruteraan Periaian
GIS	-	Geographical Information System
ICT	-	Information and Communication Technology
IMS	-	Integrated Management System
KUKTEM	-	Kolej Universiti Kejuruteraan dan Teknologi Malaysia
MDX		Multidimensional Expressions
OLAP	-	Online Analytical Processing
PPH	-	Pusat Pengurusan Harta
RAD	-	Rapid Application Development
SQL-DMO	-	SQL Distributed Management Objects
XML	-	Extensible Markup Language

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

Asset Location Detection is a system that can retrieve and displaying KUKTEM asset data. The system also can visualize all the location such as buildings for better understanding of an area using geovisualization.

The system is associated with map. All the data of a place stored in the database using Microsoft SQL and Geodatabase in order to give information to the PPH when they choose a specific area. By using the geoprocessing technique, the system use a rich set of tools to work with and process geographical information.

Mostly people used internet. It is easy way to gather information and communicate with data. The system is a web based system which is able to browse by using internet. User can search and view the location of the asset anywhere.

1.2 Problem Statement

The reason to develop this system is to ensure the PHH staffs to allocate smoothly KUKTEM assets data. GIS application can manage all of the database management process with geographic approach. Separating the non-spatial data and spatial data causing the management process to become more complicated to analyze and manipulate all the data. With GIS technique, the entire of this problem is solving with the combination of spatial and non-spatial data. The information needed is obtained efficient and effective.

Currently the PPH in Kolej Universiti Kejuruteraan dan Teknologi Malaysia already have the Asset Tagging System in Integrated Management System (IMS) System. IMS system allowed them record the assets data in the Asset Tagging System such as tagging number, location and date purchase. The processes of retrieving asset data start with by finding the local order number that are stated in the tagging number. Then all the data of the asset is shown. This system can show the specific asset when typing the asset local order tagging number but the disadvantage of the system is they cannot retrieve the information when the user need to know the list of the asset in a staff room.

This problem can be solved by using a Web Based GIS for Asset Location System. The system provides the location through the visualization map. User can view list of assets and the location of the asset that have been recorded in a specific room.

1.3 Objective of The System

The objective of this system is:

a. To developed the asset location detection using Geographical Information System.
b. To visualize department A1, A2 and A3 in KUKTEM using map.
c. To query the location of the KUKTEM assets.

1.4 Scope of The System

The scope of this system is:

a. To view assets information (e.g.: table, chair and etc) in KUKTEM using map.
b. This system is limited for mapping places for only staff room in building Block A1, A2 and A3 KUKTEM, Gambang, Pahang.
c. The system query data using search that can search by staff name and extension number.
d. Tools to develop the project using ArcView GIS Version 3.1, AutoCAD 2002 and Microsoft SQL Server database.

CHAPTER 2

LITERATURE REVIEW

2.1 Background

This chapter is present on literature review which related with this topic and the development of Web Based GIS for Asset Location Detection System. This chapter presents the literature review which discusses the term and definition of ArcView GIS Version 3.1, AutoCAD 2002 and AutoCAD Shape Source. Technical and the application for the current system are showed inside of this part and also the explanation of the technique that is applying for Web Based GIS for Asset Location Detection System. All the study case can be implementing as a reference to proceed this system that is using GIS. At the end of this chapter is also discussing the methodology types usually used during the development process.

2.2 Current System

Currently ICT already has been developed a system to manage the asset data in KUKTEM called Asset Tagging System. The main objective of this system is to recorded KUKTEM asset and inventory data and for printing tagging number. There are two (2) user of this system which is for ICT and PPH department. Each department is responsible to record their own asset. To show the asset is belongs to, is by looking at the tagging number. In case the tagging is done by ICT then the tag

number is start written with ICTXXXX meanwhile if the asset is tagged by PPH the tag number is start written with PPHXXXX.

Below are examples of Asset tagging screen shot:

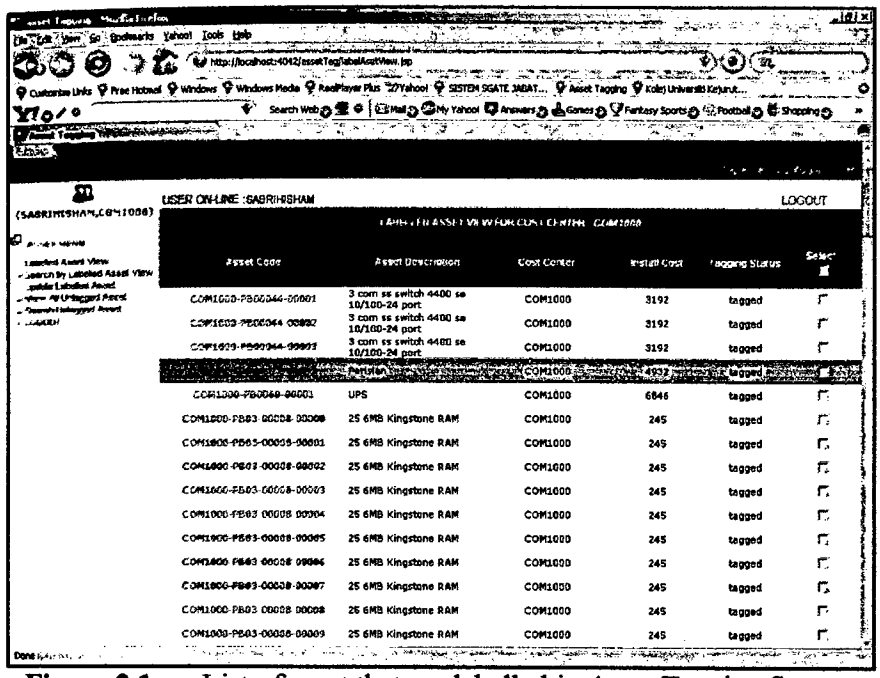

Figure 2.1 List of asset that are labelled in Asset Tagging System

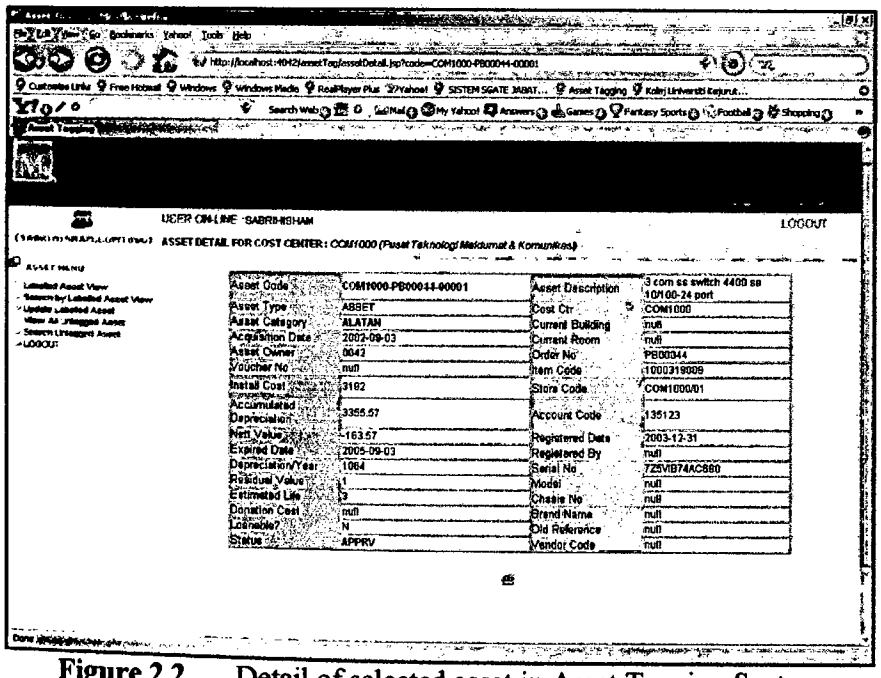

Figure 2.2 Detail of selected asset in Asset Tagging System

Figure 2.1 show the list of asset that is recorded in asset tagging database. When user select an assets user can delete or edit the data. Figure 2.2 show the detail of selected asset in asset tagging system. The details that are show are Asset Code, Asset Type, Asset Category, Asset Owner, Status, Asset Description and etc. User can print the detail of the asset by clicking print picture.

2.3 Existing System

The existing systems that are related to my system that is review in this subchapter are GIS and GPS based asset management for road and railway transportation system in India. The system has been develop by MaxSys Engineering Solutions Inc. (MaxSys) and LEA Associates South Asia (LASA). The system was focus on railway and road consist of Geographic Information System (GIS) based digital maps, high-resolution satellite imagery (up to 5 m), digital elevation models based on satellite imagery and appropriate data base management system.

The capability for the system also added the Global Positioning System (GPS) based Automatic Vehicle Location (AVL) hardware units with programmable micro processor to collect x-y-z coordinates at pre-determined intervals along road and railway networks, including storing the waypoints until requested to transmit them wirelessly. Lastly the system consist of wireless data transmission hardware units that can operate in a seamless dual mode over terrestrial (GSM) and satellite (Iridium) based infrastructures, capable of transmitting GPS data on demand or as programmed via the microprocessor. A particular focus of the technology is applications in disaster management, including the exact location of the site of an accident on digital maps, setting up infrastructures for first responders to accidents, as well as the implementation of efficient, cost effective and timely rescue operations [3].

2.4 Web Based

Web based means the computer network consisting of a collection of internet sites that offer text, graphics, sound and animation resources through the hypertext transfer protocol [1]. The system is build as web based GIS which mean the system can be run using internet browser such as Internet explorer. Using web the information can be shared by anyone [2]. By using a Web-based data viewer, it is able to house all the data in one place, rather than distributing copies of the data to several offices. Data can be update by user frequently so that anyone can get the most up-to-date information.

In software engineering, Web Based sometimes called a Web app or webapp is an application that's accessed with a Web browser over a network such as the Internet or an intranet. Web applications are popular due to the ubiquity of the browser as a client, sometimes called a thin client. The ability to update and maintain Web applications without distributing and installing software on potentially thousands of client computers is a key reason for their popularity. Web applications are used to implement webmail, online retail sales, online auctions, wikis, discussion boards, weblogs, MMORPGs and many other functions

2.5 Geographic Information System (GIS)

GIS is an acronym for Geographic Information System. Geographic in GIS technology view used this term because GIS tend to deal primarily with non-spatial and graphical features. Features on a map for instance are pictorial representations of spatial objects in the real world. Symbols, colours and line styles are used to represent the different spatial features on the two-dimensional map [3]. Information is volume of data that are recorded in a database and related with GIS. A graphical in GIS is also data. The data are called spatial and non-spatial data and these data are associated with each other to make smart map. System is an environment that are

divided into component parts for ease of understanding and handling but are considered to form an integrated everything.

Any system is essentially a dynamic entity which can receive inputs, process them in some way and produce outputs. In the past, systems dealing with information have been largely paper-based with someone's brain doing the processing in the middle. If the information is spatially-based in some way then we have the essence of a Geographical Information System.

GIS is a computer system that is capable for storing, retrieving, analysing and displaying geographic data. The main feature of GIS is that spatial data are stored in a structured format referred to as a spatial data base - that uses different maps called themes or layers. Layer is a group of specific component such as building, trees, roads that can be viewed with other themes or layer for a complete overview of the area. All data are stored in a database and linked together with geography picture. When a multiple layer is combined, it is a complete picture full with information what we called as a "smart map". A GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information; that is, data identified according to location [4].

2.5.1 The advantages of a Geographical Information System (GIS)

The GIS is one of the effective tools for implementation and also for monitoring the public infrastructure. There are lots of advantages by developing system using GIS.

The advantages of using GIS are:

a. GIS has tools to query, analyze and also map the data.
b. By using the GIS, it is possible to calculate surface, length, width and also distance.

c. GIS technology can be used to assist in tasks such as presenting information at the planning inquiries and also helping resolve territorial disputes in such a way to minimize visual interruption.
d. GIS is also on of the tools that can use to analyze administrative data such as population distribution, market localization and the other related features.
e. GIS have ability to link the data sets together by geography.
f. By using the GIS technology, it can create a shared database which means that the data can be collected once and is used many times.
g. GIS technology can reduce redundancy of data and enhance the productivity.

2.5.2 Component of GIS

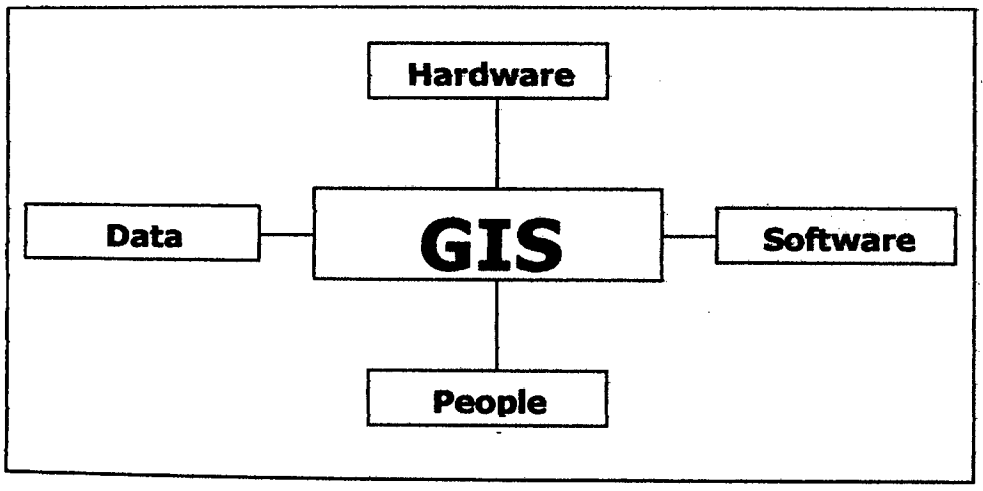

Figure 2.3: Component of GIS

There are 4 components of GIS which is hardware, software, data and also people.

This is the 4 components of GIS:

a. Hardware is a GIS relies on a computer for storage and processing the data. The size of the computing system depends on the type and nature of the GIS. A small scale GIS only need a small personal computer to run on, while a large wide system with a larger computers and a host of client machines to support multiple users.
b. Software is places at a core of any GIS system lies the GIS software itself and provide the functionality to store, manage, link, query and analyze geographic data. In addition to the core GIS software various other software components can be added to provide access to additional sources of data and forms of functionality.
c. Data for GIS comes in two forms geographic or spatial data and attribute or a spatial data. Spatial data are data that contain an explicit geographic location in the form of a set of coordinates. Attributes data are descriptive sets of data that contain several of information relevant to a particular location. For example, depth, height and so on. Sources of spatial data include paper maps, charts and drawing scanned or digitized into the system.
d. People is refers to the system users who use the GIS to solve the spatial problems. They are also who are well trained in GIS and perhaps in a specific application of GIS.

2.5.3 GIS Data Type

2.5.3.1 Spatial Data Model

Spatial data model can be divided into two models which are:

a. Vector model
    i. Vector model represent a point and line identify the border area. This approach also known as objects basis representative. The entity sites define by the location on the map based on the

coordinate. Coordinate and polygon is use to show that the geography in a map.

b. Raster model

i. Raster model functions to divide the space or area on the map into polygon units or cells that being arrange in matrix mode also known as formation. Because the raster data model is a regular grid, spatial relationships are implicit. Therefore, explicitly storing spatial relationships is not required as it is for the vector data model. There are two type of raster data, cell-based and image-based [6].

- Cell-based Raster Data.
- Image-based Raster Data.

2.6 Software and Tools

2.6.1 ArcView GIS Version 3.1

ArcView is a part of ArcGIS product. ArcGIS is an integrated collection of GIS software products for building a complete GIS. This system is develop by using ArcView 3.1 and the results is based on map. There is many the functionality of visualization map by using ArcView 3.1.

The following ArcView GIS Version 3.1 extensions are included with ArcView GIS Version 3.1.

a. ADRG Image Support
b. CADRG Image Support
c. CAD Reader
d. CIB Image Support
e. Database Access
f. Dialog Designer

g. Geoprocessing
h. Graticules and Measured Grids
i. IMAGINE Image Support
j. JPEG [JFIF] Image Support
k. Legend Tool
l. MrSID Image Support (Solaris2 only)
m. NITF Image Support
n. TIFF 6.0 Image Support
o. VPF Viewer

2.6.2 AutoCAD® 2002

A CAD system is a combination of hardware and software that create and store drawings, which can be viewed, printed or updated as required. CAD systems have evolved from the days of their introduction in the 1950's. From being able to merely develop flat two-dimensional drawings, they can now create dynamic and mathematically enriched three-dimensional (3D) models. These systems enable companies to produce cost-effective and precise illustrations of physical systems, ranging from furniture to airplanes [5].

A CAD system stores graphical elements, such as lines, arcs, coordinates, dimensions and text in a database. These can be manipulated in many ways, allowing for speedy production of 2D and 3D images and providing users with "graphic engineering" capabilities. Additionally, CAD is integrated with various other systems, such as Computer Aided Manufacturing (CAM) tools that assist business units automate and increase their productivity. Thus, by using CAD, organizations can proactively customize and manufacture their creations and gain increased competitive advantages [5].

AutoCAD is, first and foremost, a program to create *technical drawings;* drawings in which measurements and precision are important, because these kinds of drawings often get used to build something [5].

2.6.3 Microsoft® SQL Server™ 2000

SQL Server can be used to perform transaction processing, store and analyze data, and build new applications.

SQL Server is a family of products and technologies that meets the data storage requirements of OLTP and OLAP environments. SQL Server is a relational database management system (RDBMS) that:

a. Manages data storage for transactions and analysis.
b. Responds to requests from client applications.
c. Uses Transact-SQL, Extensible Markup Language (XML), multidimensional expressions (MDX), or SQL Distributed Management Objects (SQL-DMO) to send requests between a client and SQL Server.

2.6.3.1 Relational Database Management System

The RDBMS of SQL Server is responsible for:

a. Maintaining the relationships among data in a database.
b. Ensuring that data is stored correctly and that the rules defining the relationships among data are not violated.
c. Recovering all data to a point of known consistency, in the event of a system failure.