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GIS AND REMOTE SENSING INTEGRATION IN WEB APPLICATION

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Abstract

Today, thanks to the internet connection, the borders are disappearing and accessing information is more comfortable. Besides desktop applications, numbers of web-based applications which instant changes can be seen by all users are increasing day by day. The diversity of web-based applications that are currently used in presenting spatial information to users is also progressing. Using open source libraries, developers can develop web applications for their own purposes. Three dimensional (3D) visualization on the web is a commonly used approach in geographic information systems (GIS) applications. In this article, a 3D web application is developed using Cesium open source JavaScript library. Vector data layers containing attribute data on global, country and city scales are visualized on the web application. Development of the application was based on open source software tools such as Map Server for the GIS functions, PostgreSQL and Post GIS for the data management and HTML, PHP and JavaScript as programming languages. In addition, background processes are used in an innovative manner to handle the time consuming and computational costly procedures of the application.

Keywords: - Web applications, Open-source, Geographic Information Systems (GIS), software development remote sensing, Open-source library.

Introduction

Geographic Information System (GIS) is a framework designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. The pivotal components on a GIS are Hardware, Software, data and users. A 3-tier perspective helped in the examination of GIS components .It gave a detailed technological understanding of a GIS, comprising of; a geographic data collection component, database component, and presentation component. Web GIS is a type of distributed information system, comprising of at least a server and a client, where the server is a GIS server and the client is a web browser, desktop application, or mobile application. Simply put, a Web GIS is a GIS system that uses web technologies for dissemination of information and functionalities, as well as communication among different components of a system. [4]

Web GIS should not be confused with Internet GIS; in as much as they may be used interchangeably in some instances, there is a slight difference between the two. The internet supports many services and Web is one of the services the internet supports. A system can be termed as internet GIS if it uses more internet services as opposed to being singularly web based. Web GIS is also in some instances replaceable with geospatial Web or the GeoWeb.

Objective

The objective of this review paper is to provide methodology to develop a web GIS application using open source tools. The resultant application has features like pan, zoom, identity, query etc. The software reviewed in this paper is Map Server and pampar. A reader working on Windows platform, with no technical web GIS and programming skills can follow the step-by-step instructions to develop a web GIS application.

There are very less developments in web applications in the field of construction that provide material selection, suggestion, and estimate but the main function that our project provides is service which is very much ahead of its time.

The user-friendly interface and gathering of data will further bridge the gap between the construction industry and common people; it will also develop skilled employment locally.

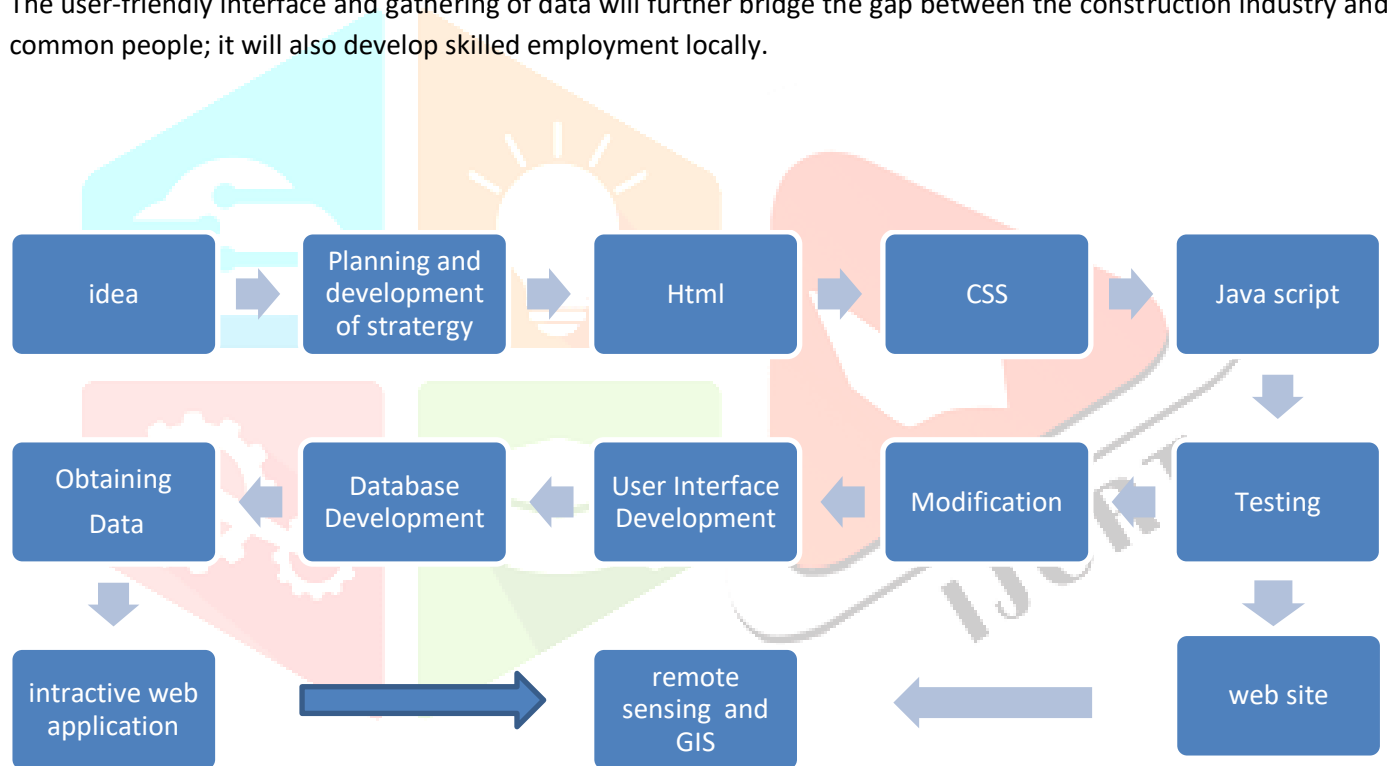


Figure: 1 flow chart of web application developing

Software Development Methodologies

Several software development models and methodologies exist for the development of web applications, case in point, web GIS applications. Models and methodologies describe the whole cycle of development stages including, achievement of functionality, release and maintenance. Some of these models are; the Waterfall Model, V-Shaped Model, Prototyping Model, Spiral Method (SDM), Iterative & Incremental Method, RAD (Rapid Application Development) model and Agile development.[4]

Principles of Remote Sensing and Geographic Information Systems (GIS)

The use of remote sensing and geographic information systems (GIS) to investigate natural and human systems is growing at an increasing rate. [3]

Remote sensing can provide cost-effective large-coverage data in a faster data format that are ready for input into a GIS and convertible into a suitable data format for analysis and modeling. Remotely sensed data can be combined with cartographic data and other data gathered by GIS to improve GIS databases. [3]

Electromagnetic Radiation

Electromagnetic radiation is a form of energy with the properties of a wave, and its major source is the sun. Solar energy traveling in the form of waves at the speed of light is known as the electromagnetic spectrum. Active remote sensing systems send out their own energy and record the reflected portion of that energy from the earth's surface, such as radar imaging systems. [3]

The electromagnetic radiation reaching the earth's surface is partitioned into three types. The amount of transmitted energy depends on the wavelength and is measured as the ratio of transmitted radiation to the incident radiation, known as transmittance. When a surface is smooth, we get specular reflection, where all of the energy is directed away from the surface in one direction. For any given material, the amount of solar radiation that reflects, absorbs or transmits varies with wavelength. If the wavelengths are much smaller than the surface variations or the particle sizes that make up the surface, diffuse reflection will dominate. Some electromagnetic radiation is absorbed through electron or molecular reactions within the medium. A portion of this energy then is reemitted, as emittance, and some of it remains and heats the target. [3]

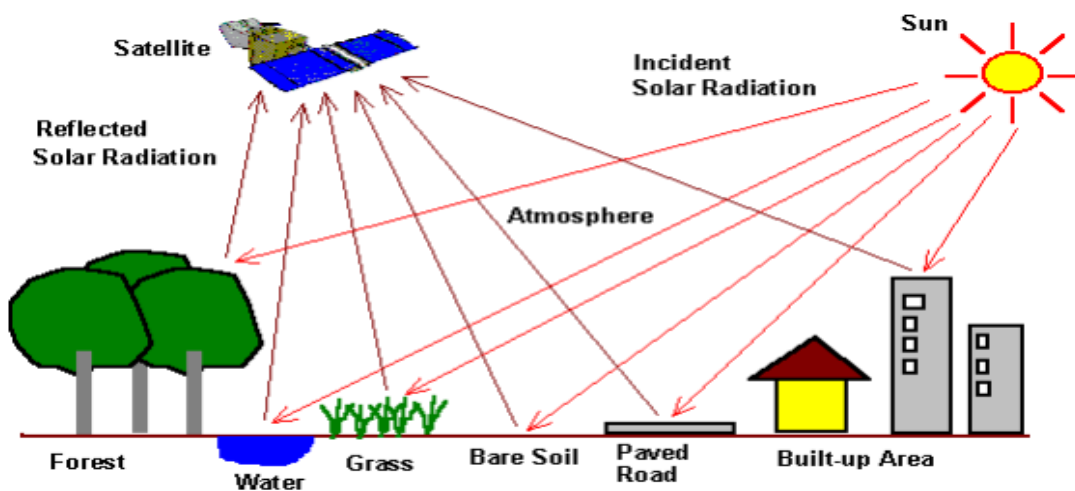


Figure: 2 Process of remote sensing

Benefits

- Web Application that provides services and material selection, suggestion, and estimation.
- The database will provide much-needed information about the requirements and needs of people in all regions thus giving us ample opportunity for growth in the future.
- We code for real-world open-source projects.
- It refines our existing knowledge of programming and also helps us to learn new skills.
- Many open-source projects offer mentorship programs to guide and help us through our first few contributions.
- We need not develop the whole thing from scratch, we just have to fork our favorite projects and start experimenting with them.
- After making any open-source contribution, we get immediate feedback regarding our developmental work.
- While doing open-source contributions, we interact with like-minded developers from all over the world and build connections along the way.
- As we get closer to the open-source community, we get to know much more about our field of interest and other related fields.
- The most important aspect of open-source contributions is It may fetch us a job in our field of interest.

Conclusions

Basic idea of the project is to provide a platform on the internet for people to upload their blueprints of the building which will be saved in the database for further use and information gathering. Our web application will connect a common man with the service provider that he needs like plumber, carpenter, mason, electrician, etc. the web application will be modified according to certain demands and needs, this project is based upon the need generated when there are refurbishment and repair works, the web application will connect the user and service provider and also provide with some of the suggestions for the type of material to be used in the work. This will be a platform that will grow as time passes and also become much better at providing a good user experience because we can use Machine Learning in the future to make our web application much more efficient and useful. There is also the factor of Graphical Information System; a geographic information system (GIS) is a computer-based tool for mapping and analyzing feature events on earth. This tool will be immensely helpful in the development of this project because it will give us the prospect to expand and provide a graphical interface globally

The project is based on web development and provides the user with the required services. The web application is modified hence can serve many purposes according to our needs.

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