



GeoJSON Location Based Information Passing System (GLIPS)

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Abstract— A location-based service oriented application is presented in this paper, allowing the user to pass information based on the geographical position. GeoJSON is used for encoding the spatial data which provides support to many Geometric types[7]. Google Latitude Technology is used for getting latitudinal and longitudinal location of any object. Users registered in particular location is stored in local database of GLIPS. Messages are passed based on the geographical locations of the users stored in the database. Each module in this project contributes to a versatile and large level to bring about an interesting salad of technologies. JSON, or JavaScript Object Notation, is an open standard format that uses human-readable text to transmit data objects consisting of attribute–value pairs[7]. It is used primarily to transmit data between a server and web application, as an alternative to XML. This technology is used in this project as a major platform.

Keywords— NodeJS; CouchDB; RESTful Web Services; JSON; GeoJSON; Open Source; Google API; Javascript; NoSQL Database; Geolocation; message passing; secured.

I. INTRODUCTION

A change in technology is the only thing that never changes. GeoJSON Location based Information Passing System as termed as GLIPS would make a major impact in existing location-based services.. The main objective of the proposed system is to improve the efficiency and reliability of such services in real world. The technologies used to develop this proposed system are open source libraries . Open source provides various openings for development of vast technologies based on existing idea or prototype. Adoption of NoSQL databases and JavaScript based framework has become latest trend among developers. Loosely packed databases rules the storage concepts among JavaScript web application developers.[2] Node.js is a platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.[6][5] . Many latest web applications are built using Node.js and it is termed as fast growing rapid development framework for web. JSON has become the most popular format which overtook previous XML formats. GeoJSON adopts that for purpose of GeoSpatial information manipulations[5]. GeoJSON is a format for encoding a variety of geographic data structures. GeoJSON object may represent a feature, geometry, or a collection of features of various uses. GeoJSON provides support to the geometry types such as Point, LineString, Polygon, MultiPoint, MultiLineString, MultiPolygon, and GeometryCollection.

CouchDB is a database that completely embraces the web. Store your data with JSON documents.[11] It allows access documents with web browser, via HTTP. Query, combine, and transform your documents with JavaScript. CouchDB supports modern web and mobile applications. It is possible to serve web apps directly out of CouchDB. And it can be used to distribute the data or applications efficiently using CouchDB's incremental replication. CouchDB supports master-master setups with automatic conflict detection.[11]

II. RELATED WORKS

Research done on existing and previous implementations of prototype, the efficiency and reliability of the system is found to be very less compared to proposed prototype. RESTful web service is found to be the main advantage of the proposed system which are not found in the previous real time projects. GeoJSON is a format for encoding a variety of geographic data structures. A GeoJSON object may represent a geometry, a feature, or a collection of features.[10] GeoJSON supports the following geometry types: Point, LineString, Polygon, MultiPoint, MultiLineString, MultiPolygon, and GeometryCollection. Features in GeoJSON contain a geometry object and additional properties, and a feature collection represents a list of features. Such type of functionalities are not provided in previously implemented projects used in day-to-day life.[12]

In the existing system, the platform used to developed such real time application involved efficiency constrains and those are resolved in the proposed system.

Structured database are used in most of the recent implementation of the prototype, while in the proposed system the database are non-structured and loosely packed. CouchDB has no fixed schema. Instead it stores documents which are formatted JSON. JSON, being a lightweight and easy-to-understand notation for simple data structures, is great for this task. And without a rigid schema, CouchDB excels at being a fast developer-friendly datastore.

Leaflet is a modern open-source JavaScript library for mobile-friendly interactive maps[12]. It is developed by Vladimir Agafonkin with a team of dedicated contributors. Weighing just about , it has all the features most developers ever need for online maps[12]. This work is very much related and helpful for the implementation of GLIPS.

Location-Based Services

Location-Based Services(LBS) are very much popular among modern applications that take your geographic location (city, state, location of your mobile device, etc.) into consideration. It access these informations using the Global Positioning System (GPS). Web applications too take this as an advantage to provide geographically relevant content. Search engines including Yahoo! and Google adopt these technologies. Conference related to LBS include O'Reilly's Where 2.0 and the Location Intelligence Conference.[15]

Global Positioning System (GPS)

The Global Positioning System (GPS), developed by the United States Department of Defense, uses numerous satellites that send signals to a GPS receiver to determine its exact location. (A Russian system called GLONASS also exists, and a new system named Galileo is under development in Europe.) In the 1980s, the US Department of Defense opened GPS for civilian use to encourage satellite technology development. Numerous location-based services are now available using GPS technology, such as GPS mapping devices used in cars or on mobile devices. GPS is also being used for safety. GPS found many places in latest applications such as GPS mapping devices used in cars or hand held devices. GPS is largely used in safety and serves lot of purposes.[15] To meet requirements of many safety commissions all over the world, wireless carriers have been developed GPS-enabled cell phones.[15] These phones also provide premium services, such as driving directions and local information. Many GPS enabled applications powered by Google is released inbuilt in latest android mobiles.

Mapping Services

Google Maps is one of the most popular mapping applications available online. Google Maps can be used for business purposes as well as for accessibility. It helps to locate businesses in your area and find businesses in various place across the world. The provide many features along with the locations. It can also be used for getting driving directions, traffic information and it provides easy integration with your website. Google Maps API provides such facility for the developers to integrate them in their websites. Google Maps serves even the mobile users in large level. In some areas, you can even get a panoramic view of a neighborhood at street level. Google Earth provides satellite images of virtually any location on the planet. [15]

MapQuest

MapQuest, owned by AOL, provides similar mapping services. They can be used to get directions from mobiles and computers.[13]. The MapQuest OpenAPI allows the developers to add location-based services to web applications in easy way. Additional mapping services include Yahoo! Local Maps and MSN Live Search. Both services offer maps, driving directions, traffic information and local search.[13][15]

Companies including NAVTEQ, Tele Atlas and many companies provide digital map data for in-vehicle and portable navigation devices, websites, location-based services and more. Commercial location-based services built by Developers can license the mapping products from these companies to build rich Web applications.[15]

III. PROPOSED SYSTEM

There are several modules involved in the proposed system. Since the project follows MVC pattern there are various modules assigned to each partitioning of project modules. The Model component includes modules such as Storing of Geographical data,Strong data of user registered in particular location and database for information passing system. View component includes Map display and other UI/UX modules designed for user to interact with the system. Controller component includes control passing modules.

The CouchDB API is the primary method of interfacing to a CouchDB instance. Requests are made using HTTP and requests are used to request information from the database, store new data, and perform views and formatting of the information stored within the documents.

Requests to the API can be categorised by the different areas of the CouchDB system that you are accessing, and the HTTP method used to send the request. Different methods imply different operations, for example retrieval of information from the database is typically handled by the GET operation, while updates are handled by either a POST or PUT request. There are some differences between the information that must be supplied for the different methods.

For nearly all operations, the submitted data, and the returned data structure, is defined within a JavaScript Object Notation (JSON) object. Basic information on the content and data types for JSON are provided in JSON Basics.Errors when accessing the CouchDB API are reported using standard HTTP Status Codes. A guide to the generic codes returned by CouchDB are provided in HTTP Status Codes.

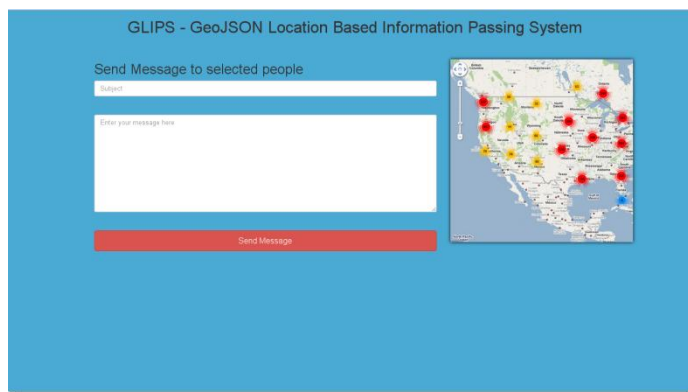


(Fig 1 Message Transfer System)

The user while registers to this portal, his geographical locations are automatically scanned and stored in CouchDB. Then the user is allowed to select people from the Maps provided by GoogleAPI. The informations are fetched through API and displayed in the user interface of web application. After this instance , the user selects a single or multiple points in the map. The users registered in a location is marked in the map and that helps the users to select them for message passing. After selecting them , the user is then taken to messaging interface where the rich text area is provided for the users to enter the message content. After the user sends the message, the people selected from the Map receives the message alert and hence a successful transfer of informations are done here.(Fig 1)

V. EXPERIMENTAL RESULTS

The geo-spatial information from the database of the application is synchronized with the information in the maps. The spatial data is stored in CouchDB. Various techniques have been employed in increasing the efficiency of the database. Distributed Algorithms are used in this NoSQL Based CouchDB database for improving the scalability and data consistency. Techniques of NoSQL Data Modeling are also used for denormalization, aggregation and application side Joins. Other general modelling techniques such as Atomic aggregates , Enumerable Keys, Dimensionality Reduction, Index table, Composite Key Index and Hierarchy Modeling techniques such as Tree aggregation, Nested sets and Batch Graph processing are used. Initially the maps API provided by Google code helped in connection to the geographical locations. The location registered by the user is prior to database of the application and it does not impose any alterations in Google. After the establishment of connection with API repository of google, the Map appears in the application with markers in it. The marker informations are fetched from the application database and it is applied in the Map displayed in the Webpage. The user is allowed to select the people he/she wants to send message by selected the markers in the map. The markers selected by the user will be corresponding to the destined users of GLIPS. The markers appear only when the destined single or group people are registered to the web application. The message can be sent in RTF (Rich Text Format) which is additional facility provided in this application. The message which is being transferred is encrypted which provides the security criterion. It is compulsory to provide security in place of any message transfers. Implementation of such type of security in GLIPS was challenging and it was achieved in large level. Intrusion Detection and Blocking modules are included so as to ensure the security of information being transferred. After the information is sent , the single/group receives the alert of New Message. Now the receiver is allowed to view the Message sent to him/her.



(Fig 2 Message Sending Interface)

Fig 2 shows the screen provided to the user for selected markers from maps and entering message content.

VI. CONCLUSION

Looking back at the evaluation of investigations into GeoJSON it has been interesting to see the depth of interoperability that was able to achieve. Since the size/time to create spatial indexes in CouchDB is much larger/longer than PostGIS. It is the platform that will improve over time and the adoption of this technology in modern web applications would yield a greater result of efficiency. Such detailed note has been implemented in this project where the data transitions from the beginning of registration to receiving messages are completely packed for best performance. It provides vast application in various domain right from social networking to emergency alert system. It could be adopted in any government operations for passing important information to the public or can also be used for awareness based on locality. It can also be used for sending files of any type with great security. The accuracy and speed of message either in form of text or files been sent is the big advantage of this project and contributes to further innovation in larger level. This could be used as a perfect route for nextGen Web applications which are geo-dependant.

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