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Creating Independent Map Using QGIS (Quantum Geographic Information System)

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Abstract- QGIS (Quantum Geographic Information System) is a cross platform, free and open source desktop geographic information system (GIS) application that supports viewing, editing and analysis of geospatial data. The basic functionality of GIS is to relate any location on earth using x, y and z co-ordinates representing latitude, longitude and elevation respectively. Precise and accurate geographical maps can be created using QGIS platform. In this article, we propose making an Open source map using QGIS which can locate Toilets, Hospitals and Dustbins around Mumbai region. The aim of this project is to provide end users those functionalities which are not available in Google Maps and to ease their tasks of finding the places which are not available under normal mapping system. QGIS is used to highlight some of the issues people face today and to map those issues in the context of a geographical map.

Keywords- QGIS; Leaflet; Open-source; layer; GeoJson.

1. INTRODUCTION

From the last quarter of the 20th century, the indispensable tool of the cartographer (a person who produces maps) has been the computer. Much of the cartography, especially at the data-gathering survey level, has been submitted by Geographic Information System (GIS). Having local information such as rainfall level, distribution of wildlife or demographic data integrated within the map allows more efficient analysis and better decision making. There is various open source software in GIS which provides all the functionalities of a map. Some of the options that are available are GRASS GIS, QGIS, FALCON VIEW, CAPAWARE, SAGA GIS, ARC GIS, etc. The Biggest advantage of using QGIS over these systems is that QGIS is free of cost and open source. Main drawback of ARC GIS is proprietary software and it costs thousands of dollars, whereas Google Maps uses a close variant of the Mercator projection, and therefore cannot accurately show areas around the poles. QGIS is maintained by volunteer developers who regularly release updates and bug fixes. Developers have translated QGIS into 48 languages and the application is used internationally in academic and professional environments. The increased user friendliness of open source GIS software packages like QGIS, coupled with agencies and companies looking to trim costs, is leading more and more entities to make the move towards adopting the use of open source software in lieu of purchasing commercial applications. QGIS can be used by layman user as well as by private institutions, government organizations and NGOs for their benefits. A 2010 survey by Accenture on the adoption of open source found that:-

- Two-thirds of businesses around the world have a fully documented strategic approach for using open source, while another 32% are developing a strategic plan.
- Of the organizations using open source, 88 % will increase their investment in 2017.

In this paper, we are proposing an Independent open- source map using QGIS technology and thereby creating a web based map using web development tools. Initially we have to collect all the information regarding the respective places that we have to map into our system. Since visiting every place is virtually impossible, so we are going to crowd source some of the data using Kobo Collect Application available on the Play store. By Crowd sourcing, we are reducing human efforts and thereby making our task simpler.

2. IMPLEMENTATION

There are various stages in the implementation phases. They are discussed below.

A. Requirement Gathering

We have to collect all the information of all the places that we are going to map into our system. Therefore by using a crowd sourcing app called Kobo Collect, we will reduce human efforts. In this app, anyone can collect the data and can send it to the servers maintained at our side. Gradually all the co-ordinates are saved along with the photo.
Co-ordinates will be of those locations which we are going to map such as toilets, dustbins and hospitals.

B. Creating map using QGIS

After gathering all the information, we use QGIS to create a layer for our independent map. For that we also need to make a .csv file and then import it so that all the points all properly assigned to the location in the layer. Multiple formats of raster images are supported and the software can georeference images. After the layer is created, we have to import it into the web based GUI. We use web development languages such as HTML, CSS and Leaflet.js.

C. Deploying the map

HTML and CSS lays the foundation stone for the web based GUI Map. Along with it, we use Leaflet.js. Leaflet.js is the leading open source JavaScript library for interactive maps. It is designed with simplicity, performance and usability in mind. It works efficiently across all major desktop and mobile platforms can be extended with lots of plugins, has a beautiful, easy to use and well documented API. We are using leaflet.js here to create multiple categories as we have mentioned (i.e. Toilets, Dustbins and Hospitals). Furthermore, zoom in and Zoom out functionalities along with the home button is also facilitated in leaflet.js. Leaflet.js also supports GeoJson files, which is a boon to us because all our data files will be in GeoJson format. Layer switcher is yet another feature which is provided in leaflet.js. Tooltips and Popup is also facilitated using leaflet.js. Therefore, it goes to say that leaflet.js plays a very important role in deploying the map. Our data is collected in GeoJson format. GeoJson is a format for encoding a variety of geographic data structures. GeoJson supports the following geometry types: Point, LineString, Polygon, Multipoint, MultiLineString and MultiPolygon. Geometric objects with additional properties are Feature objects. Sets of features are contained by FeatureCollection Objects. The information inside the pop-up is also stored in the GeoJson file along with the latitude and longitude. Any image we want to provide can also be provided in the respective GeoJson file itself. We have also used little code of jquery for layer switching. We have two options, either to use leaflet.js for layer switching or use Jquery. In our map we have used jquery for layer control and switching. In this way, we implement our map with the help of the development languages that are available with us.

3. CONCLUSION

Growth of open source mapping has been extensively increased since the last decade. Taking Open source as the opportunity, we are taking initiative of creating an independent map using QGIS as a platform. We conclude that QGIS can be used to highlight as well as resolve many issues pertaining to the society. In this report, we can analyze that by using QGIS to its potential and mapping it to a user interface; we can make precise and accurate maps for better usage. QGIS runs on cross platform and it is free of cost, use of QGIS has been on the rise since its birth. We can also do complicated analysis and visualization using QGIS. QGIS has huge scope in the future as far as analysis and development of a region is concerned. Many private and public organizations have now started to adopt QGIS Mapping system into their administrations. For E.g.:- Austrian State of Vorarlberg, Swiss Cantons of Glarus and Solothurn, Mumbai (DP 2034), Baltimore city of US and many more have used QGIS for their commercial usage.

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