

## Review Paper on Applications of Q-GIS Software

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**Abstract** - GIS is a geographic information system and it is used for gathering, managing an geospatial data. it's become popular amongst researchers to capture and study geographical data. It analyse spatial area, organizes layers and location and data into visualizations using maps and 3D scenes. It interpret data understanding relationships, patterns, and trends. Such visualization of geographical data and analyzation impact understanding of the globe we reside. This study utilized open source GIS software namely Q-GIS and study the applications of Q-GIS. In following study a number of the applications of Q-GIS are considered like mapping of Accidents zones, Covid-19 patients, ATM's, Route Optimization in Q-GIS. We successfully implemented a number of the applications and tested the efficiency and data analysis done over the Q-GIS and is it truly user-friendly.

**Key Words** : Q-GIS, Road accident, Road safety, Earthquake zone, Route Optimization, ATM, Covid-19 patients.

### 1. INTRODUCTION

GIS Applications are normally programs with a graphical program which will be manipulated using the mouse and keyboard. the appliancation provides menus almost the highest of the window (File, Edit etc.) which, when clicked using the mouse, show a panel of actions. These actions provide the way for you to inform the GIS Application what you try to do. as an example you will use the menus to inform the GIS Application to feature a brand new layer to the display output.

This study aims to identify and analyse the application of Q-GIS in different aspects and to find out if it is efficient or not. The study that are taken for analysis are as fallows:

- Mapping Location of Road Accidents
- Geographical Locating of Covid-19 Patients
- Locations of ATM's
- Route Optimization
- Earthquake Zones landslides spots

### 2. METHODOLOGY

This study utilized QGIS which is an Open Source Geographic Information System for analysis [2]. We have conducted the study on above points and the Methodology that are individually used in each of points are as follows:

#### 2.1 Mapping Location of Road Accidents

Road Accidents are very dangerous and it is increasing day by day. They are multi factor event needed to be analysed carefully. They have the most vital impact, identification of hot spots is a vital step in safety management [2]. India is top most in road accidents occurance. Q-GIS is useful in finding and analysing such location or Hot spots and improving safety management system. This study utilized open source GIS software namely QGIS to geocode road accidents locations over the digitized map [2]. To evaluate spatial clustering of accidents and spatial densities, heat map plugin is used. These heat maps could be effectively utilized by various agencies for optimum planning and management in order to ensure improved traffic conditions and accident reduction [2].

##### 2.1.1 Method of locating Road Accident in Q-GIS

The digitized map of any area can be obtained from Google Street map. Which will be imported in QGIS and saved as new layer. The location of accidents will be geocode by giving X and Y coordinates to each location. For every geocoded point, an Identity (ID) in a form of whole number is automatically created on QGIS. Every accident location was also attributed with detailed information such as type, landmark, month, date, time, vehicle type etc for further analysis [2]. Using Heat map Plugin it will indicate the areas where accident happens frequently and the intensity of the location is determine by how dark or the lighter the color is. Heatmap will calculate the density of accidents in the required kernel bandwidth [1]. Kernel bandwidth is the distance at the point where the accident area affects the other points. This study uses the Kernel Density Estimation (KDE) method with a search bandwidth in an area of 300

meters<sup>[2]</sup>. KDE will divide the research area into several pre-determined cells. Figure shows the kernel density analysis method used in the search area along the road<sup>[2]</sup>. The calculation of KDE is calculated based on each unit area of the point or feature line using the kernel function to get the right line to each point. The heat map generated with the highest density of accidents within a certain period so that it can be used as an analysis for the police and road users.

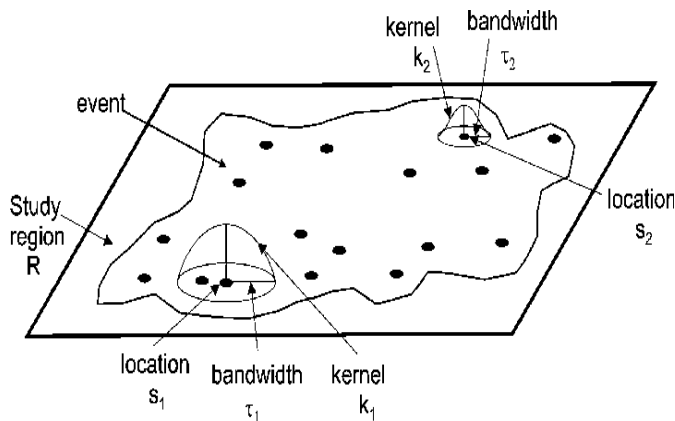


Fig. The Principle of Kernel Function

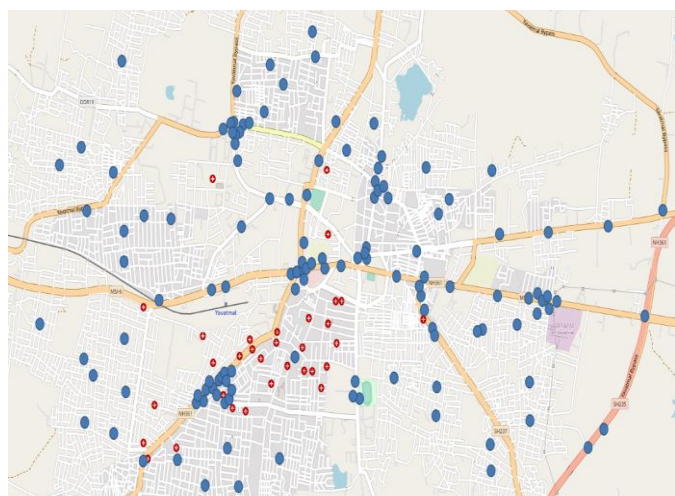


Fig. Image Representing Road Accidents Coordinates Point

After research we practically did it on Q-GIS software. And below figure represent the Heat map of Accidents zones.

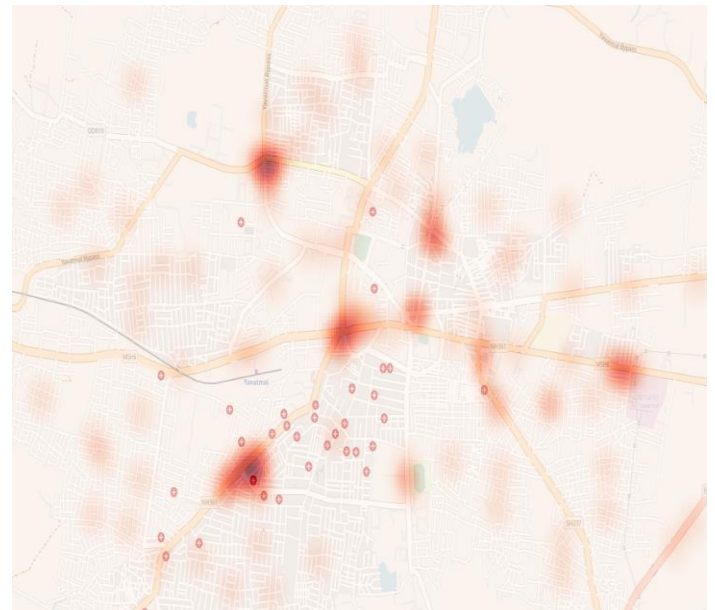


Fig. Image Representing Heat map of Road Accidents

## 2.2 Geographical Locating of Covid-19 Patients

Globally, Covid-19 remains a major public health problem. In current stage of COVID-19 pandemic the safety precautions are necessary for bringing the situation under control. Q-GIS can help in providing the information such as population density, patient information can be shown in geological format which will help in understanding risk factors and COVID-19 clinical characteristics<sup>[5]</sup>. The mapped locations of COVID-19 patients can be done by using Q-GIS which help in understanding the hotspot zone that need to be taken under control by lockdown or other safety drills<sup>[3]</sup>.

### 2.2.1 METHOD OF LOCATING COVID-19 PATIENTS

Firstly we are going to collect data related to covid-19 patients which will be obtained from medical authority Districts / States. The location of patients will be geocoded by there respective coordinates. After geocoding each area can be divided according to the patient density. Every patients location was also attributed with detailed information such as type, landmark, name, dieses, age etc for further analysis<sup>[4]</sup>. Using Heat map Plugin it will indicate according to the areas where more the patients the color of heatmap will be darker.

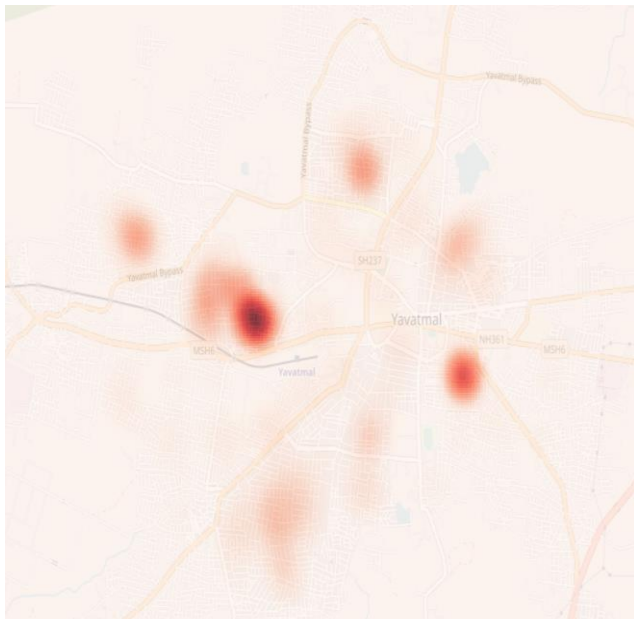


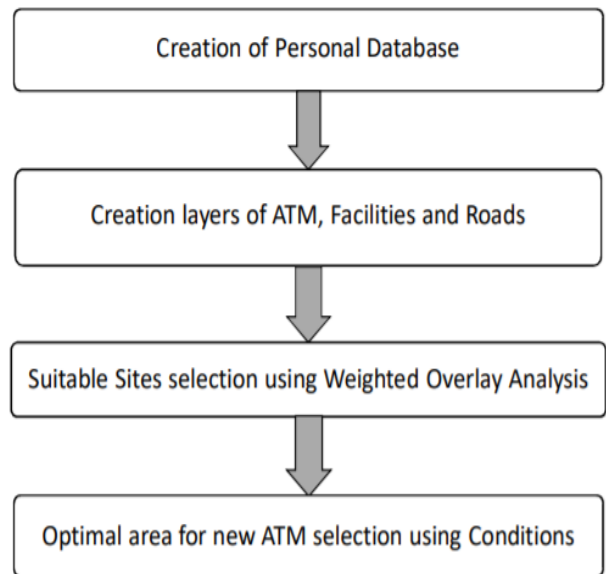
Fig. Image Representing Heat map of Covid-19 Patients

### 2.3 Locations of ATM's

GIS is an advanced tool which helps to collect , stored manipulate , analyse the required geographical data. Selecting a site for ATM requires in depth knowledge to choose their service location of banks and customers. ATM's should ensures that the customers have access to their bank accounts 24hrs a day. A GIS is a data base with a geographic variable is characterised by diversity of an application. Q-GIS allows user to create maps with various layers using different map projections<sup>[6]</sup>.

Presently customers are increasingly demanding the ability to conduct financial business at their convenience and at their preferred location. It indicates banks to locate more ATM for customers convenience. Thus, the Q-GIS is an open source software which enables to locate at a convenience distance which should be closer to major roads for customers safety<sup>[6]</sup>.

In this research to find a suitable locations of ATM's the approach can be designed which is given in the figure. ATM's location should be such as that it should be near to the facilities for the convenience. The data of such facilities are taken from Google Earth map in KML format and import it in Q-GIS. The imported KML format is then converted into shape file format. Open street map services is used to get a features of roads.



After creating topography for all layers. The data can be studied on the Q-GIS in the efficient manner to find the location of ATM's according to the criteria required i.e ,

- The site should be near to facilities<sup>[7]</sup>.
- Area surrounding the site should be as far as possible from existing ATMs<sup>[7]</sup>.
- The location of ATM's should be in close proximity to major roads, considering customer's safety and convenience<sup>[7]</sup>.

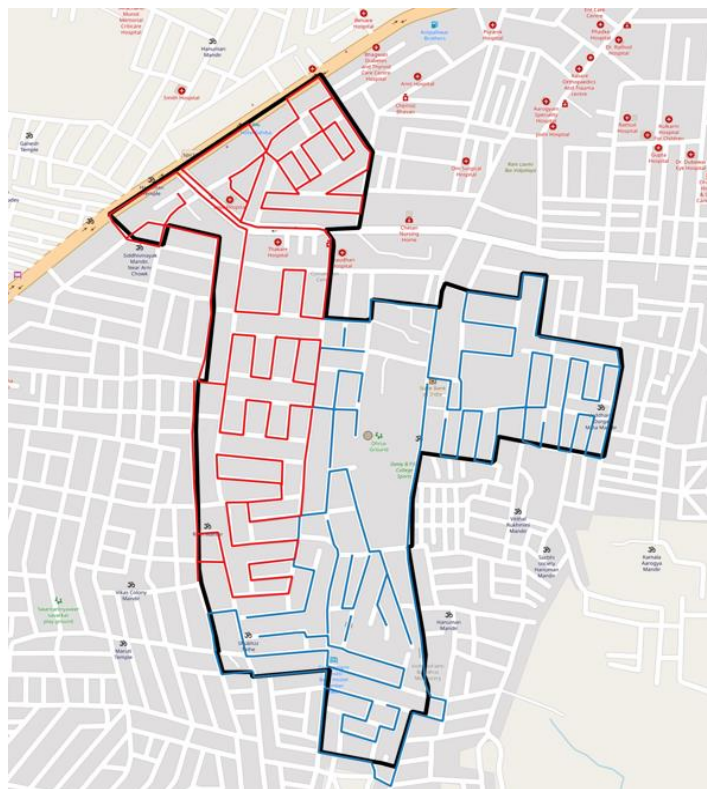
Such criteria can be easily done on Q-GIS to get easy accessibility and convenience to peoples.

### 2.4 Route Optimization

Route optimization is the process of determine the cost-efficient route. You may think that it means finding the shortest path between two points, but it's not that simple: You must account for all relevant factors involved such as the location and number of all stops on the route, time gap, effective loading, cost reduction etc. Route optimization is a solution for vehicle routing problems (VRPs). It is the challenge of designing optimal routes from a depot to a set of destinations each with business-specific constraints, such as vehicle limitations, cost controls, time windows concerning the loading process at the depot, etc. With the help of Q-GIS the vehicle Routing problem can be solved in a geographical manner. The minimum cost pathways also the shortest/fastest can be found for the vehicle will the help of Open Route Service (ORS) tool.



The designated area can be imported with the help of Google Earth in the form of KML file. After importing the new shapefile layer will be formed. Using plugin i.e, Quick map services the area features can be stopped in the geographical format. It is a plugin that makes work with web-based base maps easy. This plugin provides convenient list of services plus search for finding datasets and base maps. ORS plugin is used for the Route Optimization. ORS plugin can give shortest and fastest route after selecting the two end point which will be selected by the user according to their criteria. It can also optimised route upto 50 points. After Route optimization we can also find other details such as distance, cost, etc..



The above red and blue path represent the Optimized Route.

## 2.5 Mapping of Earthquake zone and landslides spots

Earthquake severe hazards to humans and animals in many parts of the world. Earthquake, and landslides causing heavy harm to life of humans and animals and stuff. The objective of this study is to detect the Earthquake zones and landslide spots and to prepare the map by using GIS software. The study contains of comparing potential of QGIS software in the form of data analysis and thematic map construction. Natural hazards like Earthquake impact population, infrastructure, economy and overall growth of the world.

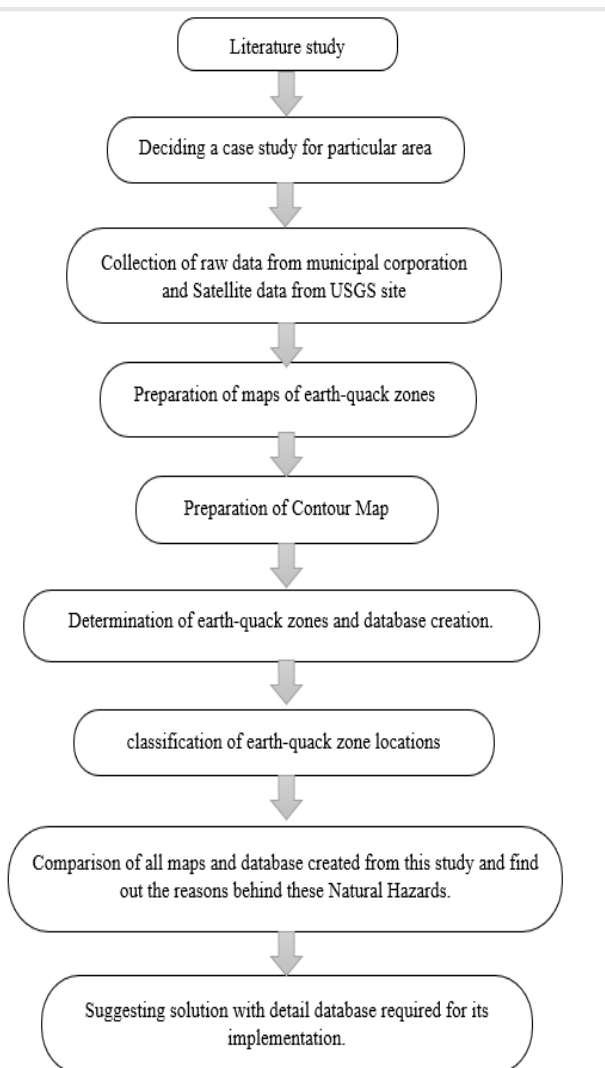
Earthquake occurrence incidents have increased across the world due to numerous reasons, and sufferers of Earthquake damages are huge. The urban Earthquake zones maps are useful tool for mitigation preparation and to classify the areas which need supplementary infrastructure<sup>[8]</sup>

GIS provides an effective way to identify, detect natural hazard-prone areas and insecure structures and properties<sup>[8]</sup>. Huge volumes of data are assembled on various parameters and are presented through maps revealing the hazard-vulnerability-risk of a given area; this paper is intended at creating earth-quake areas and landslide spots for using QGIS software. GIS is considered as one of the convenient tools for hazard, risk analysis and mapping of Earthquake zones.

### 2.5.1 Methodology

Pictures of the satellite were copied by the path, row of the USGS and were freely took on a group. Information for any location you want were collected from the Municipal Corporation of particular location and later on is geo-referenced by using co-ordinate system in QGIS software. This polygon layer was also beneficial in digitizing Earthquake zones. Point layers are formed for all the Earthquake spots, landslides, famous places and transport locations. The map is digitized using the above layer classification which is required to create the attribute table which contains details on the spatial and non-spatial data. QGIS software were used to spot the natural elevation, contour and Earthquake zones for the study area. The study also consists of comparing potential of QGIS software in the form of data analysis and thematic map creation. The wards of particular location digitized that one gets the data in terms of ward name, ward no., ward area, geographical location, number of landslide spots, vulnerability settlement, dilapidated buildings, open gardens, grounds, fire station, police station, bus depots, hospitals, parking lots, rain gauge stations, roads and its lengths, major and minor nallahs, outfalls, topography, and type of city zone just by clicking on that particular ward<sup>[8]</sup>. The Earthquake locations were spotted by using QGIS software. As per the Earthquake, landslide-prone area's data from Municipal Corporation of study area and the data generated taking 1 m contour interval in GIS software, Earthquake and landslide spots were marked using point layer on desitized map. These marked points are so digitized that one can avail data regarding name, ward type, ward number, contour value, and topography just by clicking on the respective Earthquake zones.

### Flow chart of proposed methodology



### 3. Conclusion

- By this study we understood that Mapping Location of Road Accident can be easily done by Q-GIS. This study also produces a heatmap of accident locations in a period that has a high-frequency level in a certain area. The use of heatmaps is more beneficial because it can produce spatial data that is easier to understand because it groups from the same area. In this study, the grouping is done based on the time of occurrence so that a heatmap with red to black is obtained for the density level based on the frequency of occurrence. Safety precaution such as Ambulance can be arrange according to the heat maps.

- By this study we understood that Mapping Location of COVID-19 Patients can be easily done by Q-GIS. This study also produces a heatmap of patient locations in a period that has a high-frequency level in a certain area. The use of heatmaps is more beneficial because it can produce spatial data that is easier to understand because groups from the same area. More precautions should be taken in areas where density of patients is more.
- This study is an ability of a Q-GIS software to be a very efficient powerful tool for the determination of location of ATM's for banks. Also this describes nearest location of ATM's will be beneficial for customers as the ATM's are keys for accessing the bank accounts.
- Using Route Optimization we can reduce cost of vehicle transportation and traffic problems can be solved. Also help in salesman routing problem.
- The study also contains of comparing potential of QGIS software in the form of data analysis and thematic map creation. The main factor is that QGIS is open source software, while other GIS software's are commercial software. Database created from this study is also beneficial for implementation of the pervious concrete. in the future which needs the government bodies, institutions and NGOs and policy makers to take utmost important decisions on assessing the extent of damage caused by Earthquake and landslide and also to make the disaster management plans which can mitigate the situation before and after it gets generated by using this study.

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