Optimum Route Identification by using Road Graph Plugin in QGIS

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Abstract

QGIS (previously known as Quantum GIS) is a free and open-source cross platform desktop geographic information system (GIS) application that supports viewing, editing, and analysis of geospatial data. Optimum route is introduced for optimized routing identification for minimization of the time as well as the fuel consumption. This is possible with the help of QGIS. Here, for optimum length was identified between two locations of the Surat city.
Keyword- Optimum Route Identification, QGIS

I. INTRODUCTION

Optimum route identification is a very common part of the network analysis in geographic information system (GIS) which is introduced for best routing identification to minimize the time as well as the fuel consumption. The optimum route means the shortest route between two junctions with minimum time consumption. It also depends upon the traffic condition, width of the road, road type and the number of junction (Optimal Route Analysis,2016).This optimum route analysis is possible with the help of "road graph plugin" in QGIS. QGIS (previously known as Quantum GIS) is a free and open-source cross platform desktop geographic information system (GIS) application that supports viewing, editing, and analysis of geospatial data.The Road Graph Plugin is a C++ plugin for QGIS that calculates the shortest path between two points on any polyline layer and plots this path over the road network(QGIS User Guide,p.307).It calculates the path with its length and travel time The optimization can be possible on the basis of the length and the travel time criteria.

II. LITERATURE REVIEW

Mohammad Abousaeidi et. al has carried out GIS modelling approach for the determination of the fastest delivery route for the fresh vegetables. The work was carried out to Kuala Lumpur, Malaysia with the help of ArcGIS software. According to author, network analysis tool helps the decision-makers determine the best routes among all of the existing road networks for transportation and delivery services.

M. Sureshkumar et.al argues that route optimization is one of the important requirement for proper traffic management in cities. Kanchipuram , Tamilnadu has been adopted for the study area for the determination of alternate routes for effective traffic management via Arc map 10.1 software.

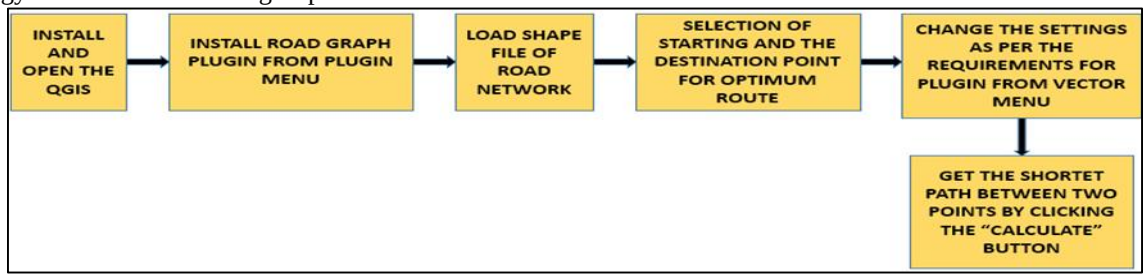
J.R. Kinobe et.al has used GIS tool for Kampala city to optimize travel distances, trips and collection time, for the waste collection and transport system. Total number of trips and travel time has been decreased through GIS hence fuel consumption and vehicle emission also decreased. As per the author, the GIS based routing procedure is flexible and could be used in planning of waste collection policies and decision making mechanisms in waste management.

- Study Area

Surat city, Gujarat, India

- Methodology

Methodology includes the following steps:



Step-1: Software and plugin installation

First step is to install and open QGIS software and after that install "openlayers plugins" and the "road graph plugin" from plugin menu.

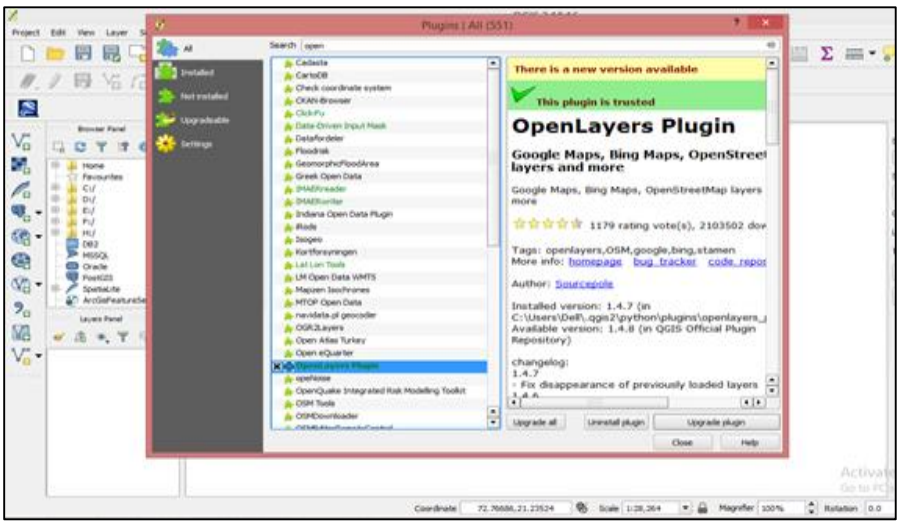


Fig. 1: Plugin manager in QGIS

Step 2: Creating shape file and adding base map

The shapefile for road network of suart city were generated with the help of the software "Spatial manger", for the background base layer, "Open street map" was selected from the web menu.

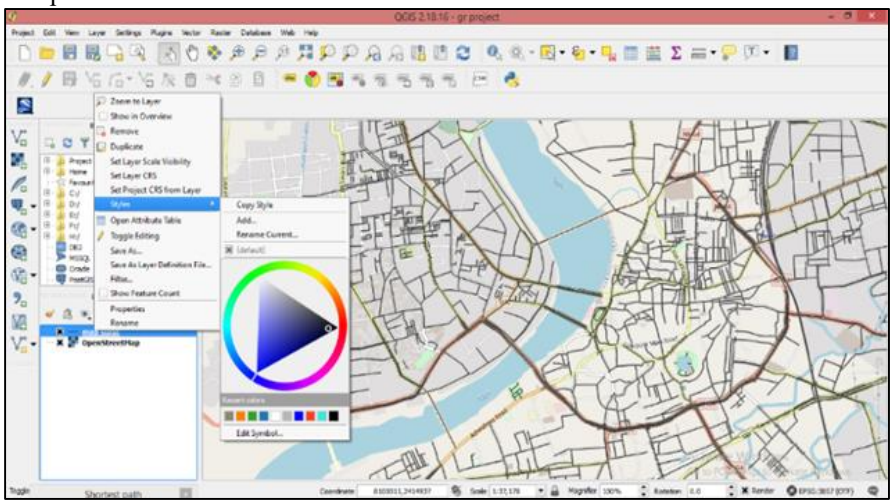


Fig. 2: Road network of Surat City

Step 3 : Selection of locations for getting shortest route between them. For this step, the direction of travelling, number of trip, average speed between nodes, output result units can be changed as per our requirements

Fig. 3: Optimized route between Athwagate to Surat station

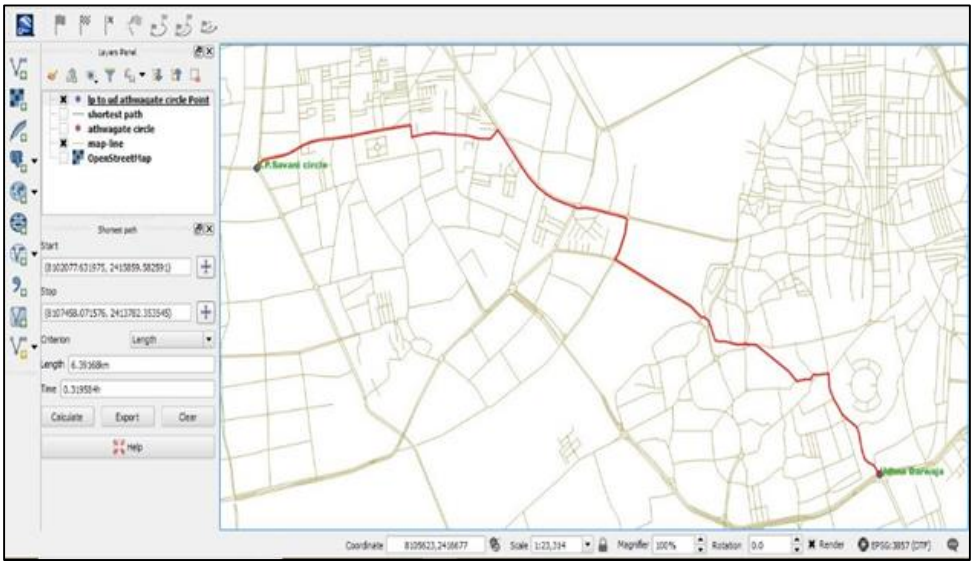


Fig. 4: Optimized route between L.P. Savani circle to Udhna Darwaja

III. RESULT

The obtained result from Surat station to Athwagate via QGIS was 4.2 km while the same result obtained via google map was 4.9 km. This difference was probably due to the different base map, here we made a shapefile with the help of openstreet map, while google shows the result with the help of google map. Hence the overall obtained result is fairly accurate in terms of the optimum length. For the time requirement we assumed 20 km/h average speed of vehicle throughout the road and we got 12.5 minutes for single forward trip.

Trip	*Type*	*Length*	*Average speed*	*Time required*
Athwagate circle to Surat railway station	*One way trip*	*4.2 km*	*20 km/h*	*≈12.5 minutes*
	Two way trip	*8.4 km*	*20 km/h*	*≈25 minutes*
L.P.Savani circle to Udhna Darwaja	*One way trip*	*6.4 km*	*20 km/h*	*≈19.2 minutes*
	Two way trip	*12.8 km*	*20 km/h*	*≈38.4 minutes*

Table 1: Result table obtained via QGIS

Trip	*Type*	*Length*	*Average speed*	*Time required*
Athwagate circle to Surat railway station	*One way trip*	*4.9 km*	*18.37 km/h*	*≈16 minutes*
	Two way trip	*9.8 km*	*18.37 km/h*	*≈32 minutes*
L.P.Savani circle to Udhna Darwaja	*One way trip*	*6.6 km*	*30.55 km/h*	*≈13 minutes*
	Two way trip	*13.2 km*	*30.55 km/h*	*≈26 minutes*

Table 2: Result table obtained via Google map

Fig. 5: Google map result for shortest route between (1) Athwagate to Surat station and (2) L.P.Savani circle to Udhna

IV. CONCLUSION

Route optimization can be effectively done via QGIS, Here the obtained optimum length for two different locations closely matched with the google map result. We also obtained estimated time to reach to the destination point along with the shortest route. The route optimization through GIS can be effectively used for the road planning and network designing to save the time and cost of transportation.

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