SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

GIS Based Modelling of Routes of the Allahabad City (U.P.)

Seemab Akhtar[1], Priyamvada Singh[2], Sufia Rehman[3]

[1]University of Allahabad, Allahabad
[2]Assistant Professor, University of Allahabad, Allahabad
[3]Department of Geography, Jamia Millia Islamia, New Delhi

*Corresponding author: akhtarau90@gmail.com

ABSTRACT:
The current Geographic Information System (GIS) modeling work is to analysis the shortest and fastest route among the city of Allahabad's routes. These alternative routes save time, fuel and money and are the best for driving, which is especially important for emergency case. Allahabad city is the seventh most populaces place in the state of Uttar Pradesh and has recognized the fastest growing cities. Although, a number of roads connect almost the all stoppages and stations and the vast population leads the city very busy and vibrant, as a result chaos occurs very often on roads, where one can easily get confused to find the best and convenient way to reach the destination. The inconvenience is even worst when the roads are very long time taken and passed through much traffic hold areas, however at the same time some short roads are available to reach a station from a stoppage and these alternative routes may free from the traffic noise. Purpose of present research work is to extract these alternative routes with the help of ARC GIS software. There are 23 stations and 69 stoppages selected in the city of Allahabad. In present work station is hospital and stoppage is an accident spot.

Keywords: ARC GIS, Fastest, Shortest route

INTRODUCTION

Geographic Information System(GIS) can be used many characters in emergency management. It is an effective tool for determining emergency vehicle response routing and solving the traffic problem. A shortest path algorithm applied to a routing problem in a transportation network can calculate the path with minimum travel distant or least impedance from an origin to a destination. Depending on the type of cost, the shortest path can be referred to as the shortest and fastest, or most optimal path or route. Emergency medical services are a system that provides emergency medical care. Once it is activated by an incident that causes serious illness or injury, the focus of Emergency Medical Services (EMS) Emergency Medical Care and the patient (s). Technological advances such as geographic information system (GIS), can allow emergency vehicle to reach patients more quickly (Wilde 2009). In present paper work incident place is stoppage and hospital is station.

STUDY AREA

Study area of the present research work is focused on the Allahabad city. Allahabad area is started from the 81.45^0 E, 25.30^0 N the 82^0 E, 25.15^0 N. and covers area of 1087 km^2 . Its elevation from mean sea level is 98m. Major geographic locations of the stoppages and hospitals come in the area of Allahahpur, Katra, Tailyerganj, Govindpoor, Rasulabad, George Town, Salori and Civil Lines. In Figure 1 has shown the map of study area.

DATA COLLECTION

All data collection of stoppages (incident place) and stations (Hospital) were collected in the form of latitude and longitude by GPS. The data base was constructed by using the data base programme Microsoft Excel. There are 68 stations (hospitals) and 23 stoppages (Incident places) marked in the Allahabad city.

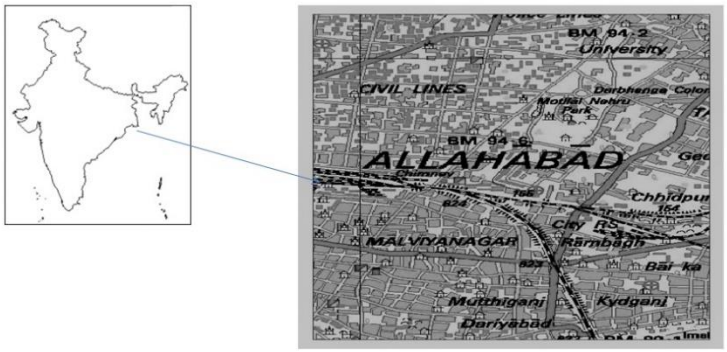

Fig. 1 Study Area

METHODOLOGY

The scope of this research was to employ GIS in finding the shortest and fastest route among them as travelling via this short route will save time, money and fuel. The complete method and objective of this

SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

study were segmented into three parts or elements for better accepting. The first part was to successfully develop a functioning dynamic road network for the study area. Analyses without a well-built functioning road network would be difficult to undertake. Second part was to compute shortest and fastest route among the routes of Allahabad city. The third part was to compare travel-distance and time derived from the shortest and fastest route. The appropriate methodology of flow chart for this research work has been shown by Figure 2. For this paper work first collect the data and SOI map of the study area and construct the data base. After then import on the ARC GIS software and made map to georefference. Next phase for this paper work is to create a point shape file for data collection of stoppage (Incident Place) and station (Hospital) and digitized the roads of the Allahabad city. Main theme of present paper work is to construct a network data set for the route of the Allahabad city. Network data sets constructed are on ARC GIS 10.4.1. After then create a route analysis layer and locate stoppages and stations on the route analysis layer. And finally run for the shortest and fastest route over the network data set of routes of Allahabad city and calculate the shortest distance and time taken by a vehicle (Ambulance) on these GIS based of the shortest and fastest route.

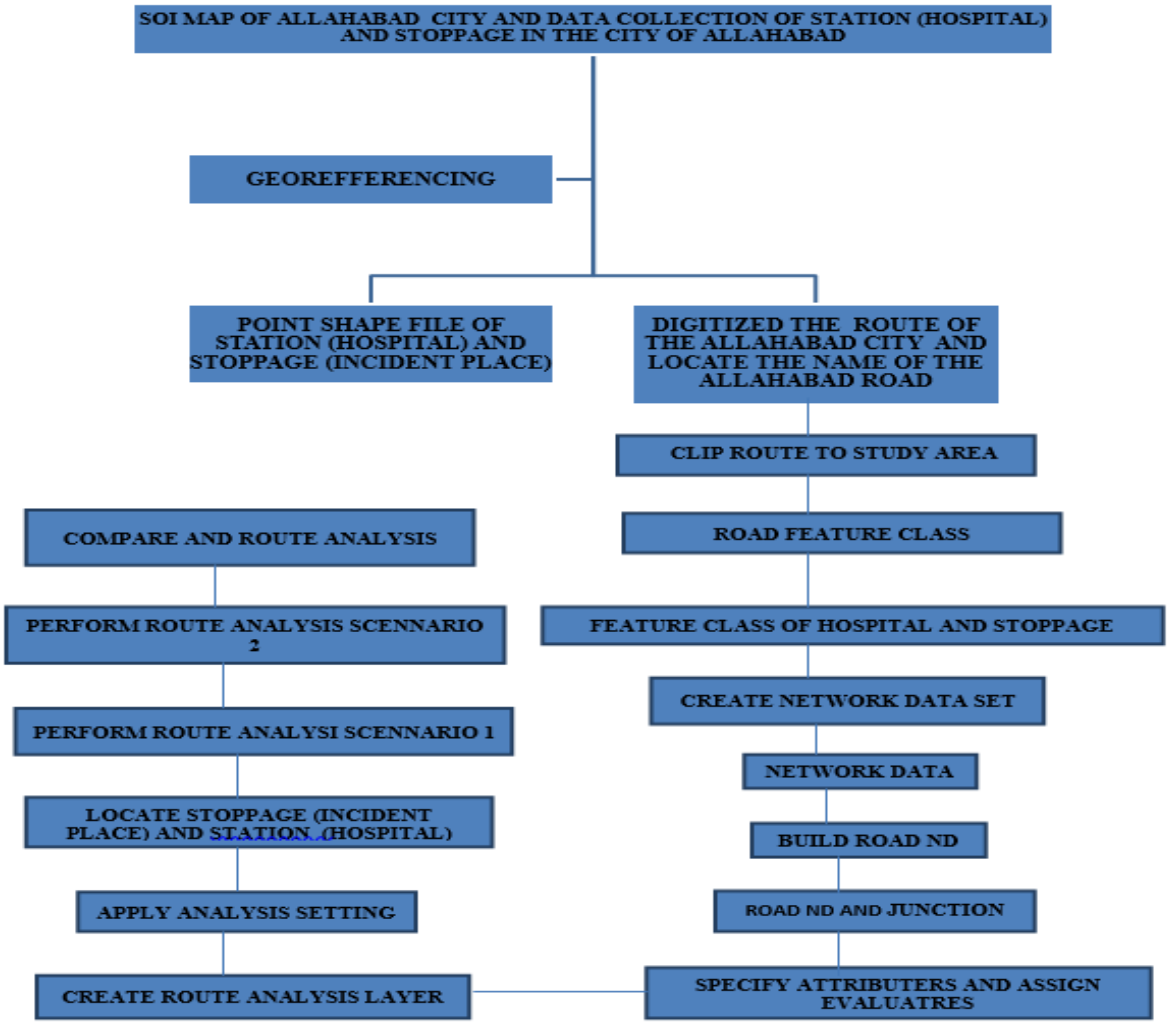

Fig. 2 Work flow of the overall study

Results and Discussion

From the digitized route of Allahabad city, it can be advocated that highly compressed route areas are George Town Allahpoor while civil line are less dense route areas. Figure 3 has revealed the digitized map of the Allahabad route.

From Figure 4 it is clear that most of the Hospitals are located in the civil lines area, and in Figure 4, symbol store is marked as a stoppage, which is an incident places and symbol H is the symbol of Hospitals, which act as a station.

SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

Figure 5 has been shown the network data set of Allahabad route. Network data set of Allahabad route is the heart of the present research work. Network data sets are constructed in a geodatabase using Allahabad routes and their turn features. It defines connective rules and network attributes for the network dataset. Figure 6 has been shown the driving direction of the shortest and fastest route from a stoppage (civil line Taxi Stand) to the station (Nazareth Hospital) and total length of the shortest path is 589.0 meters. The distance of the same destination from the other route is about 1.5 km which is much larger than the shortest and fastest route. Similarly, other routes are evaluated in a same fashion. Figure 7 and 8 has been shown the final networking of the shortest and fastest route among the roots of Allahabad city.

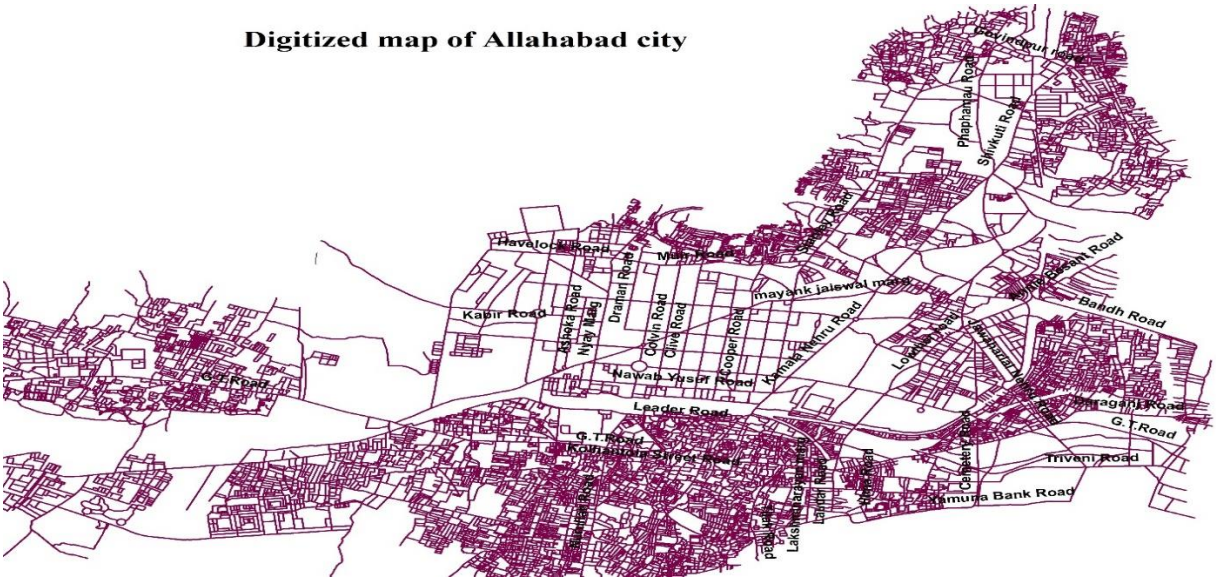

Fig.3 Digitized route of Allahabad city

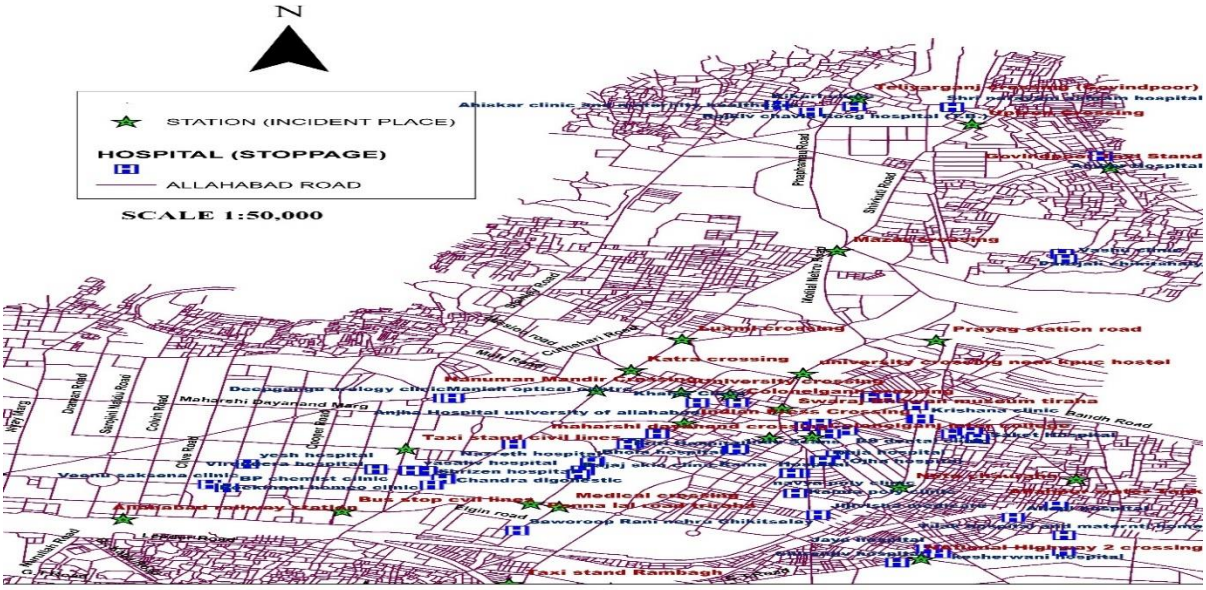

Fig.4 Digitized route of Allahabad city and geographic locations of the stoppage and hospital.

SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

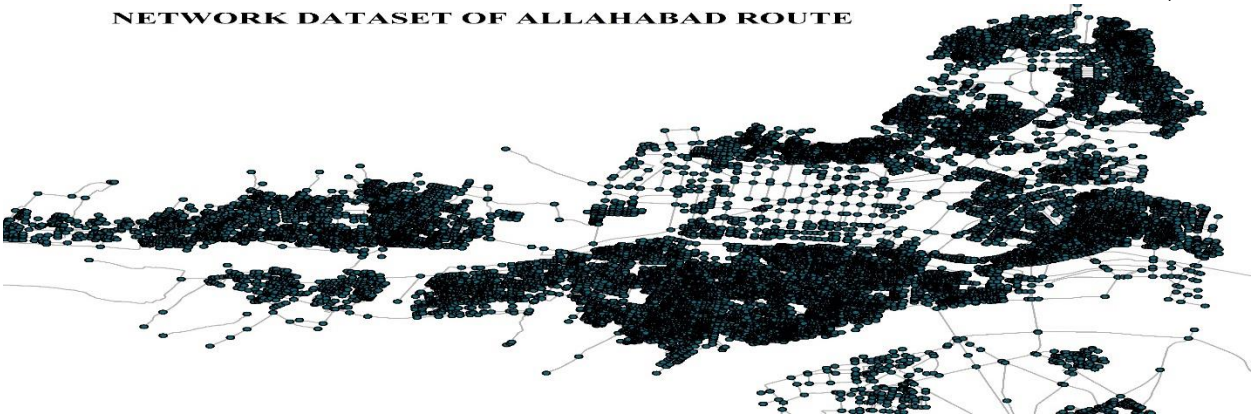

Fig.5 Network data set of Allahabad route

Driving Direction

1. 0 meter start Graphic Pic 1
2. 0 meter go east Kasturba Gandhi Marg 438.8 m
3. 438.8 meter turn left to Kamla Nehru road 150.2 m
4. 589.0 meter Finish at graphic pic 2
5. Driving distance 589.0 meter

Fig. 6 Driving direction of the shortest and fastest route from Taxi Stand Civil lines to Nazareth hospital.

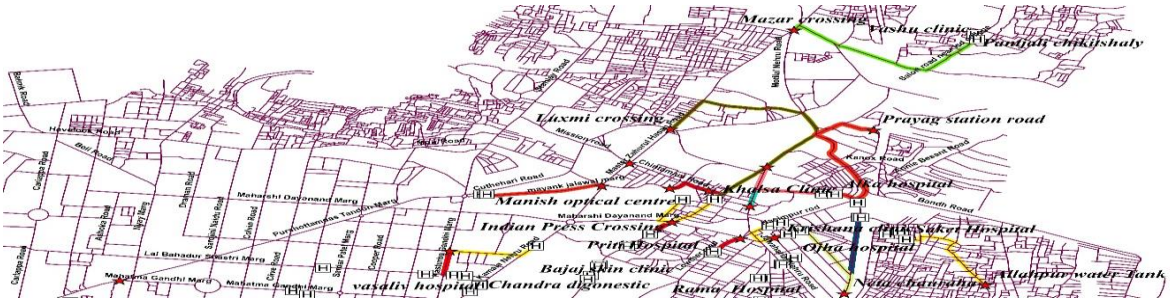

Fig.7 The shortest and fastest route among the routes of the Allahabad city.

SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

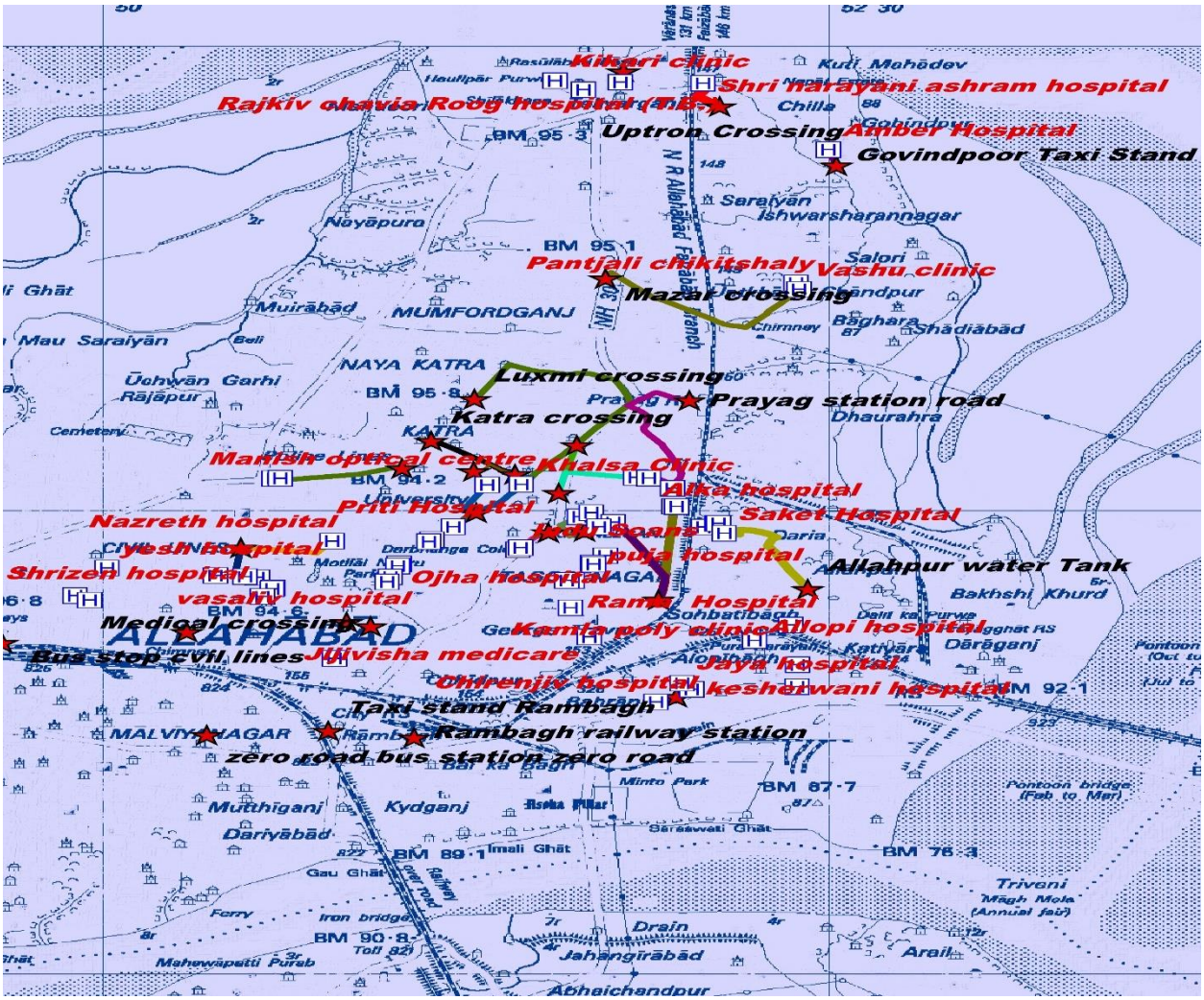

Fig.8 The shortest and fastest route among the routes of the Allahabad city.

CONCLUSION

The shortest and fastest routes are especially designed for emergency services of a vehicles (Ambulance). Suppose the normal velocity of an ambulance is 40km/hrs. then the shortest time is calculated from the shortest path has given in Table 1. From table 1 it is cleared that these paths are saved fuel and time for an ambulance. From these studies it is also cleared that if these paths are unrestricted from the traffic hold area and well maintain then average speed of an ambulance hike from 40 kms\hrs to 60 kms\hrs and patients reached very soon to hospital.

Table 1 Time evaluated from the shortest and fastest route.

Serial No.	Stoppage (Incident Place)	Shortest Distance (m)	Station (Hospital)	Shortest Time (Sec)
1	Taxi Stand Civil Line	395.1	Virendra Hospital	35.91
2	Allahpoor Water tank	592.2	Shaket Hospital	53.3
3	Colonelganj Crossing	294.47	Anjha Hospital	26.52
4	Colonelganj Crossing	139.9	Bharat Hospital	12.59
5	Teliyerganj Crossing	282.4	Rajkivchaviaroog Hospital	25.59
6	Hanuman mandir Crossing	736.3	Deepganga urology clinic	66.27
7	Indian Press Crossing	197.6	Priti Hospital	17.78

SGVU J CLIM CHANGE WATER
Vol. 3 ,2016 pp. 1-6
ISSN: 2347-7741

8	Katra Crossing	583	Khalsa Clinic	52.47
9	Luxmi Crossing	294.6	Anjha Hospital	26.51
10	Luxmi Crossing	2329.5	Khalsa Clinic	209.67
11	Maharishi Dayanand Marg	228.8	Bhola Hospital	20.59
12	Mazar Crrossing	1526	Vasu Clinic	137.35
13	Neta Chauraha	928.6	Krishna Hospital	83.58
14	Neta Chauraha	1490.7	Alka Hospital	134.17
15	Neta Chauraha	230.5	Trishila Hospital	20.74
16	Neta Chauraha	230.5	Tamnna Hospital	20.74
17	Teliyarganj Crossing	1446.4	Shrinarayaani Hospital	130.18
18	Sawaraj Bahwan Museum	619.19	Sarojoni Naidu ball Chikitshaly	55.73
19	University Crossing	8639.9	Sarojoni Naidu ball Chikitshaly	777.66
20	University Crossing	1228.6	Alka Hospital	110.58
21	University Crossing and colonelganj crossing	462	Khalsa Clinic	41.58
22	Pryag Station	1490.3	Alka Hospital	134.14
23	Uptron Crossing	4576.9	Shri narayani Hospital	411.96

REFRENCES

Dueker K. T., and Ton T., 2000. “Geographical information systems for transport,” In: Handbook of Transportation Modelling (D. A. Hensher and K. J. Button, eds.), pp. 253-269. Pergamon, Amsterdam

Goodchild M. F., 2000. “GIS and transportation: Status and challenges,” GeoInformatica, vol. 4, issue. 2, pp.127-139

Goodchild M. F.,1998. “Geographic information systems and disaggregate transportation modeling,” Geographical Systems, vol. 5, pp. 19-44

Liu S. and Zhu X., 2004. “An integrated GIS approach to accessibility analysis,” Trans. GIS, vol. 8, pp. 45–62

Miller H. J. and Shaw S.L., 2001. “Geographic Information Systems for Transportation. Principles and Applications,” Oxford University Press, Oxford

Singh S.K., Chandel V., Kumar H., Gupta H., 2014 “RS & GIS based urban land use change and site suitability analysis for future urban expansion of Parwanoo Planning area, Solan, Himachal Pradesh (India)”, Inter J Develop Res, Vol. 4, Issue. 8, pp. 1491-1503

Spear B. D. and Lakshmanan T. R., 1988. “The role of GIS in transportation planning and analysis,” Geographical Systems, vol. 5, pp. 45-58

Sutton J. and Gillingwater D.,1997. “Geographic information systems and transportation-Overview,” Transportation Planning and Technology, vol. 21, pp. 1-4

Waddell P., 2002. “Urban Sim: Modeling urban development for land use, transportation and environmental planning, J. Am. Plan. Assoc., vol. 68, pp. 297–314