

# Advanced Traveler Information System for Aurangabad City

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**Abstract**—The Advanced Traveler Information system (ATIS) play very important role to solve the different traffic related problem. It is one of the most used ITS and helps to find out all travel-related information so that travelers can take correct decisions about the best transportation route, time and mode for trip. Accurate, integrated and comprehensive information about area, zone, road, closest facility, and location information helps all travelers in their journey planning decisions and reach as fast as at destination. This paper analyzes application that guide the driver to find the fastest path between his or her current location and final destination with closest facilities like ATM, Bank, Shopping mall, Hospital etc. It represent a powerful solution on traffic problem to efficiently manage and integrate many types of information required for the planning, design, construction, analysis, operation, maintenance, and administration of transportation systems and facilities.

**Index Terms**— Advanced traveler information system (ATIS), Intelligent Transport Systems (ITS), Geographic Information System (GIS).

## 1. INTRODUCTION

Now a day the world becomes a closer because of the advanced research and technologies in communication and transportation. Within a short span of time we can travel a much distance and we can make contact with anybody in any part of the world immediately. Every day we are using various means of transport directly or indirectly. Probably vehicles are used to come to school, colleges, offices and go back. In case of transport strike, our daily life is affected in terms of economically and social aspects. A good system is much important in country's economic and social growth. Because of good system of the transport network, tourists can visit places of interest. Business can developed rapidly. But the lack of transport makes all these activities difficult and the overall social-economic development is affected [1]. The above subject will be fulfilled using intelligent transportation system (ITS). The ITS is application of advanced sensor, computer, electronics, and communications technologies and management strategies in an integrated manner to providing traveler information to increase the safety and efficiency of the surface transportation system [2]. There are many application domains of intelligent transportation systems, such as

- Advanced Public Transportation System (APTS)
- Advanced Traffic Management System (ATMS)
- Advanced Traveler Information System (ATIS)
- Emergency Management System (EMS)

Purpose behind the intelligent transportation system (ITS) is to provide good service to traffic related issues, which is more beneficial for traveler [3].

### 1.1 BENEFITS OF ATIS

The following are some of the benefits of ATIS

- Eco-driving made possible (reduces co2 emission)
- School /Hospital Zone Alerts
- Less Fuel
- Reduction of travel time:
- Accident Cost Savings.
- Reduction of stress level:
- Reduction of traffic congestion:
- Avoidance of unsafe driving conditions
- Improved safety to drivers
- Improved traffic efficiency
- Reduced traffic congestion

## 1.2 GOALS OF ATIS:

The goal of ATIS is to provide information to the travelers about the route choice, closest facilities, information about tourist places, and shortest route from source to destination [4]. This ATIS consist zone wise information, it is easiest to traveler to find out different location, road or visitor places. Following are some goals of ATIS for Aurangabad city

- Find out the Shortest path from different places
- Search the Closest Facilities
- Zone wise facilities
- Information about the AURANGABAD city.
- Information about tourist spot in the city.
- Road networks;
- Information about educational institutions, colleges and schools.
- Information about hospitals and offices.
- Information about time tables of bus and railway.

## 2. LITERATURE REVIEW

### 2.1 GEOGRAPHIC INFORMATION SYSTEM (GIS)

A Geographic Information System (GIS) or simply GIS is a computer system for managing spatial data. GIS is a system designed to collect, store, manage, view, and analyze geographical data [5] [6]. Geospatial data consist the characteristics and locations of spatial data [5]. The location or shape represents spatial data, whereas the characteristics are attribute data. Any geospatial data includes spatial data as well as attribute data. Integration of GIS with the global positioning system (GPS), wireless technology, and the Internet has also introduces new and exciting applications [5]. GIS have functional capabilities for data capture, input, manipulation, transformation, visualization, combination, query, analysis, modeling and output GIS consist of package of computer program with user interface that provides access to a particular function.

### 2.2 ROLE OF GIS IN TRANSPORTATION

There are many applications of GIS. Like Disaster Management, Crime Statistics, Archaeology, Civic Planning, Health / Medical Resource Management, Agricultural Applications and Transport. One of the widely used applications is transportation [7] [8]. In terms of transportation GIS play role in

- Road Network
- Traffic congestion and management
- Find out Shortest route
- Traffic Density Studies
- Accident analysis
- Highway maintenance
- Traffic modeling
- Route planning
- Road Transportation Management Using GIS

A GIS can provide a valuable tool for transportation-management. It includes planning, design, construction, analysis, operation, maintenance, and administration of transportation systems [9] [10].

### 2.3 ArcGIS

The ArcGIS system is an integrated geographic system consisting three key parts

- ArcGIS desktop software
- ArcSDE gateway, an interface for managing Geodatabase
- ArcIMS software

ArcGIS desktop includes suite of integrated application like Arc Map, Arc Catalog, and Arc Toolbox. Arc Map is the central application in ArcGIS desktop .It is used for map based task like editing. Arc Catalog help by providing view of all data and databases. Arc Toolbox is simple application contains many GIS tools used for geoprocessing [6].

### 2.4 RELATED WORK

One GIS based application of advanced traveler system was developed by Praveen Kumar (2005). This application is useful to find out shortest path, closest facility, and city bus routes and timetable. The developed application helps to provide information about Hyderabad City in terms of transportation and facilities [1]. Thecla I. (2014) developed a GIS database of tourism for Anambra State of Nigeria. This is GIS based web application, useful in tour planning with showing good quality of maps in the tourist sites [11]. For Eastern U.P, Tyagi (2014) developed a Web based application on Tourism Information System (TIS), using GIS platform. This application is useful in location searching for tourist [12]. Mir Mahammed Hussain Hashmi (2006) developed an Interactive Web-based GIS Application, "Explore Hyderabad" This is online tourist information system .this

application help tourist to find out destination and plan for the trip of Hyderabad city. This application can also assist the city tourist department to promote the tourist activities and increase foreign revenue in the state [3]. One another recent research by Antoine Zimmermann ATIS (2016) he describe the common approaches to managing resources and service for ATIS [13]. Another one of the ATIS application was developed by Zhang et al. (2011). He represent generic multimodal transport network model for developed ATIS applications. This model was created for public and private modes [14]. For Tourism purpose in Sivasagar District in Assam state, ATIS was developed by Namita Sharma (2016). Also in this application GIS environment was used with web portal. This ATIS includes information about tourist spot and nearest available facility. In this system analysis was done on spatial and non spatial data of tourism [15]. Bhupendra Singh developed one of the best applications on Advanced Traveler Information System for Chandigarh city. GIS environment was used to develop this ATIS .same as above ATIS, this system was useful to get information such as closest facility, current location, shortest route between origin and destination, city bus routes, etc [16].

### 3 .STUDY AREA

ATIS development is carried out for the Aurangabad city. Aurangabad City is Tourism Capital in the Marathwada region of Maharashtra. Aurangabad is one of the districts out of 35 districts of Maharashtra state in western India. It is bordered by the districts of Jalgaon, Jalna, Ahmednagar and Nashik.

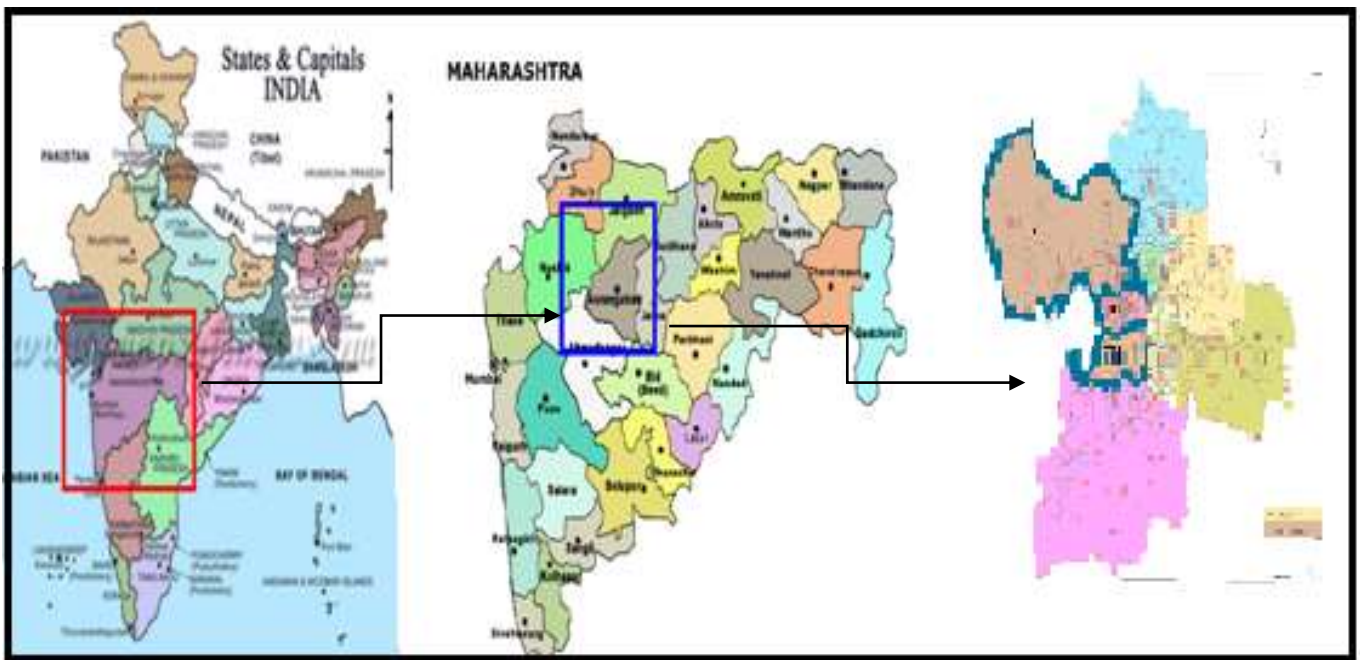


Figure 1 Aurangabad City Geographical location

The district area is 10,100 km<sup>2</sup>, out of which 141.1 km<sup>2</sup> is urban area and 9,958.9 km<sup>2</sup> is rural area [18]. It is an International tourist place because Bibi Ka Maqbara, Ajanta and Ellora Caves, 52 gates ,Shahganj Mosque, Salim Ali Lake & Bird Sanctuary and Sonery Mahal, History Museum, and Caves [17]. Aurangabad district include 9 Talukas and 1344 villages. Aurangabad city is at Decimal Degree 19.880 N and 75.320 E .city includes 9 zone and 115 wards with population approximately 11, 89,376 as per census 2011 [17] [18]. Figure 1 shows Aurangabad city on map of India [19].

### 4. METHODOLOGY

Developing ATIS, the ARCMAP environment was used. In this ATIS, GIS modules are used for the finding shortest route, nearest facility, and location guidance. As well as, Zone-wise information and intercity traveler information, such as bus station, train timing, and traffic status of different signal in peak hour at normal days are also included. Methodology of ATIS for Aurangabad city is shown in Figure 2.

#### 4.1 DATA COLLECTION

Data collection consist three main parts

- Collecting map of Aurangabad city.
- Survey data of traffics at signals.

Implementing ATIS, first step is collecting map of study area.This map is collected from Aurangabad Municipal Corporation (AMC). These maps can be used as a reference which even contains some attributes of major settlements.

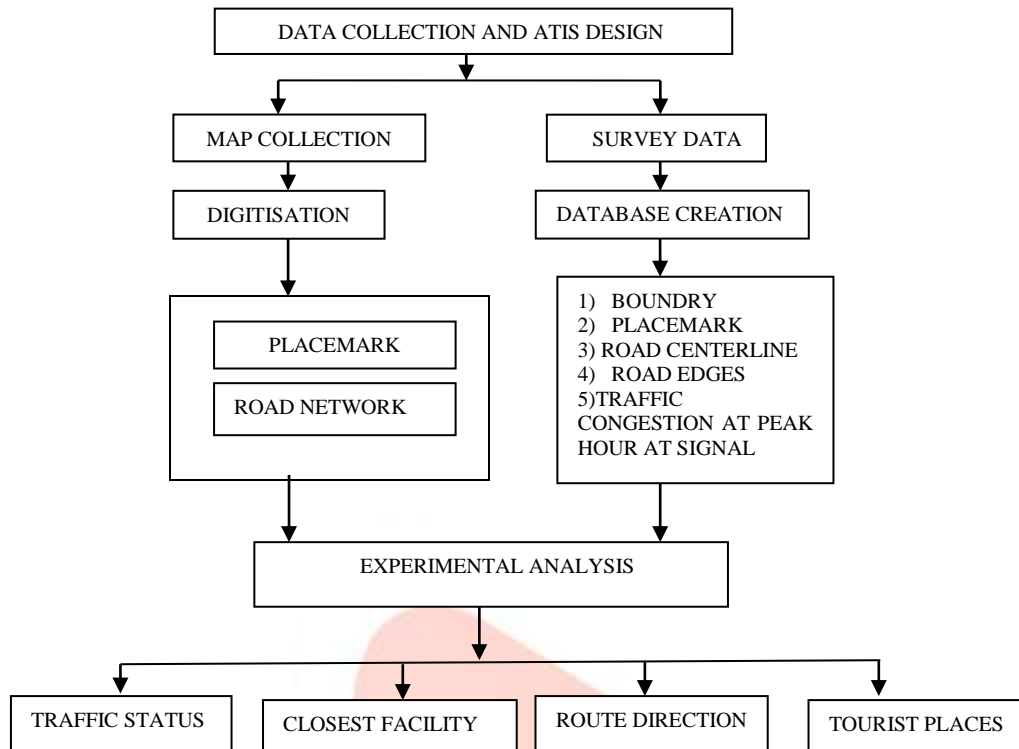


Figure 2 Methodology of proposed work of ATIS

At peak hour of normal day, survey data of the traffic at different signals or roads given in table 1, data at three different places are given. Table consist ,At each route/signal left hand side (LHS )and right hand side (RHS) how many vehicles pass away at peak hour ie morning 9.30 am to 10.30 am and evening 5pm to 6 pm also consist information about which road/places towards vehicles moving away.

Table 1: Traffic information at different signals at peak hour of normal day

SR NO	VEHICLES	PLACES/ SIGNAL	LHS MOR	LHS EVE	MOVING TOWARDS MAJAOR PLACES	RHS MOR	RHS EVE	MOVING TOWARDS MAJAOR PLACES	TOTAL
1	4 WH 2WH 3WH	Nagar Naka	930 2958 120	845 1832 145	MIDC Waluj Aurangabad/ Ahmednagar / Pune	390 670 150	1067 2265 200	Aurangabad City/Jalna	3232 7725 615
2	4 WH 2WH 3WH	Railway Station Road	90 350 120	135 405 75	Central Bus Stand / Samarth Nagar Road	270 430 149	190 510 207	Railway station	685 1695 551
3	4 WH 2WH 3WH	University Gate Signal	80 200 55	10 50 40	University Gate	10 40 48	45 300 35	Govt Hospital Aurangabad	145 590 178

Abbreviations - LHS: Left hand side, RHS: Right hand side, MOR: Morning, EVE: Evening, WH: wheeler.



Next and last step of data collection is collecting and c different place mark like Colleges, Schools, ATM, Hospitals, Hotels, Tourist places etc. Wikimapia and Google earth are used for the place marking of different location in Aurangabad city.

#### 4.2 GEOREFERENCING

The registration of a geographical data into an established coordinate system is called Georeferencing [1]. Georeferencing is must because map are flat, but the surfaces which is represented are curved, so need to transform three dimensional space into a two dimensional space. In Georeferencing, with the help of Geographic Coordinate System (GCS), the image is registered. GCS is used for defining locations on the earth using three dimensional spherical surfaces [5]. For Aurangabad city, the Geographic Coordinate System is WGS\_84.

#### 4.3 DIGITIZATION

Digitization is next most common method used for data development projects. Digitization is the process by which the operator converts the document that is in an analog form into digital form by tracing features depicted on analog form into system using combination of hardware, software and operator assistance. Spatial data is stored by automatically recorded the x, y coordinates of these features [20]. In Digitization with the help of Editor Toolbar we can trace road network. Point, Line and Polygon features are used in digitization. For Road Network the Line Feature is required. Figure 3 shows road network. Digitization for AITS consist

- 1) Digitize Road Network
  - Digitize Road Centerline
  - Creating road edges
- 2) Digitize placemark



Figure 3 Digitize road network

#### 5. THEMES AND DATABASE

Placemark are categorized in to different Layers as-

- |                            |                  |
|----------------------------|------------------|
| -Road                      | -zone boundaries |
| - Police station           | - Hotels         |
| - School/colleges          | -Hospital        |
| -Medical                   | -Offices         |
| -Atm                       | - Bank           |
| -Bus Stand                 | -Railway station |
| -Church                    | -Temple          |
| -Fire station              | - Garden         |
| - Mosque                   | -Shopping center |
| -Market                    | -Chowk/circle    |
| -Tourist places (locality) |                  |

Near about 2500 locations (placemark) and 7000 major and minor roads have been included in the system Placemark included 150 ATMs, 120 Hospitals, 154 schools and colleges, 54 educational facilities ,183 temple.70 mosque, 36 gardens ,627 shopping

centers, 12 tourist places, 11 petrol pump and 109 offices (including private and government) included in the current system. . Figure 4 shows different layers of place mark.



Figure 4 Placemarks of different locations

## 6. SYSTEM MODULES

### 6.1 SHORTEST ROUTE MODULE

In this shortest route module Dijkstra’s algorithms was used in Arc View Network Analyst to find out shortest distance from source to destination [2]. Dijkstra’s algorithm solves the shortest-paths problem, directed graph  $G = (V, E)$  where  $V$  is a set of vertices and  $E$  is a set of edges, for the case in which all edge weights are nonnegative [21]. Dijkstra’s algorithm maintains a set  $S$  of vertices whose final shortest-path weights from the source  $s$  have already been determined. The algorithm repeatedly selects the vertex  $u \in V - S$  with the minimum shortest-path estimate, adds  $u$  to  $S$ , and relaxes all edges leaving  $u$ . In the following implementation, we use a min-priority queue  $Q$  of vertices, keyed by their  $d$  values [21]. Dijkstra’s algorithm operates by maintaining a sub-set of vertices [22]. Figure 5 shows the shortest route between four locations.

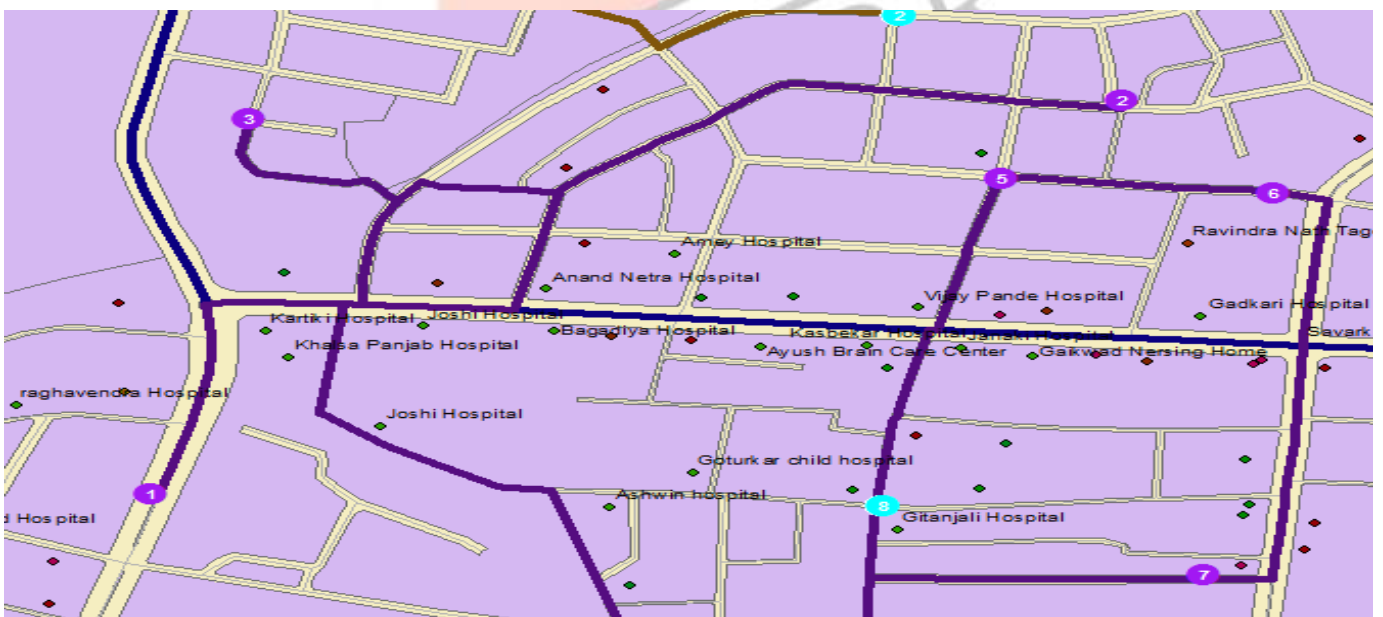


Figure 5 Optimal routes between the locations

### 6.2 CLOSEST FACILITY MODULE

Closest Facility Module is used to find out nearest facility like ATM, shopping center, Hospital, Medical .Bank, tourist places, petrol pump, school and colleges etc. Figure 6 shows closest facilities from the source location to destination location.

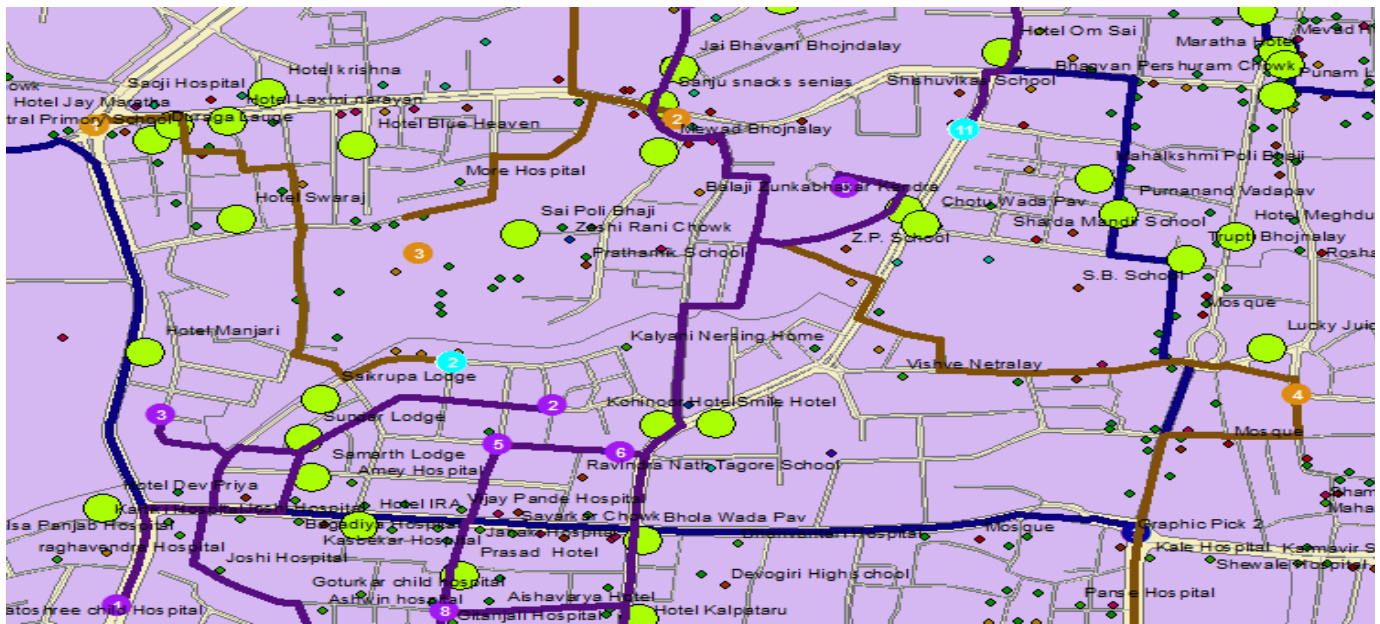


Figure 6 Closest facilities from the user’s location

**6.3 ROUTE DIRECTION MODULE**

In this module, road direction was displayed from source to destination. TIS information consist details direction including road names, distance and turns [23] [24]. Also required time is mentioned. Figure 7 shows direction from the source location to destination location.

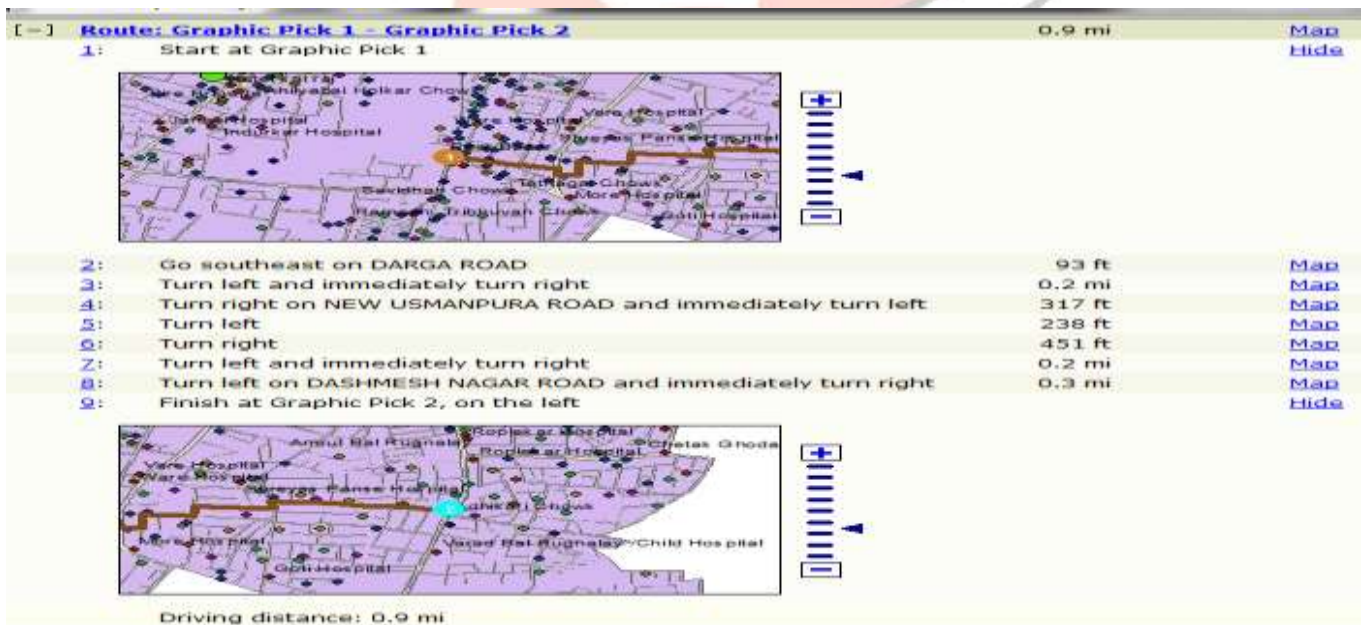


Figure 7 Route direction from the user’s location

**7. CONCLUSION**



Intelligent transportation system (ITS) play vital role in transportation System. ATIS is one type of widely used ITS. In this developed AITS for Aurangabad city traveller used important information about shortest Route ,closest facility like ATM,Bank,Petrol Pump ,Tourist places etc. emergency services like Hospital ,medical, fire station etc.different locations, and pre idea about traffic in that area at normal day. ATIS includes zone wise data/place mark of Aurangabad city. This is easy for traveler to find out destination.

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