RAILWAY TIME TABLE INFORMATION SYSTEM

Kamal Jain*
V. Phani Kumar*

*Department of Civil Engineering
Indian Institute of Technology
Roorkee – 247667
E-mail: kjainfce@iitr.ernet.in
India

ABSTRACT

Indian Railways are second largest railway network in the world. For easy operation and management, Indian Railway is divided into 15 zones and each zone manages its own local affair. When a person wants to travel from one place to another place by train, he has to do planning for the shortest route, minimum traveling time or cost effective route and the detailed information of trains operating in the route, for the comfort of his journey. Railways publish Time Table giving details of trains operating between different stations, train-timings etc., but these Railway Time Tables are not user friendly and the person has to refer number of tables depending on the starting station and destination station. In this scenario a user interactive Railway Time Table Information System (RTTIS) is necessary to assist an ordinary person.

RTTIS has to manage a huge volume of data given in different tables contains train name, train no, days of operation, distance, starting time etc. and the railway map. This can be effectively handled by GIS (Geographical Information System) packages. These packages can be customized for a particular application using the inbuilt modular languages or standard programming languages such as Visual Basic or Visual C++. In the present work GIS has been used to create digital Railway map and to link database of Railway Time Table. It has been customized to display Railway Time Table and train route on the map interactively.

1. INTRODUCTION

Information about the availability of trains, their routes, traveling time and fare is necessary for sufficient planning of the train journey. The train's information is provided in hundreds of timetables on the basis of main or sub route. One may require referring number of tables depending on the starting and destination station. This may require proper understanding of the lay out of railway timetable. A semi illiterate person finds difficulty in reading the Railway Time Table. This problem can be effectively handled through information technology by providing a user, an interactive Railway Time Table Information Systems (RTTIS) at the railway stations. For this a Data Base Management System (DBMS) will be required to handle the large volume of data about station name, Train no, Timings, distances etc along with a graphics software to display graphical data e.g. route map etc. Further software capable of linking both i.e. railway timetable and railway route map is required so that the results from the DBMS is seen on the map. All these facilities are available in Geographical Information Systems (GIS). Hence in the present paper a methodology has been proposed to develop a Railway Time Table Information System (RTTIS) in GIS, which can display shortest route, availability of trains, fare, and class of accommodation between two stations.

1.1 Scope of GIS

RTTIS has to display Railway Information with shortest route between two stations. It is a special problem and all types of queries are not possible directly from a GIS package. There are some basic in-built queries available in GIS software. Other specific queries will be designed through customization using modular languages available within a GIS or using standard programming languages such as Visual Basic or Visual C++. Visual Basic can be effectively used in Data Base Programming and it has link with most of GIS packages.

2. GIS CUSTOMIZATION

GIS allows application developers to create specific customizations of generic software system. Therefore "customization is the process of adapting a generic system to an individual specifications" (Maguire, 2000).

In the case of desktop and professional level GIS, the process of customization typically involves modification of a standard Graphical User Interface (GUI) and extension of the "out of the box" tools by writing application programs. More sophisticated users may be allowed access to the underlying core GIS capabilities and database. They may be able to extend the core class libraries or reuse objects within their own programs.

3. GIS APPLICATION DEVELOPMENT TOOLS

In the present work Intergraph's GeoMedia Professional was used. Application customization capabilities of Intergraph's GeoMedia Professional is as given below:

3.1 Customization Approaches To GeoMedia Professional 4.0

GeoMedia Professional is object oriented GIS software with an object oriented customization language. There are three ways to approach GeoMedia professional programming. One way is to create a custom application; this is done by selecting only GeoMedia professional objects for performing desired functions. For example a custom application may only use Map view, Coordinate system, Legend and GDO database Automation. These objects would be referenced and programmed through a project to produce an application.

The second approach is to drive GeoMedia Professional as a server application. This is typically used when working across applications. In this approach, the GeoMedia Professional application object is created by the create object method or returned from a running instance by get object method. The application object is then available for programming.

The third approach is to build custom commands. The commands are created by using the GeoMedia Professional Command Wizard. The Wizard registers the commands and creates the necessary project files required for producing a DLL. The project files contain boilerplate code that incorporates selected command features. Adding the automation code and compiling a DLL complete the command.

3.2 Executing The GeoMedia Command Wizard

The GeoMedia command wizard is a tool that helps to develop commands in GeoMedia based applications. It performs most of the work in setting up a Visual Basic project in which all command server functions are implemented. GeoMedia Professional exposes its objects to support programming functionality. As part of this process, the Command Wizard generates a class module; a main subroutine and depending on user input a form. The command wizard creates the parts of code that are typically same for any commands that are created for an application. User can choose a custom bitmap for his command that he can add to a tool bar in GeoMedia. The Command Wizard is a Visual Basic Add In item. The command wizard creates Visual Basic commands for the GeoMedia based application and edits or deletes Visual Basic command set information.

3.3 Install User Command Tool

The install user command tool is a batch command that allows registering a user command that was previously written on another machine without compiling and registering command through the GeoMedia Professional Command Wizard in VB. With the batch command user can register a user command without having VB or Command Wizard loaded onto user machine.

The files necessary to install a user command are its VB DLL and its INI file. The command wizard in the bin directory of VB user command project generates the INI file. When you run install user command, it registers the user command in the system registry on user system.

Once the user command has been installed, it can be associated to a menu or a keyboard accelerator through customize on the tools menu.

4. WORK PLAN, METHODOLOGY AND RESULTS

4.1 STUDY AREA

Railway network of Delhi, Punjab, Haryana and Uttaranchal has been selected for present planning. These states are covered by dense railway network, consisting of many junctions and are well connected with one another. The network that has been used consists of 29 junctions, four terminals and five intermediate nodes (Fig.1).

4.2 DATA USED

Following data was used in present work
a. The detailed Railway system map of Northern Railway (Fig.1)
b. Trains At A Glance of July 2001 – June 2002 was used to create the database of Railway Time Table.

4.3 METHODOLOGY

4.3.1 Creation of digital railway map - The Digital Railway map was prepared in GIS by the following steps:
a. Scanning railway map of Northern Railway.
b. Registration of railway maps to grid points in GIS.
c. Various junctions i.e., railway stations and line connecting two stations were digitized in GIS, the digitized is shown in fig 1.
d. Database was created for point features and line features. The attributes for point features were station name and station number (Fig 1). The station numbers are used in shortest path calculation. The attributes for line features were end station names, end station numbers and distance between two stations (Fig 2). These were also used in customizing GIS for shortest path and timetable display.

4.3.2 Database creation of railway timetable - The database of various trains information had been created in Microsoft Access in a table form   The database consists of information about train name, train No., days of operation, class of accommodation, and timings of all stations in that route.

4.3.3 Customization of GIS for RTTIS - The various steps that were followed in customization :

(i) **Opening New Project -** The new GeoMedia command Visual Basic project was opened in the visual basic through GeoMedia command wizard. The various GeoMedia objects (like GDatabase, GRecorset) were added to the visual basic header files.

(ii) **Designing of Form -** A user interactive form has been designed for each command. All forms consists of labels for guiding the user, combo boxes for selecting stations as input, text boxes and data grid for outputs and command button for proceeding the next step and back.

(iii) **Implementation** - In implementation, code was developed in VB for shortest path and trains details from railway timetable database in interactive manner, and highlighting the geographical location in GeoMedia. To activate events, related application programming code has been written in code window. ADO Data Objects are used for connecting the MS Access database (i.e. Railway Timetable Database). The data has been retrieved from tables using record set property of that object. GeoMedia application object was used for connecting the GeoMedia workspace. The coding for each GeoMedia commands developed in Visual Basic 6.0 is described below:
   a. **Distance() -** This procedure has been developed to determine distance matrix from one station to another   station. The input data (weights for each link) to calculate distance matrix is accessed from the digital railway map, which was created in GIS. For this GDatabase and GRecorset objects of GeoMedia were used.
   b. **Minimum Distance() -** This procedure was developed to determine minimum distance from distance matrix that was calculated; this matrix gives minimum distance from any one station to any another station. In this modified matrix multiplication method was implemented.
   c. **Shortest – path() -** This procedure was developed to determine the shortest path between two stations in this method the mathematical model for shortest path was implemented.

4.3.4 Making DLL - The GeoMedia command Visual Basic project has been converted in to Dynamic Link Library (DLL) files in Visual Basic.

4.3.5 Installing Command - The DLL and INI files were installed in GeoMedia Professional program files by using "installusrcmd" command at MSDos command prompt.

4.3.6 Running GeoMedia Command - The installed command (RTTIS) has added to the menu of GeoMedia menu bar. The command was executed in GIS by clicking on RTTIS menu. The results of the command were checked for execution errors and correct results.

4.3.7 Display of Results - The results of RTTIS command have been displayed in GeoMedia. The final shortest route and trains information were displayed interactively according to user choice.

4.3.8. How to operate the tool - The user has to follow these steps to know the shortest route, trains availability, distance and fare between any two stations. Geoworkspace (i.e. railway map) should be essential for working the tools.

i. Shortest Path - Click on RTTIS on the menu of GeoMedia professional map window and click on shortest route tool. Then shortest route window is shown on the screen, and then the passenger has to do follow following steps.
a. The passenger has to select two stations one is starting station and another one is destination station by clicking from list for starting stations and for destination stations (Fig.3).
b. If passenger wants shortest root for his journey, he should click on "Click here for shortest route" button after some time he can see the shortest root from origin to destination in the root text box as well as on the railway map. Above the text box it can also show the traveling distance in km. (Fig 3).

ii. Trains Information - The passenger has to select two stations one is starting station and another one is destination station. Then click on "Get Route and Trains" button. It will show number of routes available between them and their full paths also (i.e. Intermediate stations). User can select various paths for different routes, distances and their corresponding trains details, which are operating between them.

iii. Availability of trains by Query - If passenger wants to know about availability of trains on the basis of class of accommodation like firstAC, sleeper class etc.and days of operation. Then he has to select starting station, destination station, class (IAC, IIAC, IIIAC, CC, FC, SL and II) and any day of the week (Sun, Mon …etc). Click the button "Get Trains" for displaying the trains list those are available on the basis of given query. User can change the options according to his choice.

iv. Fare Details - If user wants to know fare between any of the two stations (If direct train available) for different classes, then he selects two stations and any one of the classes like I AC, SL etc. Click the "Get Fare" button. Then distance between two stations and fare for corresponding class displays on the table. If there is no direct train then message will displays as "Sorry! Direct train facility is not available. Please change your options" (Fig.4).
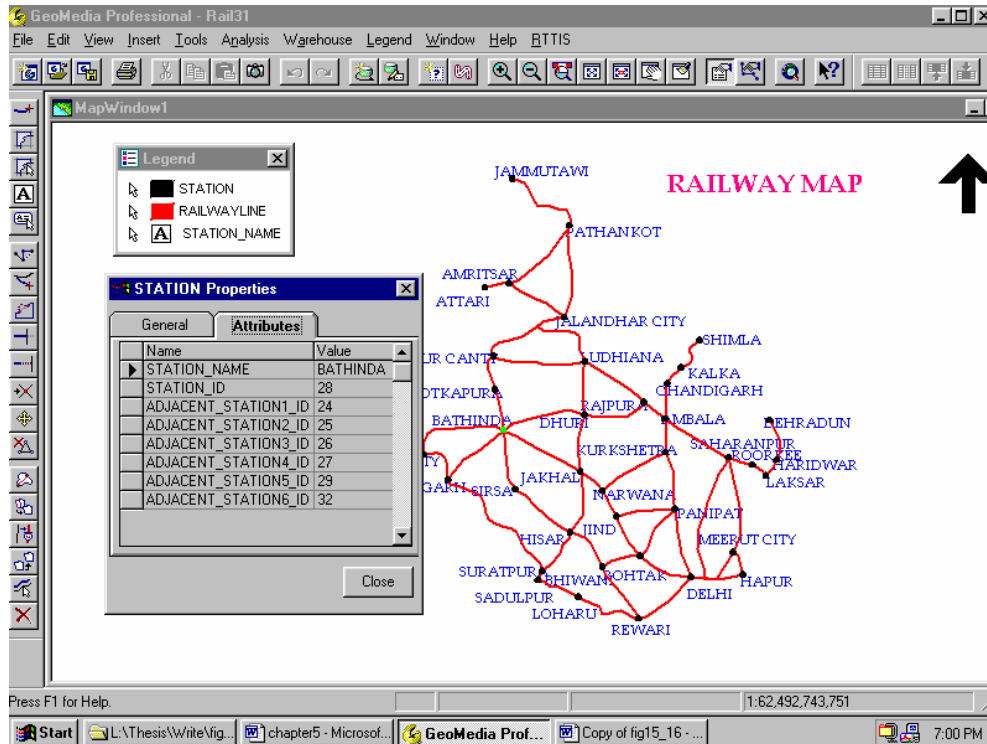
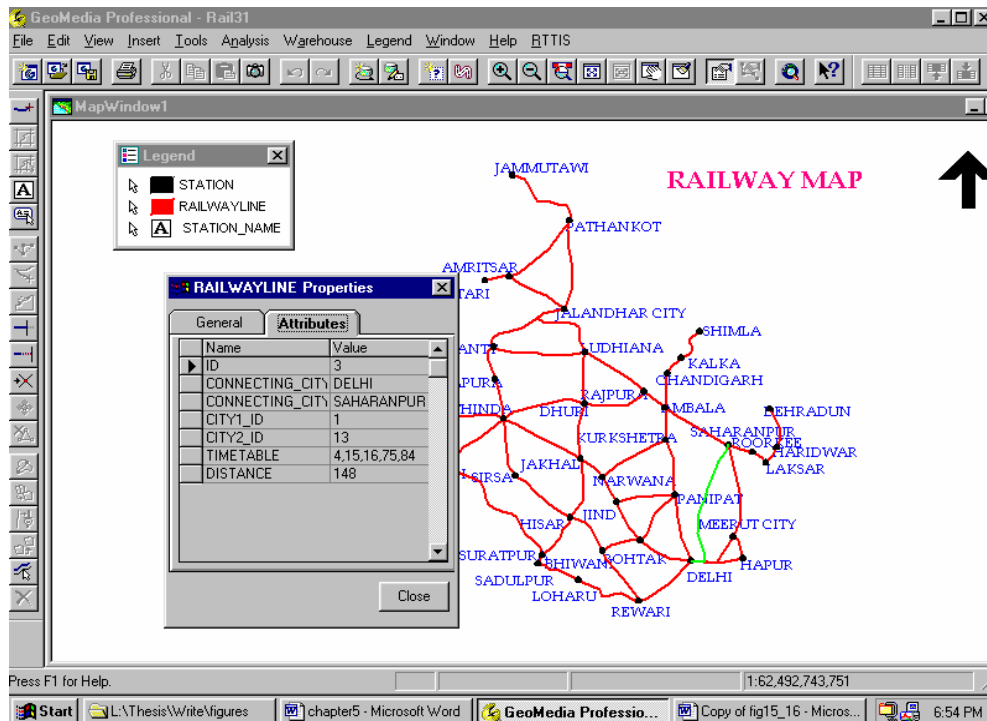**Fig.1: Railway map with Attribute Data for Point (station) Feature**

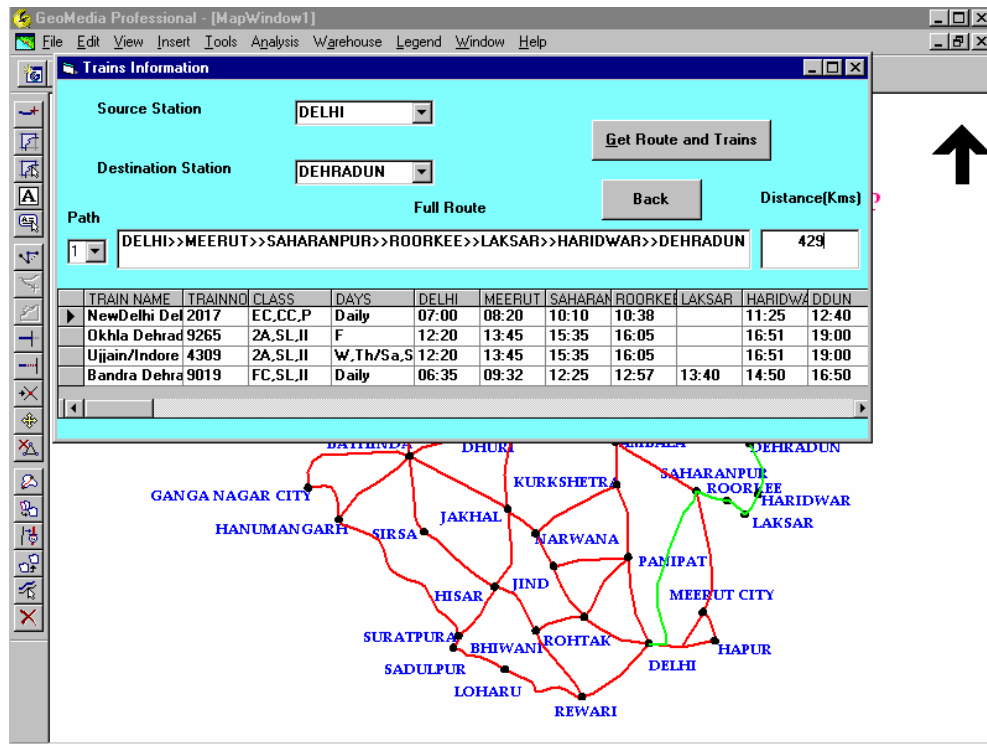**Fig.2: Attribute Data for Line (Railway line) Feature**

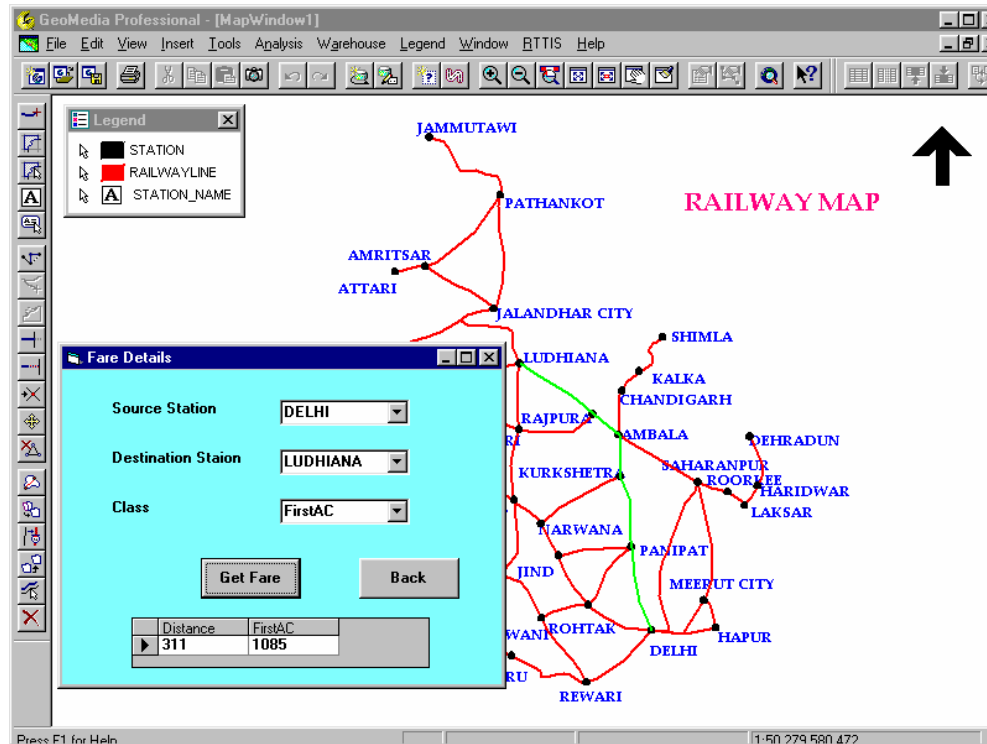**Fig. 3: Trains details between first route**

Fig. 4: Distance and fare between any two stations for First AC class

5. CONCLUSIONS

Following conclusions can be made on the basis of work done.
i.   RTTIS is developed in GIS environment customized with VB, which can operate by any person with out any prior knowledge of GIS/Visual Basic.
ii. The system has following functionalities:
a.   It can take starting and destination stations as input.
b.   Calculate the shortest root.
c.   Display details of trains operating between any two stations with different paths and their distances.
d.   Display details of trains operating between any two stations by query of class of accommodation and day.
e.   It will show fare between two stations based on class of accommodation.
f.   Display the route on the map.
iii. The system can be effectively used for airlines or road transport having detailed information regarding Bus no, route, timings etc.

6. REFERENCES

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