

TRANSPORTATION MANAGEMENT BY USING GIS

CASE SUDY IN DEPARTMENT OF FEEDER ROADS IN

GHANA

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1- Abstract

The growth of most of the urban area is effected by two factors.

1- The establishment of Business activities which open up a lot of employment opportunities.

2-the large influx of people to the urban areas.

This means there will be a large number of people traveling from one area where the people live to the area where they work

The people in Riyadh in average spends about (1 – 2) hours every day on the roads to reach the work place, school or home, where it was before ten years ago the same distance would have been covered in about one third the time as that of now.

Considering the exponential growth of the number of Vehicles and the increasing population the situation become as serious problem and I think GIS technology tool can help to minimize these problems

2-background

From the historical view we can see that the transportation types had very strong effect in shaping of the cities and from that point we can see how was the shape of the old Islamic cities where the camels and the horses were the main types of transport the peoples and the goods and how the street which were called treak or zogag controlled by the transportation regulation in that time so, the space which was enough for loaded camel as the unit width of the treak and the zogag and within the middle of the last century the people start using the cars then the car became the unit of the road width.

Also we can see that any development plan to succeed it should contain successful transportation system.





3-Introduction

The Better information we have doesn't guarantee the better decision-making capability but its absence complicates it. This strong need for information requires new approaches in which data related to transportation network should be identified, collected, stored, retrieved, managed, analyzed, communicated and presented. The database that existed before did not allow the user to manipulate, access, simulative and query the database other than in a very limited way. The user is limited to textual queries only, the selection and viewing of crossing attribute data with respect to spatial and topological relationships is not possible.

With GIS provides the tool a transportation planner would need to convey ideas and present implications of planning decision for non-planners visually. GIS provides a means of communication that allows for an interactive understanding between the public and transportation professionals.

4-1 identification of Geographic Information System (GIS)

GIS is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies

The main benefit of using the GIS is not merely the user-friendly visual access and display, but also the spatial analysis capability and the applicability to apply standard GIS functionalities such as thematic mapping, charting, network-level analysis, simultaneous access to several layers of data and the overlay of same, as well as the ability to interface with external programs and software for decision support, data management, and user-specific functions.

4-2 transportation management

Transportation management plays an important role in a country. A country or city area's economic and social health depends to a large extent on the performance of its transportation system. Not only the transportation management provides and enhances the mobility of people and goods, but also over the long term it influences patterns of growth and the level of economic activity through the accessibility it provides to land. Urban transportation management is an important activity for promoting the efficient movement of people and goods in an area and for community development as well (Black, 2003). Individuals who use an urban transportation system everyday determine, in part, just how successful a transportation management really is. In addition, a successful transportation management tools should be attractive to customers not already using the public transportation system and should lure potential customers away from private transportation. (Woudsma, 2003).

4-3 using GIS in transportation management

Roads are main arteries of modern society's infrastructure, contributing heavily to the distribution of goods and persons. GIS provides many helpful applications for

ensuring a smooth flow, by aiding design, routing, traffic control and real-time navigation. In essence, a GIS application in transportation is maybe no longer a GIS, but a merger of GIS with Intelligent Transportation Systems or Transport Telemetries, where GIS no longer exists as a stand-alone product. This essay will attempt to display the extent of existing GIS applications within road transportation, and critically assess their appropriateness and potential

Using GIS in the field of transportation opens up a wide range of possible applications, as diverse as the field of transportation itself. Whether these are cars and trucks along a road, trains along a track, ships across the sea or airplanes in the sky, all applications have one thing in common: They are objects that move along a path in space. A GIS can provide a valuable tool for managing these objects in a spatially referenced context, viewing the paths as a transportation network.

5-the relation between Planning, design and using GIS

The term Computer Aided Design, is closely related to the process of GIS, but it is hard to tell at what level of detail Computer Aided Design finish and where GIS actually start. Modern software prefers to bridge this gap between discipline-specific applications and GIS in a way that they are fully integrated.

Traditionally, clarifying different route options and proposals has been done in the form of 2D maps, assisted by section drawings, maybe together with an aerial photo, where the road network was overlaid in the form of lines. It is simple and straightforward, but it is not proved much information on the actual impact. Engineering drawings and maps may show landscape in minds of engineers familiar with them, but to decision makers or the public in general these drawings can be quite incomprehensible. A GIS can help visualize and communicate the effects of roads on their environment.

6- GIS technology for Routing and navigation

Route planning is one of the most popular applications within transportation, for obvious reasons. Roads are part of the infrastructure that makes up the communication of modern society, but roads can be easily congested. Consequently, any business distributing vehicles is interested in determining which route is the best to follow concerning save time and essentially gain the best cost/benefit ratio. This

can be used to distribute goods, deliver newspapers, food or anything that be needed respond to emergency calls, or to plan your personal travel. There are many ready-made software products available on the market, ranging from simple A-to-B drive time analyses to full-fledged fleet management systems. There are also many online routing applications available on the Internet, and mobile allowing travelers to log in, plan their journey and consider different options. Route planning is also applied as a part of location planning, analyzing catchment areas for different sites, calculating overall drive-times to and from site, maximizing potential customer inflow and ensuring best possible accessibility.

GPS provides the driver with detailed instructions on where to turn in what direction. It also contains a lot of information on points where the drivers interested and want to know. The road data itself derives in most of the cases from Ordnance Surveys product family, which is after that used by different manufacturers in the same time with their own system.

7- Monitoring and traffic control (SAHER)

finding the best road from one point to the other is importance to vehicle drivers or the company who distribute them is not only the benefit of using, the advances in mobile communication (GSM) and satellite navigation (GPS).but keep track of where the vehicle is at any given moment of time is equally, if not even more crucial, in efficient fleet management. Tracking and monitoring of vehicle movements emerged with these systems, the position of a vehicle is monitored by using GPS, transmitted back to a base by GSM, and loaded into a GIS where it can be displayed on map.

By using cameras the Highway Agency in many countries monitor continues traffic at critical points in the road network, counting devices or other means of traffic data gathering, and then transfer this information to the public or using it for analytical purposes. the most demanding of the Intelligent Transportation Systems is the traffic control systems. They may have to cover large geographical areas and interface with a large number of devices not necessarily in common format. , thus managing data available from a variety of different sources. In Saudi Arabia and by starting using the new system of traffic control (SAHER) we can use the GIS technology to indicate which points are the most affected to the traffic dangers to point the device to control the traffic there

8-Evaluation

The most useful tools we can use to solve any conflict that could arise because of different opinion is the tools which give us clear picture and show us all possible solution and it was clear that GIS aiding road design has been approved itself as that tool,. Using GIS for 3D visualization may also help solving clashes that often occur when different engineering fields work together on a large-scale project. Any changing Discussion and deciding any changing in design can be made before the problem appear itself on site.

A further development of this application could be for use in simulators for training drivers, similar to simulators already in use for planes and ships, something that could turn out to be especially helpful for emergency vehicle drivers when they are still new to an area.

Visualizing and analyzing data in all the applications is the tool of using GIS. This is historically point view is the way to describe the use of GIS. The data itself has to be compiled and put together in databases that are linked with or resident within the GIS. Looking at future prospects, the potential range of such applications, combined with 3D visualization, is virtually unlimited.

With some limitations Route planners are very useful tools in general. Even though the road network may look fine on screen, it may contain false information that will divert the route from where it should go, such as sending a vehicle to the wrong way or using a route that is closed to the public. Data that is used in route-planning systems must be extremely accurate otherwise all the plans will be not effective.

The data must be kept up-to-date with the latest status of any particular road in the network. Thus, a GIS for route planning will have to contain a large volume of attribute data, depending on the specific application needs. Users may want to enquire about gradients, height and weight constraints, road works, filling stations, detour options, hotels or other points of interest (Remscheid, 1996). All this has to be updated continuously. This again means cost for the end user. This is not a product you buy once and for all.

Route-planning systems typically either calculate the shortest or the fastest journey; however, some experienced drivers may not take the same route as the system

calculates. In doing this, the system uses algorithms for choosing a particular route... For inexperienced drivers, on the other side, the system provides much help.

Because variables such as time of day, weather conditions (e.g. sun, rain, fog, ice or snow), type of car used or driver behavior are usually not implemented, route planners will often tend to be generalized, even though they lay heavy influence on driving. Systems may also lack local knowledge a driver has about a certain stretch of a route.

route planners will undoubtedly not cease to exist because of the weight that road transport has in distributing goods and personal transport, and given the steadily increasing complexity of road networks.

European legislation on what may be displayed inside a moving vehicle is rather rigid, only allowing a screen showing a single bold arrow as for in-car navigation systems (Schofield, 1996). A full map can only be displayed when the vehicle is stopped. Voice messaging has no such restrictions. Both visual and audio output have a potential for distracting the driver, which is why the newly revised Highway Code includes an admonition against the careless use of route guidance and navigation systems. Bearing in mind the current debate in Europe over banning the use of mobile phones in cars, in-car navigation may face the same argument.

Tracking systems depend on GPS for finding the exact location of a vehicle. Modern GPS receivers have an accuracy of between 3 and 6 meters in good conditions. Using so-called differential GPS, the accuracy can be increased to a few centimeters. With a moving object, this is more difficult. On the Internet sites none of the manufacturers advertising their navigation systems that are listed as reference actually mention the accuracy or possible deviation of the system. On large-scale maps this will seldom generate a visual error, even when roads may be slightly displaced on the map to create a clearer differentiation between roads or to highlight certain features along the road or give it special use.

As one of the important sides that needs to be mentioned is the fact that in-car navigation also can serve as a tracking device, leaving behind electronic signals of a vehicle and its place, adding up just another of the many electronic footprints a person might work on during a day.

In the transportation sector the range of products and applications indicates that these are tools that are in high demand. It has been estimated that some 80% of all information that any business manages has a geographic context (Leslie, 1999). Crucial to any organization's success is access to good and valid information. This information is constantly moving in the field of transportation much of, thus increasing the demand for up-to-date information. GIS can help manage this information.

9-Conclusion

In transportation management and especially in travel demand modeling GIS technology has opened up new horizons. It provides the tool a transportation management group would need to convey ideas and present implications of management decision for non-planners visually. For an interactive understanding between the public and transportation professionals GIS provides a means of communication this technology has developed an essential tool for the most effective use of spatial data analysis yet.

Using GIS is useful for many purposes, including and especially for route guidance and traffic control. As with all information, one possible problem associated with using GIS is the level of accuracy which can be maintained. When considering levels of accuracy, the intended usage should always be taken into account. The level of accuracy that can be provided by making comparisons of traffic conditions between limited numbers of alternative routes For certain applications such as for route guidance services and traffic impact studies for planned projects should be acceptable. In contrast, for the controller to provide reasonable control strategy and measures, traffic volume information for traffic control must be very accurate

10-Case study

GIS a Tool for Transportation Infrastructure Planning in Ghana

A Case Study to the Department of Feeder Roads

A-The Purpose of this Pilot phase project Inventory

Was in three parts:

1-Planning

2-Management

3-Engineering

B-The surveys were done in four parts

Which were?

1- Desk Study / DFR Consultation

2- District Consultation

3- Field Survey

4- Delivery the data.



Figure1 *example of field survey*

C- Road network in Ghana is more than 50,000km of road length

The planning and management of such a huge network in the country has been primarily done at three levels

1- About 13,367km of Trunk Roads

2- About 4,029km of Urban Roads

3- And about 32,600km of Feeder Roads

It really became a problem managing such roads, so a pilot phase project was put in place using GIS to see how effective this system would work for the decision making process of the Ministry. Many development projects have serious dependence on transport network. Authentic information on the transport infrastructure was fundamental requirement; therefore information required was to be reliable, updated, relevant, easily accessible and affordable for the decision making process of the Ministry.

| ROAD SYSTEM OF GHANA | |
|-----------------------------|--------------------|
| TRUNK ROADS | Length (Km) |
| Rigid Pavement | 38 |
| Asphalt Surfaced | 1,566 |
| Bituminous Surfaced | 4,733 |
| Gravel | 6,357 |
| Missing Links | 673 |
| Total | 13,367 |
| URBAN ROADS | Length(Km) |
| Asphalt Surfaced | 427 |
| Bituminous Surfaced | 1,496 |
| Gravel | 2,106 |
| Total | 4,029 |

THE WAY FORWARD

D-Updating *The topological information available in GIS database opens the new ways for analyzing the transportation related data for different purposes.*

- 1- *The database keeps on evolving, which is otherwise not possible to compile at one time.*
- 2- *Various GIS functionality, the spatial analysis functions and querying capability, are very useful tools for the day-to-day management of the road network by the government of Ghana.*

E-Engineering

Engineering applications are required which is a relationship between Planning and Management review cycles.

- 1- *GIS is a logical approach for managing the road network in Ghana, thereby pavement condition surveys could be maintained by location.*
- 2- *GIS use in bridge & culvert maintenance*
- 3- *Congestion management systems using GIS can start with the highway base maps and attribute databases used for long range transportation planning in urban areas.*

- 4- *Information in GIS environments will be very useful to develop safety management system.*

F-Conclusion

GIS have come to stay and there is no doubt that is a an efficient and effective tool in the Transportation Infrastructure Planning of the transport industry .There is an urgent need to organize the existing database compatible to GIS environment and suggest various other new data items, which are considered useful for better planning and management. If GIS technology is exploited to its fullest extent in Ghana it will completely revolutionize the decision making process in transportation engineering. The huge amount of information related to transport infrastructure in Ghana could be put together for its most efficient utilization in planning, design, construction, maintenance and management of the transport system.

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