In the name of Allah, the most Gracious, the most Merciful

Introduction to GIS

CRP 514

USING GIS IN TRANSPORTATION AND ITS APPLIICATIONS

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Outline

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- GIS Models Used in Transportation
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Introduction

Geographic Information systems (GIS) represent a powerful new means to efficiently manage and integrate the numerous types of information necessary for the planning, design, construction, analysis, operation, maintenance, and administration of transportation systems and facilities.

Objectives

- To point out the need for Geographic Information Systems in Transportation.
- To explore the applications of GIS in transportation.

GIS Transportation

- ***Geographic information systems for transportation (GIS-T)***

can be defined as interconnected hardware, software, data, people, and organizations for collecting, storing, analyzing, and communicating particular types of information .

GIS Transportation Cont.

GIS-T applications are currently used broadly by

- transportation analysts and decision makers in different areas of transportation planning and engineering.
- from infrastructure planning, design and management, traffic safety analysis, and public transit planning and operations to **Intelligent Transportation Systems** (ITS).

GIS Models Used in Transportation

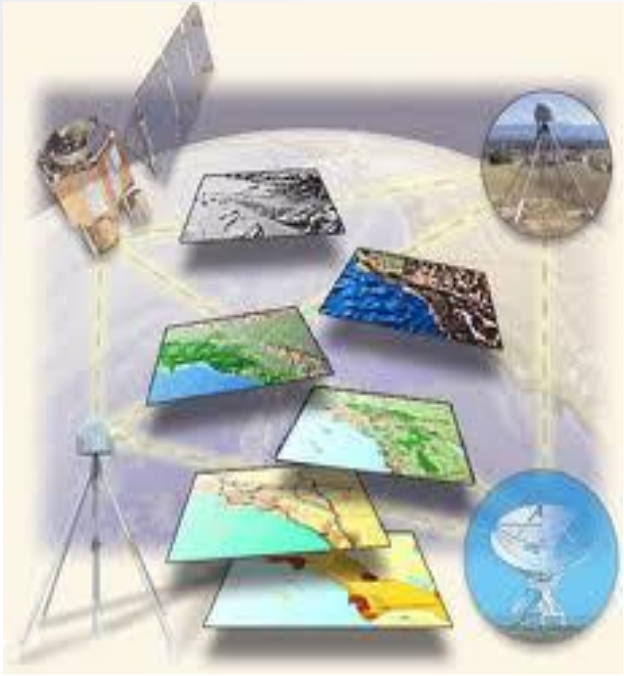
- In general, three classes of GIS models are used in transportation, which include:

  - Field models of the continuous variation of a phenomenon over space (e.g., land elevation).
  - Discrete models, depending on which discrete entities (points, lines or polygons) populate space (e.g., toll barriers, urbanized areas).
  - Network models to represent topologically-connected linear entities (e.g., roads, rail lines, or airlines) that are fixed in the continuous reference surface.

Geographic Information Systems for Transportation (GIS-T)

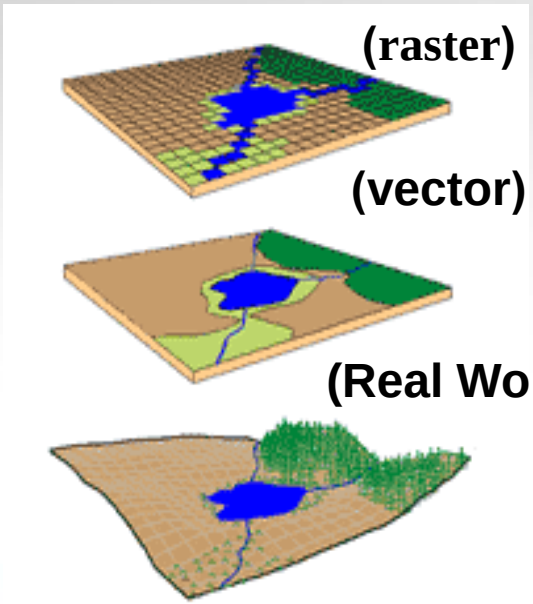
In general, topics related to GIS-T studies can be grouped into three categories:

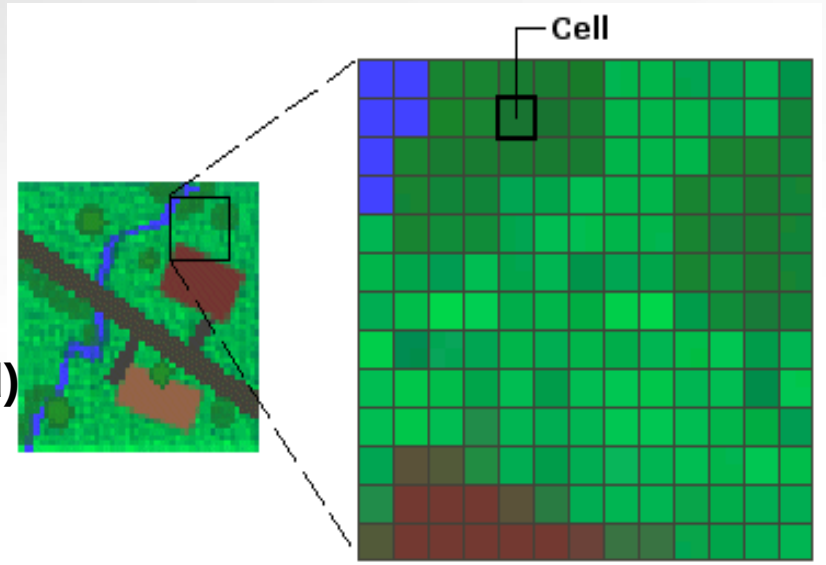
- GIS-T Data Representations
- GIS-T Analysis and Modeling
- GIS-T applications



GIS-T Data Representations

- GIS-T studies have employed both vector and raster GIS data models to represent the relevant geographic data.





GIS-T Analysis and Modeling

- Transportation has developed its own unique analysis methods and models. Examples include
  - shortest path.
  - spatial interaction models.
  - network flow problems.
  - facility location problems and.
  - travel demand models.

GIS-T Applications

- GIS-T applications covered much of the broad scope of transportation, such as
  - infrastructure planning.
  - design and management.
  - transportation safety analysis.
  - travel demand analysis.
  - traffic monitoring and control.
  - public transit planning and operations, and
  - intelligent transportation systems (ITS).

GIS-T Applications Cont.

GIS-T Applications Cont.

- Transportation facilities, including roadways and railways, bridges and tunnels, air and sea ports, are planned and managed using GIS.
- Public and private fleets are being made more efficient and effective through the application of GIS.
- Applications of GIS-T are highly appreciated in major fields like:
  - ☞ Aviation
  - ☞ Highways and Streets
  - ☞ Railroads

Aviation

- Airlines and flight control groups use GIS to analyze routes and capacities, and to plan re-routing and contingency plans for weather-related or other emergencies.
- GIS provides an excellent means of visualizing flight paths, capacities, or noise contours.

Highways and Streets

- Transportation infrastructure represents one of the largest and most critical investments made in any nation, at any stage of development.
- The movement of people and goods either domestically or internationally is vital to every aspect of that economy.
- GIS can be used to determine the location of an event or asset and its relationship or proximity to another event or asset, which may be the critical factor leading to a decision about design, construction, or maintenance.

Railroads

- Railways around the world find great utility in using GIS.
- Major functions in which GIS has been successfully deployed in railway organizations include:
  - Emergency response management .
  - Environmental and construction management.
  - Passenger information .
  - Capacity planning.
  - Site selection .
  - Risk management.

GIS and Transportation Case Studies

❖ To find the best and optimum rout between A and B because the existing rout lie on igneous rocks and causes sliding.

❖ The conditions for the design the new road

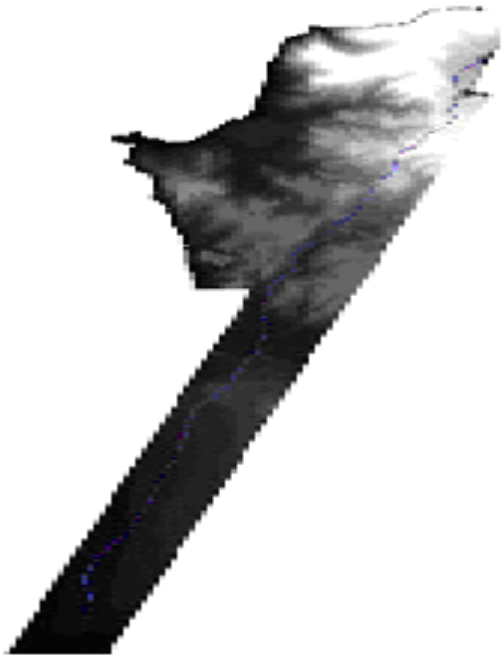
1. It should be faraway from mountains and vallies.
2. It should be faraway from igneous rocks regions.
3. It should be faraway from plants location and forest .
4. It should be construct near the existing rout to reduce the cost.

GIS and Transportation Case Studies

- In GIS system should do the following :

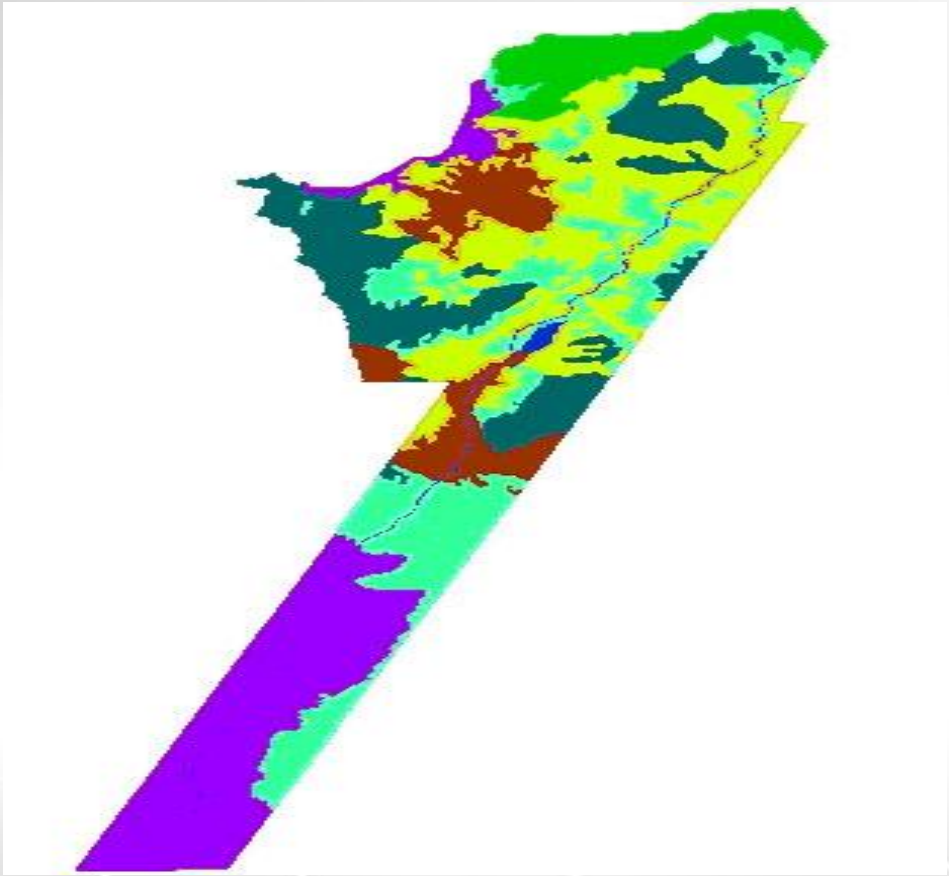
1) Inserting elevations layer.

2) Inserting the existing rout layer .



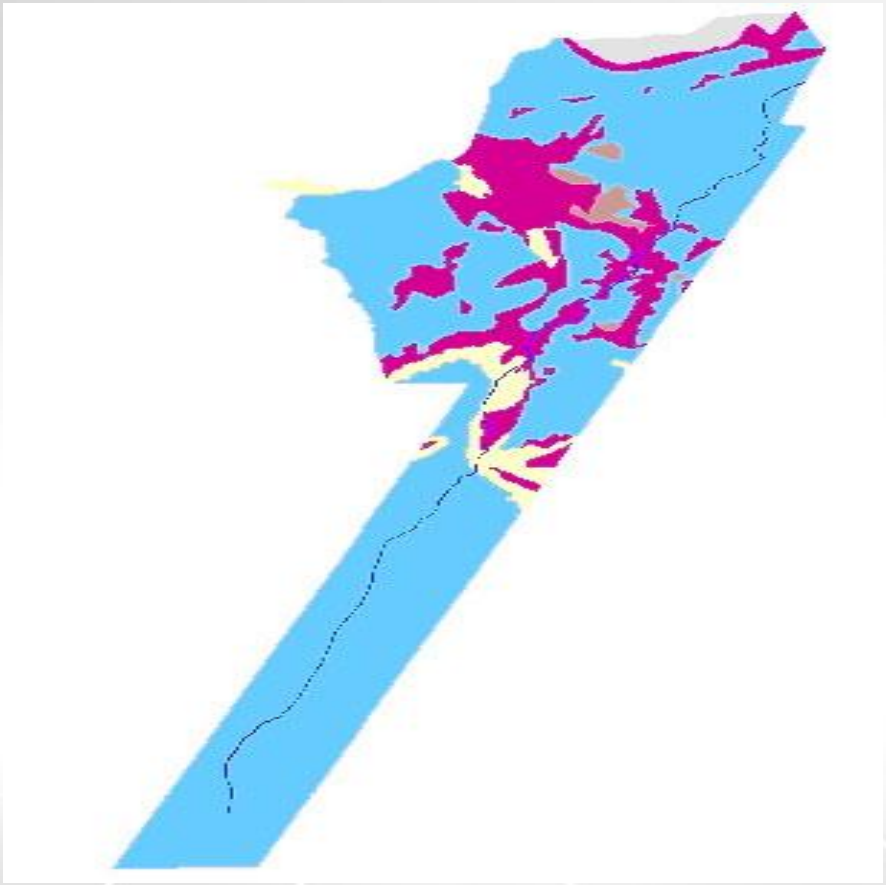
GIS and Transportation Case Studies

3) Inserting plants distributing layer .



GIS and Transportation Case Studies

4) Inserting soil distributing layer .



GIS and Transportation Case Studies

Then the GIS system finds the best design to attain the conditions of new road .

Case Study :
To define the best route for the buses in The Crestwood School District, Michigan.It has asked for a revised bus route and schedule to run a newly developed Summer Program.

GIS and Transportation Case Studies

- The primary focus is to define the best route for the buses in the school district according to predefined conditions such as demographic data, administrative considerations, and optimal bus usage.
- In this Case Study, ArcView's Network Analyst extension tool is used.
- It dealt with the complexities of transportation data and the potential impacts on land area and how demographic information contained within the area affect the transportation infrastructure.

Conclusions

- GIS-T platforms now represent a highly viable alternative for information processing in transportation agencies.
- In the transportation industry geographic analysis is the key to making better decisions.
- GIS technology serves three distinct transportation needs: infrastructure management, fleet and logistics management, and transit management.
- Application of GIS to transportation has required the extension of basic functionality to include the linking of linearly referenced information to the network.

THANK YOU