Spatial Analysis of Indian Railways

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Why a project on RAILWAYS

- Railway is the biggest public sector of India.
- We need a platform for analyzing rapid advancements.
- Some tool that can affect our policy making.

Moreover

- Country growth is a direct consequence of transport development.
- Repository of database is necessary for the growth of sector.
- GIS helps in populating this repository.
Our Objectives

➢ Budget analysis of an entire decade.

➢ Creation of open access repositories for conducting the spatial analysis.

➢ Major disasters analysis: Places and patterns.
Data

- Railway budgets for financial years 2000 to 2009.
- Official Data
- Height variations data for various districts of the states.
- List of the major rail accidents over last decade
Workflow
Development of Repository

- Using open source library GDAL and its OGR toolkit
- Over a district-wise geo-referenced map of India in form of Shape (.shp) files.
- District -> Polygon
- Railway lines -> Lines
- Railway Station -> Point
- Centroid of Polygon : int OGRGeometry::Centroid (OGRPoint * poPoint ) const [virtual]
- Lines : OGRLineString ()
- Vertex point : Void setPoint (int, OGRPoint *)
Electrified Routes
Work in Progress
Limitation:

This only looks at the district level information and overlooks the sub district stations that come in the network.
Other Repository

- open access Google Earth repository.
- Verification of existence of proposed train
- Finding route of train if it exists.
- Tagging important stoppages of the train along its route.
- Can be imported to the local system that can be accessed offline.
Limitation:

It does not follow the actual railroads rather the road transit system which is assumed to be parallel to the rail network and thus solving the purpose.
Inclusion of new train services and their impacts for decade 2000 to 2009
Relation of increase in no. of trains with new lines, gauge conversion and doubling

- **New Lines**
- **Gauge Conversions**
- **Doubling**
State wise distribution of electrified network
Predictive model based on gradual increase in length of electrified network across country for the past 85 years:
Topographic limitations in specific regions of India:
Limitations of railways in Jammu and Kashmir due to variation of heights:

- Rajouri: 1000 m to 2000 m
- Poonch: 1000 m to 2000 m
- Udhampur: 600 m to 3000 m (Only One Line)
- Kulgam: 1000 m to 1700 m
- Budgam: 2400 m to 4000 m (Only One Line)
- Ganderbal: 1600 m to 3000 m
- Baramulla: 3500 m to 5000 m
- Kupwara: 4000 m to 5300 m
- Kargil: 4500 m to 5500 m
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In the extreme cases the value of tangent of angle reaches $1/20$ and it is not only difficult but **impossible** to grant a permit to establish rail network in such regions.
Repository of Rail accidents:

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IIIT-Hyderabad

LSI
Areas hit by rail disasters
Reasons for the sudden shoot might be:
• introduction of large number of trains in year 2002
• heavy traffic on nearly the same length of route length
Climatic Analysis on major accidents:

Frequency of rail disasters is more in the months of winter or monsoon the reasons cited are:

- Dense fogs in the northern parts of the country.
- Heavy rainfall causing damage to machinery and flooding of tracks.

Both of these cause mismanagement and difficulty in operations of signals and instructions to the rail drivers.
Conclusions:

- Visualization of Indian Railways has been made very effective through the integration of geospatial technology in data storage.

- Existing schematic view of Indian railways that displays just the network without any coordinates attached to the nodes and edges.

- The Budget Viewer gives the user a better insight of the works done during the year.

- GIS has brought a transparency in the management and functioning of works in the sector.

- For Government it serves for Policy making and for end user Decision making.
Future Work

- Sharing of the repository information through the development of a web portal assisted with a feedback system.

- A query based applications for users to fetch information of their use from the large pool of data.

*The essence of feedback systems is from usability perspective of the stakeholder, this feedback information may be anything – the type of data that user frequently visits, the design of elements, the query result format and what not.*
Thanks