Spatial Computing

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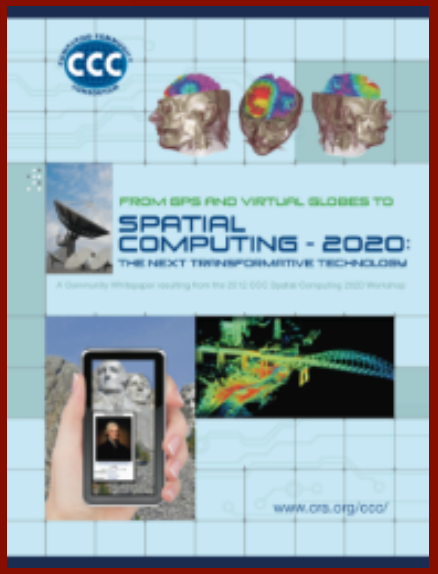
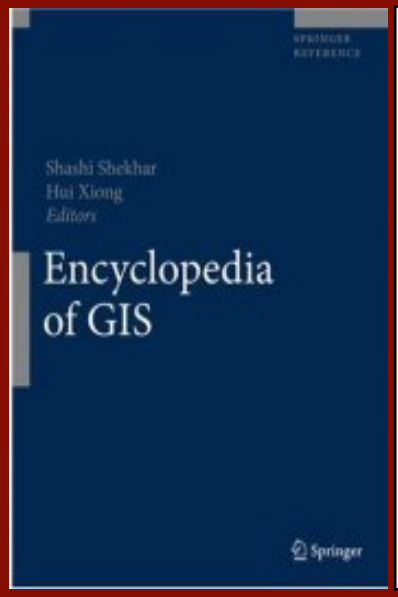
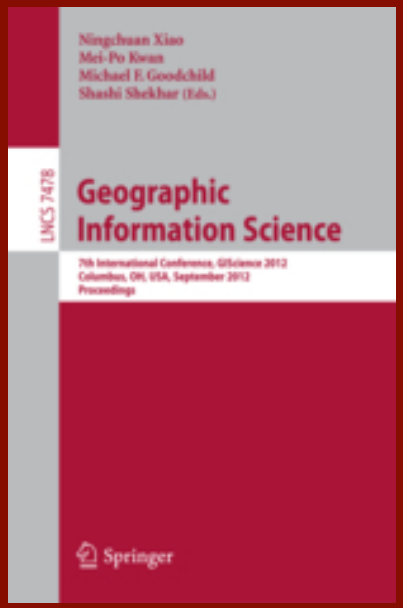
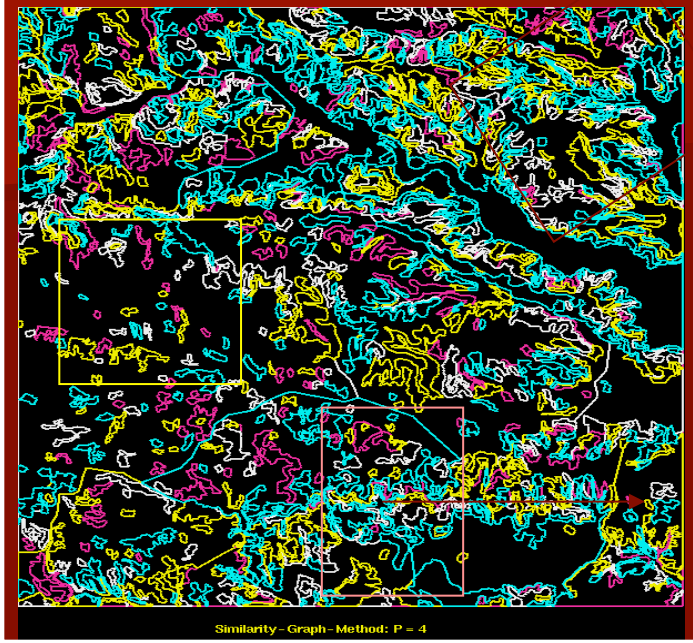




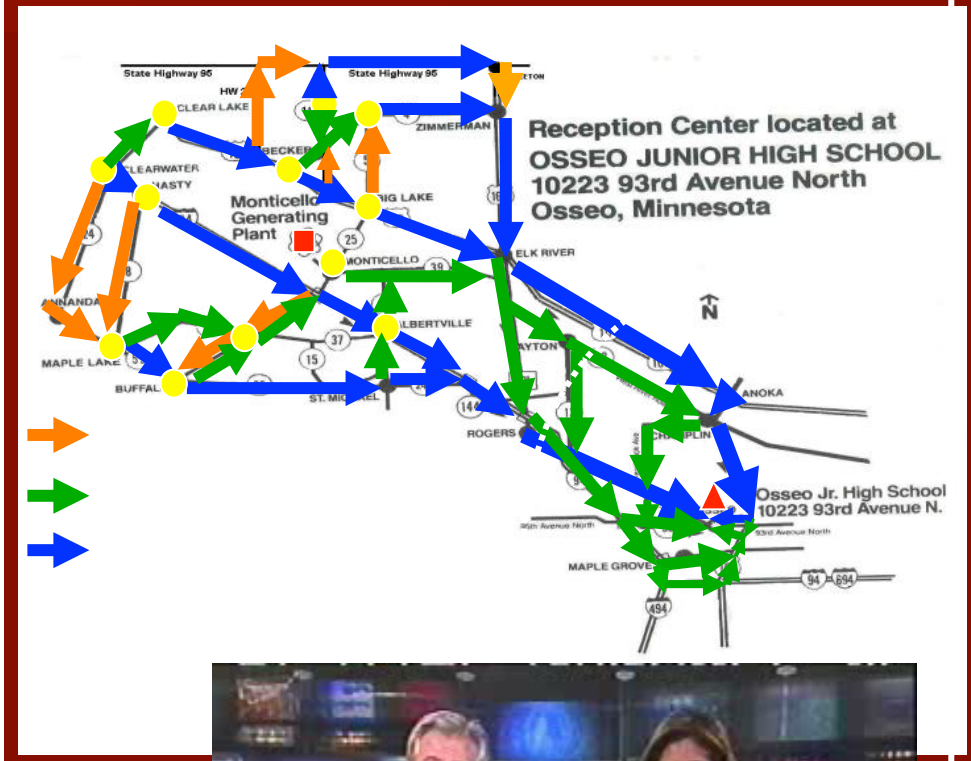


Spatial Databases: Representative Projects



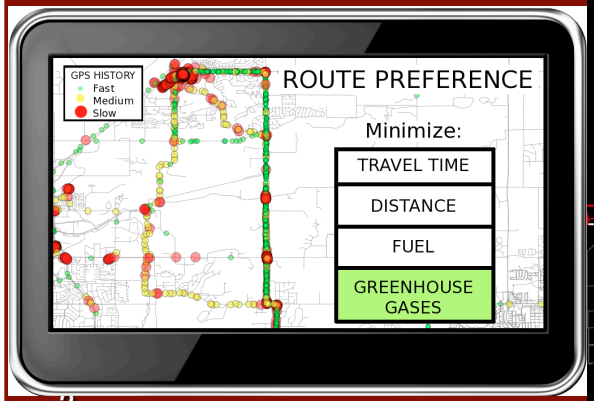
Parallelize
Range Queries

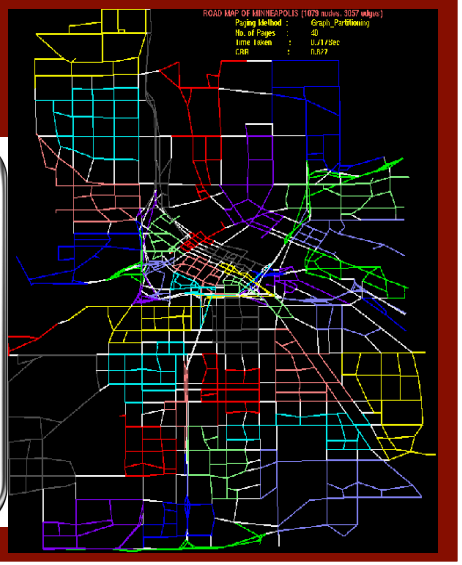
Evacutation Route Planning



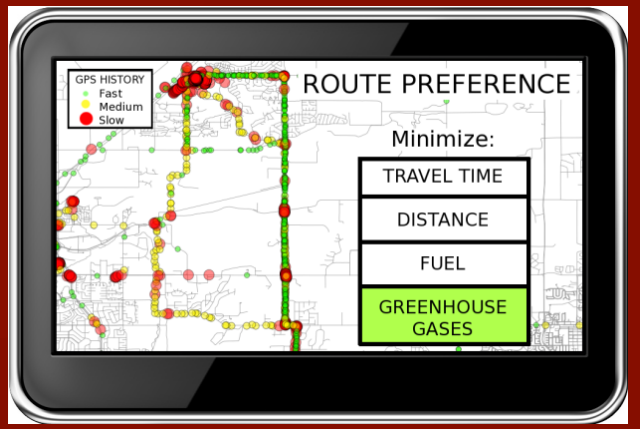
Storing graphs in disk blocks

Eco-Routing





Investigating Spatial Big Data for Next Generation Routing Services



Opportunity 1: Minimize fuel use instead of distance, travel-time

Approach: Leverage temporally detailed roadmaps, GPS traces…

Rationale: Avoid congestion, idling, hill climbing, etc.

Challenges: Wait for turns => violates sub-path optimality in Dijkstra's, A*

Opportunity 2: New Service: What is the best start-time ?

Opportunity 3: New Service: Recomm

U.P.S. Embraces High-Tech Delivery Methods (New York Time, July 12, 2007)

*By "The research at U.P.S. is paying off. ……..— saving roughly **three million gallons of fuel** in good part by mapping routes that **minimize left turns**."*

Acknowledgements

National Science Foundation (Current Grants)

- 1320580 : III:Investigating Spatial Big Data for Next Generation Routing Services
- 1029711 : Expedition: Understanding Climate Change: A Data Driven Approach
- IIS-1218168 : III:Towards Spatial Database Management Systems for Flash Memory Storage
- 0940818 : Datanet: Terra Populus: A Global Population / Environment Data Network

USDOD (Current Grants)

- HM0210-13-1-0005: Identifying and Analyzing Patterns of Evasion
- SBIR Phase II: Spatio-Temporal Analysis in GIS Environments (STAGE) (with Architecture Technology Corporation)

University of Minnesota (Current Grants)

- Infrastructure Initiative: U-Spatial - Support for Spatial Research
- MOOC Initiative: From GPS and Google Earth to Spatial Computing

- Past Sponsors, e.g., NASA, ARL, AGC/TEC, Mn/DOT, …

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•A Critical-Time-Point Approach to All-Start-Time Lagrangian Shortest Paths: A Summary of Results, Proceedings: Symposium on Advances in Spatial and Temporal Databases, Springer LNCS 6849, 2011.