Extracting Energy-Efficient Transportation Patterns from Location Traces

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Location Traces

- Fine-grained location traces
  - GPS Traces
  - WiFi Location Traces

(a) A Monitoring Area (b) Trajectories

Data Collection Challenges

- Energy-aware collection of location traces from smartphones
- Low-delay detection of trip origin and destination
- Integration with additional car sensor data, e.g.
  - Acceleration / deceleration
  - Engine air flow
- Estimation of fuel efficiency from location traces

Profiling Driver Behaviors

- Profiling the driver behaviors to identify transportation related green knowledge
  - i.e. effective use of energy; safety driving; the driving patterns affecting the gasoline consumption

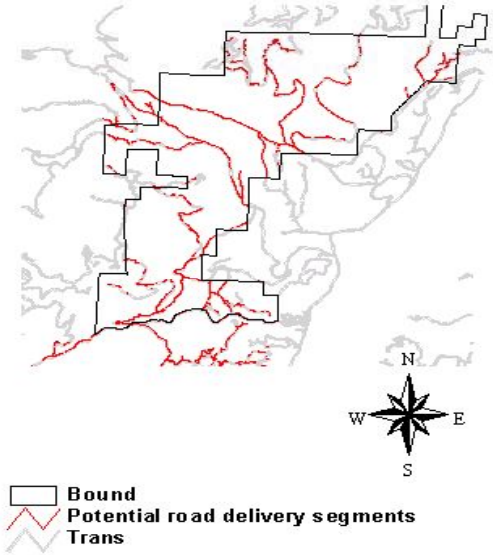
- <u>Method</u>
  Trajectory Clustering for Driver Segmentation

Ref: Transecurity

Seasonal Adjustment Frequently Used Segments of Trajectories

- Mining Seasonal adjustment frequently used segments of trajectories
  - Applications: carpool formation in the community, the plan of bus routes

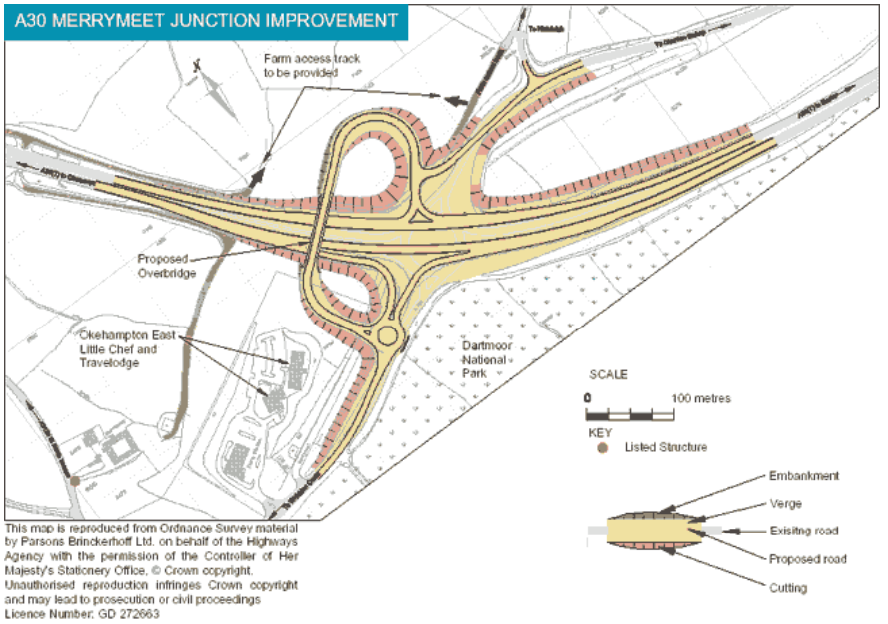
- <u>Method</u>
  Co-Movement Mining of Line Strings



Correlating Road Topology with the Energy Use

- Discovering the correlation between road topology and the energy use.
  - i.e. some road topologies are more likely for the slowdown of traffic

- <u>Method</u>
  1) Graph Mining
  2) Event Co-location Mining



Identifying Abnormal Traffic Discontinuities/Gaps

- Identifying abnormal traffic discontinuities, such as the ones caused by road surface distress, debris on the road, or car accidents
- Challenges: how to distinguish abnormal traffic gaps from seasonal traffic gaps
- <u>Method</u>
  Two-step filter-and-refine
  1) finding seasonal traffic discontinuities/gaps;
  2) making a real-time map of traffic map, then filtering

Research Challenges

- Fine-grained Location Traces
  - Large-scale Data
  - Multi-source
  - Multi-level
  - Spatial Autocorrelation
  - Temporal Autocorrelation

Thank You !

http://datamining.rutgers.edu