Data Isn't Information and Real-Time Isn't Fast Enough

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Computational Engineering challenges

IBM Intelligent Transportation (IIT)

• TOAS: Public Transportation Awareness
  • Urban Dynamics:
    • Traffic Prediction Tool

• Smarter Traveler

• Multi-modal Transportation Pricing
  • DOCIT

• Megaffic: Agent based Traffic Management

• Never Blocked

• Traffic Prediction Tool

• Analytics for frugal ITS

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Transportation Management Solutions - Functionality

Data Needed
- Road sensor
- Movement (Mobile, GPS, etc.)
- Transit & Transportation System
- Network GIS
- People count, Behavior
- Vehicle location & flow
- Fare rules

Analyses / Projects
- Journey Management System
- Zonal densities and Interzonal O/D matrices
- Transit network Simulation and Operational plan Optimization
- Analysis of passenger Spatio-temporal Distribution
- Traffic simulation
- Dynamic route Reconstruction and Time of arrival prediction
- Network-wide Optimization of prices To maximize revenue Or profit

Results Provided
- Journey history, travel time predictions Upcoming travel Actionable information
- Optimized transit Routes and scenario Planning
- Passenger O/D matrices
- Decision support for Public transportation Network planning
- Predicted time of Arrival
- Predicted traffic Conditions upto 1-hour ahead
- Route performance, Road speed, vehicle location
- Optimized prices, Revenue potential Under different rules And assumptions
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Smarter Traveler notifies users in case of transportation incidents

E2E Business Scenario

Step 1: Real-time traffic data → HTTP feed → Traffic Information Repository → Import

Step 2: Subscribe Smarter Traveler Service

Step 3: Collect Data

Step 4: Process Journey Data → GPS Journey Data → Map Matching GPS Point is transferred to road segment ID

Step 5: Query Dynamic Travel Time → Journer ID → Estimated Arrival Time

6. Send notification in case of any significant change in travel time

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**Traffic Prediction Tool (TPT)**

- **Issue:** “real-time” is too late
  - Little automated use is made of the gigabytes of real-time traffic data today; often, by the time it is received, it is no longer representative of the actual traffic.

- **IBM Innovation:** forecast the future
  - IBM’s TPT provides a layer of intelligence by using sensor data in sophisticated algorithms that create relevant insights from the raw data.

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**Current Focus**
- Traffic Operations: Variable Message Sign setting; traffic signal timing, ramp metering

**Future Use**
- Traffic Planning; Dynamic Road Pricing; congestion based tariff setting; route planning & advice

**Extension:** Data Expansion
- (2008 IME) develop algorithm to fill in gaps of real-time sensor data, resulting in a complete picture of future traffic state, network-wide.
Typical Scenario:
• A family travels from Birmensdorf (ZH) to the Zoo.

Several possibilities with different
• Modes
• Connections
• Transfers

and uncertainties!
• Delays
• Lack of parking
• Traffic jams
• …

Use Case 1
Personal Journey Planning
• Provides API to external applications to plan a journey in a multi-modal network and track trip progress
• Re-plan when User is off-track; Events invalidate plan; Events create better opportunities

Use Case 2
Operator facing optimization
• Derive and communicate to operator performance measures based on how the system works for a user
  - Account for uncertainties
  - Performance Metrics: journey times, wait times, missed connections, walk access distances
• Make recommendations on schedule refinements
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Analytics Driven Asset Management - ADAM

Data → Operational, Failure, Usage, Condition, Customer, Location

- Insight, Foresight and Prescriptions
- Descriptive, Predictive and Prescriptive Analytics
- Maintenance Planning
- Maintenance Scheduling
- Replacement Planning
- Condition Assessment
- Failure Cause Analysis
- Failure Prediction
- Usage Analysis
- Customer Analysis

Enterprise Asset Management
- Asset Management
- Work Management
- Service Management
- Inventory / Contract
- Procurement Management

Scada, Sensors, Inspection, Metering Systems

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PALM: Planning Analytics for Asset Lifecycle Management

Profile | Predict | Prescribe | Coordinate | Act
--- | --- | --- | --- | ---
Infrastructure Profile | Predictive Analytics | Strategic Needs & Sustainability Assessment (replace vs. rehab vs. run to failure) | Cross Agency Project Identification | Investment Planning - O&M vs. Capital

Unified information portal of Region Assets across all agencies

Road | Water Sanitary / Storm | Ponds | Bike Paths | Signs | Pavement | Buildings

Enterprise Asset Management | GIS | Agency Plan (O&M + Capital) | Agency Financials

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