Effective road safety management using network-wide historical speed data – commercial speed data as big data source to improve road safety intelligence

Timo Hoffmann, PTV Group
OVERVIEW

Effective road safety management using network-wide historical speed data – commercial speed data as big data source to improve road safety intelligence
COMMERCIAL SPEED DATA
TOMTOM EXAMPLE
Sources - Floating Car Data from TomTom Navigation Devices
SINGLE SPEED MEASUREMENTS SITES VS. NETWORK WIDE SPEED DATA
USE CASES AND BENEFITS OF USING SPEED DATA TO INCREASE ROAD SAFETY INTELLIGENCE

1. Design speeds
2. Effect of changes
3. Crash site investigation
4. Time dependent speed limits
5. Transportation models: travel times, emissions, crash prediction
6. Microsimulations
COMPARE DESIGN SPEEDS WITH ACTUAL DRIVING SPEEDS

- Actual design speeds
- Speed limit
- Free flow speed

- Median speed
- $V_{85}$ (85th percentile)
- $V_{95}$ (95th percentile)

For different times of the day, weekdays, date periods…
COMMERCIAL SPEED DATA COMPARISON OF DESIGN SPEEDS WITH DRIVING SPEEDS

Digital road network of Basel showing ratio of night time (free flow) speeds vs. morning peak speed in different colours

Digital road network of London showing free flow speeds and Sunday night/early morning speeds
EFFECT OF ROAD INFRASTRUCTURE CHANGES

Assess the effect of
- road infrastructure changes
- speed enforcement tactics
- introduction of cycle or bus lane
- road safety campaigns
- etc

on the driving speeds
- at a specific site
  &
- in its vicinity
BLACK SPOT MANAGEMENT

- Identify Black Spots in a network based on crash data
- Analyse crash data and possible safety deficits or risks at Black Spots
- Develop measures to eliminate Black Spots
ANALYSE SPEEDING BEHAVIOUR AT CRASH SITES

- For certain black spots road authorities need to assess if speed reduction / enforcement is a good countermeasure

- Actual speeds driven at a crash site are generally not known
- Quality of collected crash data often not good

- Speed data in combination with crash data improves knowledge about road situations
General speed limits are not always wanted or needed

Speed data can help define times for time dependent speed limits
COMMERCIAL SPEED DATA: CALIBRATION OF MACROSCOPIC TRANSPORTATION MODELS

- Defining free flow speeds
- Estimation of capacity
- Speed calibration
- Calibration of Volume-Delay-Functions
- Validation of model results
APPLICATIONS OF TRANSPORTATION MODELS:
NETWORK SAFETY MANAGEMENT

- Evaluate the safety level of the road network based on crash data and traffic volumes
- Identify road stretches with high potential for safety improvements
- Define further actions

- Speed data used to calibrate the model
- Model is of a better quality and delivers more realistic traffic volumes across the network
- More accurate crash rates (crashes per vehicle kilometers)
- Better identification of safety potentials

www.ptvgroup.com
APPLICATIONS OF TRANSPORTATION MODELS: ROAD SAFETY IMPACT ASSESSMENT

- Using crash prediction models (CPM) to model shift in crash costs
- Using speed parameters as parameters in a CPM
- Microsimulations cannot predict crashes
- Nevertheless, it is possible to evaluate safety levels using surrogate measures
- Safety comparisons of different scenarios are possible
- Speed data used for desired speed distribution and calibration