Dynamic O/D matrix estimation: A behavioural approach

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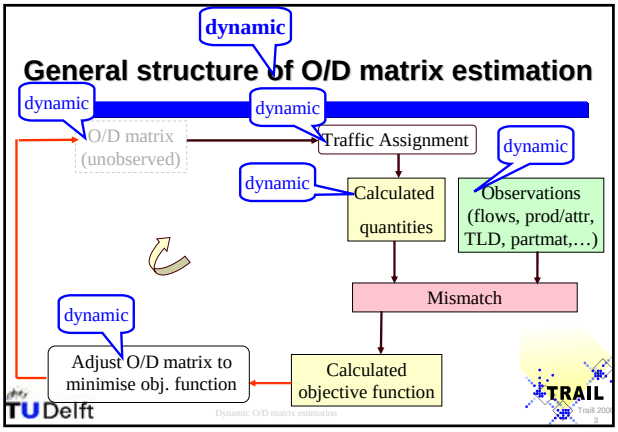
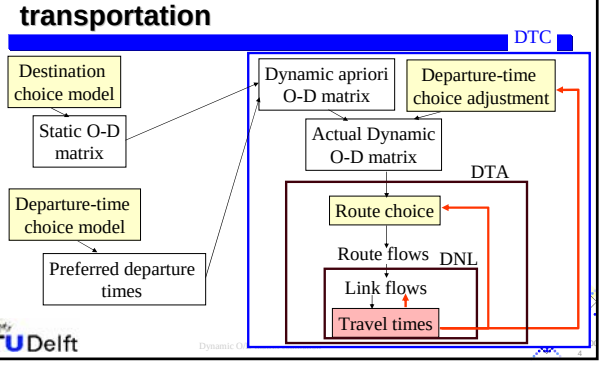
Presentation overview:

- General structure of O-D matrix estimation
- Modelled choice behaviour in transportation
- Proposed framework for dynamic O-D matrix estimation
- Comparison with existing methods
- Status, outlook

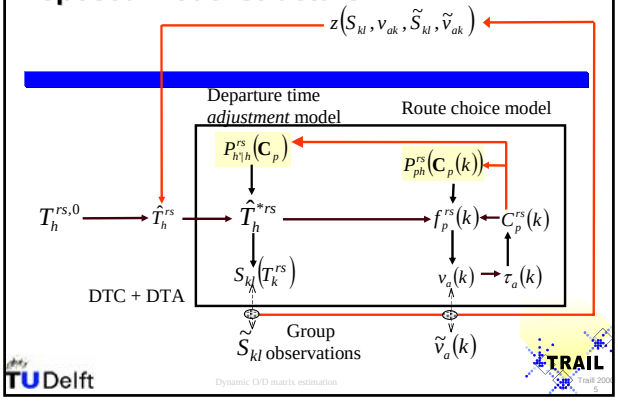
General structure of O/D matrix estimation



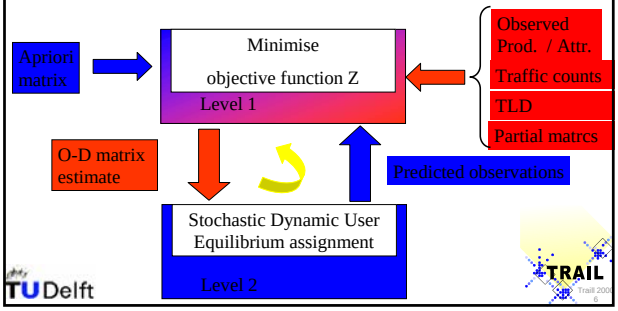
Modelled choice behaviour in transportation



Proposed model structure



Bilevel formulation



General formulation of estimation problem

Objective function:

$$Z\left(\hat{v}_{a,k}, \tilde{v}_{a,k}\right) = \sum_{a,k} \left(\hat{v}_{a,k} - \tilde{v}_{a,k}\right)^2$$

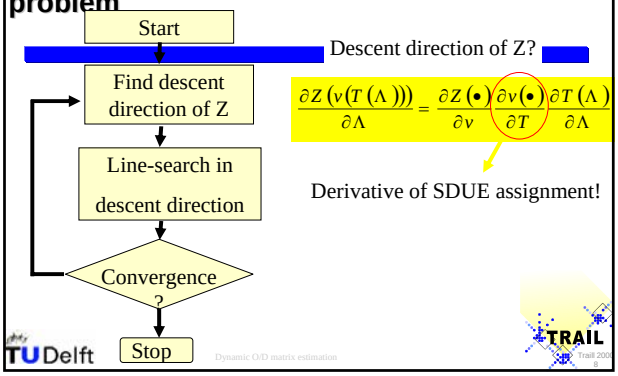
Bilevel optimisation problem

$$\hat{T}_h^{rs} = \arg\min_{\Lambda_{l\kappa}} Z\left(\hat{v}_{a,k}\left(T_h^{rs}\left(\Lambda_{l\kappa}\right)\right), \tilde{v}_{a,k}\right)$$

Subject to:

$$\hat{v}_{a,k} = DUE\left(T_h^{rs}\right)$$

Heuristic solution algorithm for bilevel problem



Comparison with existing methods

- **Positive**
  - Applicable to general networks (not just closed networks)
  - Integrates with behavioural transportation modeling
  - Very flexible in data use
  - Adaptable (could e.g. be used to calibrate assignment)
- **Neutral**
  - Off-line method
  - Needs apriori matrix (preferably from a model)
- **Negative**
  - Still under development
  - Computationally intensive

Status, development, and outlook

- **Current status and developments**
  - Basic version works
  - Incorporation of classical refinements to O-D matrix estimation by separation of level and structure
- **Future work**
  - Incorporation of observational errors and error covariance through Bayesian methods
- **Outlook**
  - Bilevel problem is “tough”, but heuristics exist
  - Upscaling to operational level still computationally troublesome