A micro-simulation model system of departure time and route choice under travel time uncertainty

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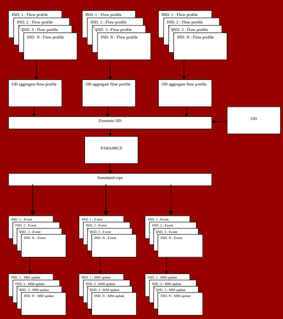
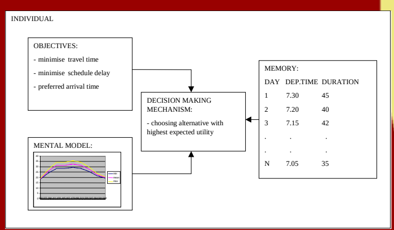
Background/goals

- Importance of departure time choice models
- Limited behavioural scope
  - Travel time uncertainty
  - Learning and adaptation
- Prototype model including these aspects

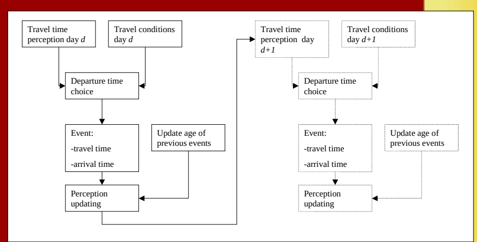
Model system (1)



Model system (2)



Model system (3)



Behavioural model (1): event

$$e = (\mathbf{x}, \mathbf{r}, d, \rho, w)$$

- x — vector of attribute values (dep. time, info);
- r — vector of reward values (travel time);
- *d* — index of the time (a day) of the event;
- ρ — is the memory strength of the event;
- *w* — is a weight associated with the event (recency, memory classes)

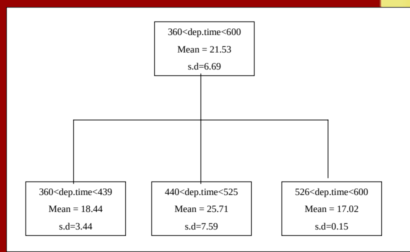
Behavioural model (2): weight

$$w = \left(1 - \frac{abs(t^e - t^r)}{t^e}\right)^{\mu} * (1/q_{ec})^{\chi}$$

Behavioural model (3): updating

- set of conditions $\{c_1, \ldots. c_n\}$
- $T_{c_1 \ldots c_n}$ and $\sigma_{c_1 \ldots c_n}$
- classify events into conditions based on event outcome (travel time) : CHAID
- weighted by event weight *w*

Behavioural model (4): classification



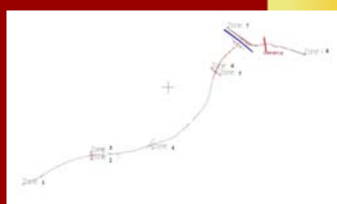
Behavioural model (5): departure time choice

$$EU_t = \int_{T\min}^{T\max} [\beta_1 * T_t + \beta_2 * SDE(t, T_t, PAT) + \beta_3 * (t, T_t, PAT) + \beta_4 * L(t, T_t, PAT)] f(T_t) d(T_t)$$

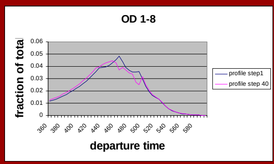
$$P_t = \exp(EU_t) / \sum_k \exp(EU_k)$$

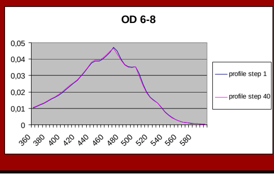
Case study

- N57-road
- 8 zones
- 4 ind./OD



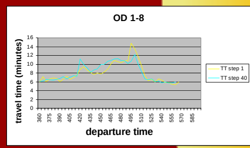
Results (1)

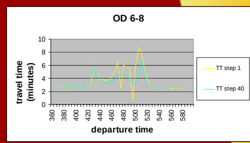




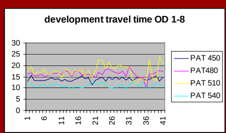
Results (2)

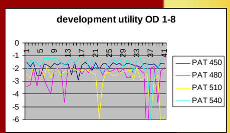
- Travel time upstream origins increases
- Travel time downstream origins decreases

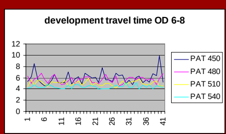


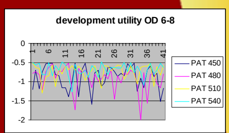


Results (3)









Conclusions

- Approach combines L+A principles with applied traffic assignment modelling
- Approach incorporates L+A under uncertainty
- Perception is improved through learning, but performance not
- Future work: calibration of parameters, understanding relationship learning-performance, larger scale implementation