Waiting and Weighting: Public transport model sensitivity to waiting time and schedule deviation

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5th New Zealand Mobilities Symposium
3–4 July, 2014
Travel from Pipitea, beginning Tuesday 5pm, with a 50 minute time budget.
Is The Schedule Enough?

Cumulative mean and standard deviation of travel time for trips in the AM peak, 91 Airport Flyer, April 2014
Is The Schedule Enough?

Cumulative mean and standard deviation of travel time for trips in the AM peak, 91 Airport Flyer, April 2014

- School Term Weekdays
- School Holiday Weekdays
- Weekends
- Weekday Schedule

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Estimating Waiting Time

Waiting is difficult to estimate (tempting to simplify)
Waiting and Weighting
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Research
Motivation

Research Question

Data

Transportation
Networks

Schedule-Based vs
Observational
Networks

Conclusion

References

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Waiting is difficult to estimate (tempting to simplify)

Waiting time depends on:

• *How* you arrive (random/coordinated)
• The time until your next service
• Service punctuality
“Arriving to Wait”

Vincent (2008, p. 52), Table 7.2

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Reliability

Earliness and lateness affect waiting and travelling time
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The consequence of poor reliability is attenuated by high frequency
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Frequency and reliability should be included in models
Reliability

Earliness and lateness affect waiting and travelling time

The consequence of poor reliability is attenuated by high frequency

Frequency and reliability should be included in models

Frequency and reliability vary with time and location
Research Question

Does incorporating reliability in expectations of waiting and travel time within spatial public transport models lead to significantly different estimates of travel time than from schedule-only models?
Data

General Transit Feed Specification (GTFS)

Google Transit; the timetable and network.
Data

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Open Street Maps (OSM)
Crowd-sourced pedestrian network.
Data

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**Snapper**
Anonymised, 17 GB. Millions of passenger trips and transfers.
## Data

**General Transit Feed Specification (GTFS)**

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**Real-Time Information (RTI)**

Archived RTI from GWRC.
Data: Limitations

**Snapper**
Very large. Few passengers = few vehicle observations.

**Real-Time Information (RTI)**
Ambiguous dwelling time. No cancellations.
Types of Transport Networks

- Network models are *models*
- Variable complexity and realism
Types of Transport Networks

- Network models are *models*
- Variable complexity and realism
- Each can be schedule-based, or observation-based
**Waiting and Weighting**

Richard Law

**Research Motivation**

**Research Question**

**Data**

**Transportation Networks**

**Schedule-Based vs Observational Networks**

**Conclusion**

**References**

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**Time-invariant Deterministic**

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The Chartered Institute of Logistics and Transport

NEW ZEALAND INSTITUTE FOR THE STUDY OF COMPETITION AND REGULATION
Time-invariant Stochastic
Time-dependent
Deterministic
Schedule-Based vs Observational Networks

Schedule-based networks

- Rely on the schedule being accurate
- Cannot give the likely range of travel time
- Imagine waiting time only as a function of headway
- ...are relatively simple to construct
Schedule-Based vs Observational Networks

Networks based on system observation

- Incorporate true reliability
- Return the mean and spread of actual travel time
- Model waiting time based on headway and punctuality
- ...are harder to construct and require a lot of (closed) data
Take Home Points

- Reliability in GIS models of public transport
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- Implications for waiting time are often ignored
Take Home Points

- Reliability in GIS models of public transport
- Implications for waiting time are often ignored
- Do spatial models of public transport need to be based on more than just the schedule?
Questions?

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Bibliography II
