IDENTIFYING THE BIAS:
Evaluating the effectiveness of automatic data collection methods in estimating the details of bus dwell time

ABSTRACT
The purpose is: to estimate how accurately AVL/APC and fare box payments data generally do not capture. The results reveal an overestimation in the passenger activity time. Which may bias the estimates associated with dwell or reliability of bus transit systems. The study allowed us to capture details regarding the dynamics of passenger activity, details that are not currently well captured by AVL/APC and fare box data.

DOWELL TIME MODELS

Manual observations of bus operations data

Temporal data:
- Time from doors open to door close (dwell time)
- Time after doors open to end of passenger activity
- Excess dwell time

Passenger activity:
- Boardings and alightings
- Stop arrival time
- Passenger load
- Passengers boarding with an encumbrance or mobility restriction

Stop characteristics:
- Direction of trip
- Time of day
- Lift usage
- Stop location

Fare payment type:
- Cash
- Smart card
- Magnetic fare card
- No fare presented (Children under 6)

Context map of routes studied

Dwell time models
Six models are employed to compare estimates of manual observations of dwell time to estimates generated from models using data similar to what AVL/APC and fare box reports. Models 1-3 report total dwell times, and Models 4-6 report boardings by fare payment type.

Main Findings
- The traditional model using data similar to what AVL/APC reports overestimates the additional time of first passenger boarding by approximately 2.5 times.
- Overestimation of time required for passenger activity was a result of excess dwell time likely captured by AVL/APC data.

Recommendations
- To improve AVL/APC data collection, the time stamp of the last passenger boarding recorded by the APC system can be used to identify the end of passenger activity. This information, when combined with the door closing time, can enable transit agencies to identify the amount of excess dwell at every stop and adjust schedules accordingly.
- Knowledge of the composition of patronage along a bus route, such as a route serving a high proportion of elderly passengers, can inform schedulers with the required modifications to the schedule.

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