Commuter’s individual travel time estimation: using AFC data of Paris transit system

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Introduction
Automated Fare Collection (AFC) data of public transport details more passenger behavior information than manual survey. Based on an AFC dataset of line RER A of Paris transit system, commuter’s Origin-Destination (O-D) pair has been generated by two loops. Passenger’s gate-to-gate individual travel time between access station and egress station is derived directly from the generated O-D pair.

Data processing
Data processing is realized by 3 principal steps combining TCL and SQLite:
Step 1: Data filtering
Extraction of all records of line RER A from mixed data.
Step 2: O-D pair inference
Loop 1: through each farecard number
Loop 2: through each trip
Step 3: Travel time calculation
\[ TT = t_j - t_i \]
where \( t_i \) validation time at access station gate; \( t_j \) validation time at egress station gate.

Case study and AFC data presentation
(i) RER A services’s topological structure
(ii) Paris AFC system records commuter’s farecard number which is anonymous, validation moments at access/egress stations’ gates, the date, access/egress stations (including transfer station), and station serial number.

Results
Extracted data of RER A
About 2 millions records of about 750 thousands distinct farecard numbers on April 7th 2011.

Passenger’s gate-to-gate individual travel time
Passenger’s gate-to-gate individual travel time (TT) distribution between each O-D pair of central segment of line RER A from Vincennes to Nanterre-Préfecture between 5h00 and 24h00.

Demand distribution of one O-D pair
Passenger’s demand from Auber to La Défense.

Passenger’s gate-to-gate individual travel time (TT) increases not only with travel distance, but also with the demand while the network is congested during peak hours;
The morning TT peaks are sharper than evening ones;
The dispersion of the TT points motivate a further study about the error sources of input AFC data.

Conclusions and perspectives
Passenger’s gate-to-gate individual travel time (TT) between each O-D pair has been estimated for high frequency congested transit line, line RER A of Paris transit system, by using AFC data. AFC data provides passenger behavior information at microscopic level. The growing of TT of each O-D pair displays different traffic congestion conditions during morning and evening peak hours.

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