Efficient Computation of Multi-Modal Public Transit Traffic Assignments using ULTRA

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Poster P30

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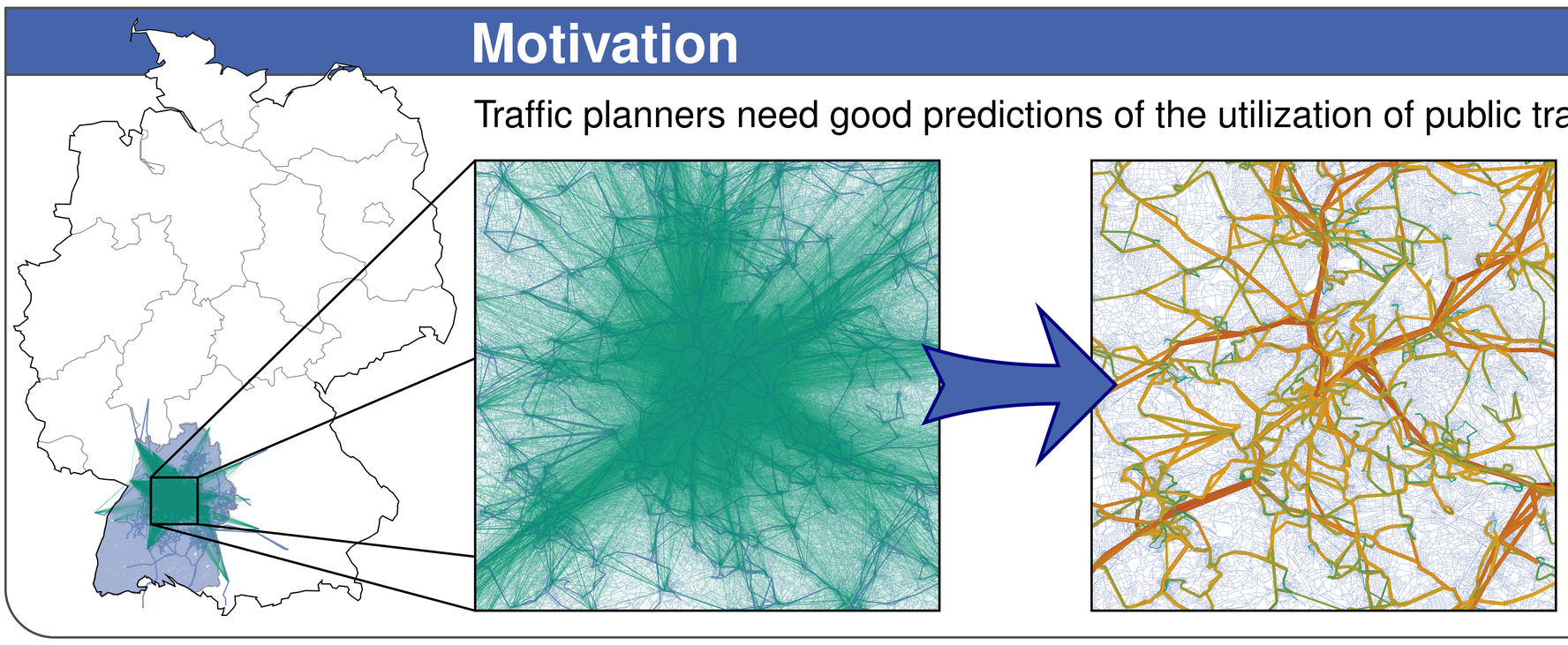
Motivation



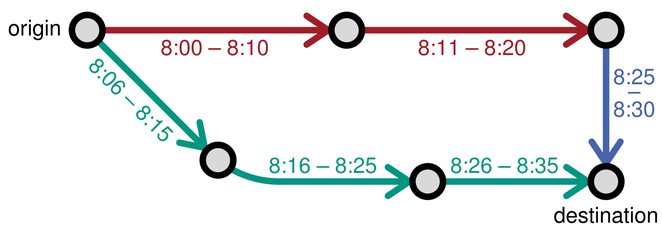
Traffic planners need good predictions of the utilization of public transit vehicles

Input:
- Transportation network
  - Timetable
  - Footpath graph
- Demand
  - Origin-destination pairs

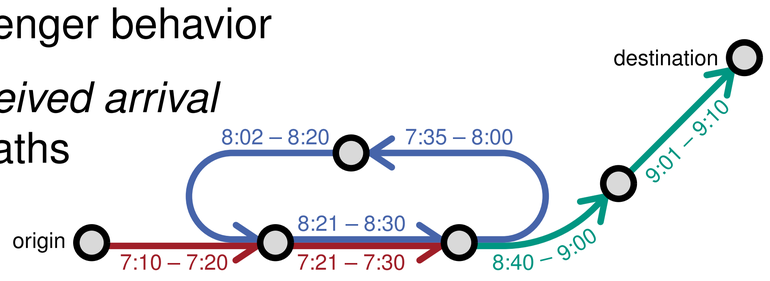
Output:
- Assignment
  - Vehicle utilization

Challenges

- Not all passengers behave the same
- Some passengers walk long distances

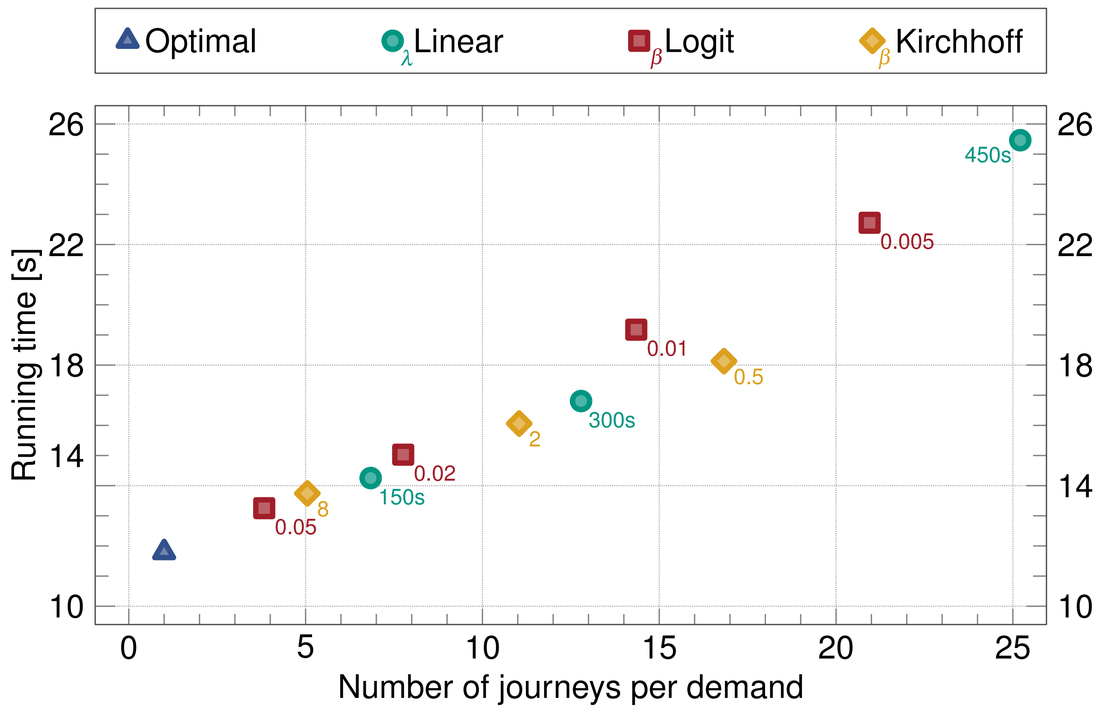


- Previous algorithms do not support long walking
- ULTRA enables fast queries, but only one-to-one [2]
- Estimate passenger behavior
- Cycles in *perceived arrival time* optimal paths



Decision Models

- Our algorithm implements a sequential choice model [3]
- Random utility depends on *perceived arrival time* (PAT)
- Choice is a function: PAT → probability
- We support various choice functions

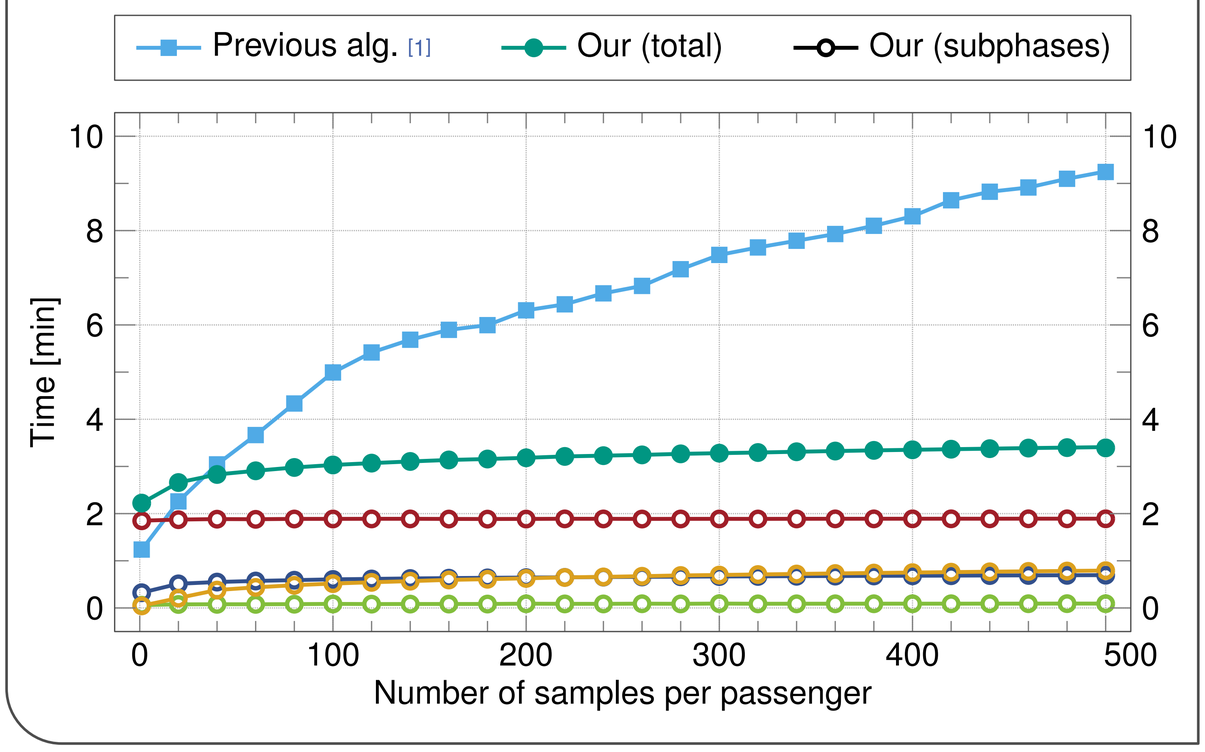


Algorithm

Preprocessing:
- ULTRA: Core-CH and shortcuts
- Bucket-CH: CH and buckets

Assignment:
- For each origin *o*:
  - Let *N*(*o*) be a list of stops, sorted by distance from *o*
- For each destination *d*:
  - Compute *perceived arrival times* from all stops to *d* [1]
  - For each origin *o* with demand for *d*:
    - Generate a *group g* of passengers for the demand
    - Use *N*(*o*) to decide where *g* walks first //split groups
  - For each connection *c* in chronological order: [1,4]
    - Decide which passengers use *c* //split groups
- Remove unwanted cycles from journeys [1]

Running time:
- Grouping of passengers reduces running time
- Faster, despite solving a problem more complex problem



Literature

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