Shared, autonomous, connected and electric urban transport

R. Kutadinata¹, R. D. Das¹, C. Duffield¹, S. Jain¹, R. Kelly², R. Kotagiri³, L. Kulik³, Z. Navidikashani¹, M. Rigby¹, N. Ronald⁴, R. Thompson⁴, M. Wallace², Y. Wang¹, S. Winter¹

¹Department of Infrastructure Engineering, The University of Melbourne, Australia
²Faculty of Information Technology, Monash University, Australia
³Department of Computing and Information Systems, The University of Melbourne, Australia
⁴Department of Computer Science and Software Engineering, Swinburne University of Technology, Australia

Emerging technologies

- IT platform
- Autonomous cars
- Electric cars

Project objective

We aim to explore the feasibility of a demand-responsive transport mode in the urban transport fabric. This mode provides ad-hoc point-to-point transport, which includes serving the last mile problem: transport from and to mass transport hubs. Vehicles of this novel mode should ideally be:

- connected for call and coordination,
- driverless (for trust and safety issues),
- economically feasible to be integrated in public transport schemes.

Sustainable future

Let’s carpool!

Demand-responsive transport (DRT) mode with electric, driverless vehicles

Simulation platforms for DRT

<table>
<thead>
<tr>
<th>Simulation platforms for DRT</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Silno (Large)</td>
<td>Can handle large areas</td>
<td>Can not simulate with other modes</td>
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<tr>
<td>Autobus (Large)</td>
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<td>MATSim</td>
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- Delphi: useful for determining areas to study further.
- MATSim: relatively low computational cost to simulate DRT without full integration (no other traffic).
- SUMoD: more realistic vehicle simulation, yet causes more complications and a higher computational cost.

The effect of ad-hoc demands on a feeder service

The proportion of ad-hoc demand (immediate pick-up request) determines the performance of the feeder service (to a train station).

- Location of ad-hoc demands are typically closer to train station.
- Fleet routes are re-optimized each time a new request is received.
- Routes chosen minimize the Vehicle Kilometers Travelled.
- Worst performance occurs when demand type are mixed (=80%).

Improved user interface using launch pads

Routing feasibility can be handled by providing information to clients on possible pick-up areas (i.e. launch pads).

- Launch pad is a geographic representation of aggregated DRT service potential.
- Flexibility constraints of passengers on-board dictate launch pad sizes.
- Map-based UI implementation for mobile devices helps users make decisions under uncertainty.

Results from different aspects of the project

Conclusion

- Existing simulation packages require extensions to enable DRT full integration.
- Ad-hoc demand causes performance degradation to a DRT service; routing improvements are required.
- The use of IT platforms to provide information eases users’ decision making, potentially increasing the feasibility and uptake of DRT.

Ongoing work

- Development of MATSim to enable full integration of DRT, including other traffic, and using it for investigating the impact of DRT to the system.
- Using surveyed travel data, investigating the factors that determines susceptibility of an area to implementation of DRT.
- Improving the quality of the travel data collected through a smartphone tracking sensors.
- Implementation of better routing and scheduling algorithm to improve the performance of the DRT.

References


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Contacts

Ronny Kutadinata
ronny.kutadinata@unimelb.edu.au

Research partners

- VicRoads
- Yarra Trams
- Transport for Victoria
- DfA
- NCC
- iMoD
- NEX

Research team

Intelligent Mobility on Demand (iMoD)
http://imod-au.info/