NP3002

HARNESSING DISRUPTIVE TECHNOLOGIES TO UNLOCK LOW CARBON MOBILITY

Research Question

How can Disruptive Technology provide low carbon mobility?

Aim: Find new methods of urban transport that are efficient, flexible, affordable that reduce reliance on carbon intensive private vehicles using disruptive technology.

Definition of Disruptive Technology:

A technology that creates a new market by changing performance values of consumers by outperforming current technologies in the mainstream market (Bower and Christensen, 1995).

Microtransit

Microtransit is demand responsive bus service that utilises Big Data, Mobile Internet, Internet of Things and Crowdsourcing.

Microtransit Services

Bridj, Chariot and Kutusuplus (no longer in service)

BRIDJ

chariot #commutesolved

Disruptive Characteristics of Microtransit:

1. App-based Transport with ability to book and track services using smart phone application.
2. Services are adaptable and don't operate on a fixed schedule and a fixed route.
3. Buses are smaller and faster with improved amenities such as Wi-Fi.
4. Service coverage is expanded using Big-Data and Crowdsourcing to reduce service failure of new routes.
5. Each Microtransit service has unique operations model.

Related Research

Kashani (2016) investigated Demand Responsive Transport (DRT) using car based ridesharing approach on a gridded network.

Ronald (2015) simulated a flexi-ride (semi-fixed schedule) and an Ad-hoc taxi service that was system completely DRT Yarrawonga-Mulwala.

Edwards (2014) built a simulation tool for a DRT feeder system within 1-mile of train station. Found the feeder buses were best suited to low density suburbs.

Knowledge Gap

Optimisation of routes and vehicles fleets. No research has investigated potential emissions savings for a microtransit. This research proposes a traffic simulation approach for a realistic urban environment.

Methodology

Develop a testbed network in agent-based software MATsim.

Use VISTA data to generate passenger demand.

Simulate the following:

1. Base-case where passengers drive to train station with current fixed line bus transport.

2. Simulate a DRT bus service that pick passengers up using existing bus stops.

3. Simulate door-door DRT bus service.

4. Develop further optimisation strategies for DVRP bus service.

Performance Metrics:

Customer Satisfaction: Passenger waiting time and total travel time.

Operations Performance: vehicle kilometres travelled, total empty vehicle kilometres, proportion of distance shared.

Environmental Impacts: Reduction in emissions and VKT.

Anticipated impacts

Reduce car travel by providing reliable and convenient public transport for outer suburban areas.

Provide research that could be used by public transport agencies to justify a pilot field study.

Potential first/last kilometre solutions for train hubs.

Contact & Further Information

Name: Jack Hill

Organisation Swinburne University of Technology

E jackhill@swin.edu.au

References

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Edwards, D.L. (2014) Designing optimal demand-responsive transportation feeder systems and comparing performance in heterogeneous environments. Available at: https://smartech.gatech.edu/handle/1853/52230 (Accessed: 12 September 2016)

Kashani, Z. (2016) 'Comparing Demand Responsive and Conventional Public Transport in a Low Demand Context', The First IEEE International Workshop on Context-Aware Smart Cities and Intelligent Transport Systems: . Available at: http://imod-au.info/comparing-demand-responsive-and-conventional-public-transport-in-a-low-demand-context/ (Accessed: 9 September 2016).

Ronald, N., Thompson, R.G. and Winter, S. (2015) 'Comparison of constrained and ad hoc demand-responsive transportation systems', Transportation Research Record: Journal of the Transportation Research Board, 2536, pp. 44–51. doi: 10.3141/2536-06.