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Benefit-Cost Evaluation Method for Transit Stop Removal

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A Benefit-Cost Evaluation Method for Transit Stop Removal

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Portland State University

Presented at the
OTREC Transportation Seminar
Portland, OR
January 10, 2014

- Introduction
- Research
- Methodology
- Application
- Next Steps

Wider Spacing

Closer Spacing

Ridership

Coverage

Speed

Access

Reliability

Proximity

Close Spacing = Duplicate Coverage

Wide Spacing = Coverage Gaps

Stop Spacing Standards = $\sim 1/4$ -mile

Stop Spacing in Practice = $\sim 1/8$ -mile (or less!)

- Existing research focused on *line-level* analysis to determine optimal *average* stop spacing

- Needed: a *stop-level* analysis method to determine which *specific* stops to remove

- Calculate Benefit-Cost Ratio (B/C) for removing each stop
- $B/C > 1$ = candidate for stop removal

- $B = (\text{\# of through riders on vehicle}) \times (\text{time saved by not serving stop})$
- $C = (\text{\# of riders using stop}) \times (\text{additional time to access nearest remaining stop})$
- Passenger-minutes saved vs. passenger-minutes lost

- Average load and stop-level ridership
- Distances between stops
- Value of time ratio
- Average walking speed
- Average time lost per stop (not including dwells)

Assumptions

- Bus serves all stops on every trip
- All passengers migrate to nearest stop
- Perfect street grid with small blocks

IMAGES AND MAPPING COURTESY OF URBAN DESIGN 4 HEALTH

Application

- TriMet Line 6
 - 20 stops
 - Outbound
 - PM Peak
 - Fall 2011
- Why chosen?
 - High ridership
 - Close spacing
 - Grid streets
 - Many stops

Results

- 5 stops have B/C > 1
- 3 adjacent stops
 - Remove outer stops first
- Remove stops, then re-evaluate after one year

Cross Street	B/C
Holland	1.6
Morgan	3.7
Bryant	1.6
Dekum	0.7
Rosa Parks	0.6
Ainsworth	0.2
Jarrett	0.7
Killingsworth	0.2
Sumner	1.0
Alberta	0.3
Wygant	1.0
Prescott	1.0
Mason	0.9
Failing	0.7
Beech	2.2
Fremont	1.0
Fargo	2.7
Morris	0.7
Knott	0.5
Brazee	0.9

Sensitivity Analysis

- V_a = Value of Time
- T_r = Time Lost/
Stop
- B/C = Benefit/Cost
- A range of values
still support the
same conclusion

V_a	T_r	B/C	
		Rosa Parks	Beech
2.5	10	0.3	1.2
	15	0.5	1.7
	20	0.6	2.3
2	10	0.4	1.5
	15	0.6	2.2
	20	0.8	2.9
1.5	10	0.5	1.9
	15	0.7	2.9
	20	1.0	3.9

- Stop Probability

- Network Analysis

IMAGES AND MAPPING COURTESY OF URBAN DESIGN 4 HEALTH

- Operational Benefits

Thank You

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Special Thanks:

Human Transit

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students in transportation engineering and planning