FUSING DATA TO CHARACTERIZE MODAL SPLIT AND PERIODICITIES OF PEOPLE MOVING TO/FROM A UNIVERSITY CAMPUS

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University of Manitoba
National Travel Monitoring Exposition and Conference

Tuesday, June 12, 2018
Presentation Outline

• Introduction
• Background
• Data Collection by Mode
• Data Collection by Site
• Data Collection Schedule
• Closing
• Questions
Research Scope

• Purpose
  • Understand the movement of people into and out of the Fort Garry campus for each mode for both spatial and temporal patterns.

• Objectives
  1) To develop data collection and fusion methods for monitoring multiple travel modes.
  2) Analyze the results to provide estimates of modal split for different time periods and spatial areas to assist the University of Manitoba in developing sustainable transportation strategies and policies.
Research Scope

• Approach
  • Use traffic monitoring equipment for each mode to gather **average weekday daily person traffic** throughout a university year at each campus entrance.
  • Monitor and analyze temporal and spatial patterns of all modes to/from campus.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Summer 2018 May-Aug</th>
<th>Fall 2018 Sep-Dec</th>
<th>Winter 2019 Jan-Apr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrians</td>
<td>AWDT</td>
<td>AWDT</td>
<td>AWDT</td>
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<tr>
<td>Cyclists</td>
<td>AWDT</td>
<td>AWDT</td>
<td>AWDT</td>
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<tr>
<td>Transit</td>
<td>AWD-Passengers</td>
<td>AWD-Passengers</td>
<td>AWD-Passengers</td>
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<tr>
<td>Vehicles</td>
<td>AWD-Passengers</td>
<td>AWD-Passengers</td>
<td>AWD-Passengers</td>
</tr>
</tbody>
</table>
Challenges

• Mode Plan:
  • Developing methods to fuse unconventional traffic data sources (like transit ridership data) with more conventional data sources (like vehicle counts).
  • Some equipment times do not function in winter.

• Site Plan:
  • Differences between facility types at each campus entrance influences the expected mode split and the type of equipment that can be deployed.
  • City property makes permitting counting more difficult.

• Schedule:
  • Variability in pedestrian and cyclist volumes due to daily and seasonal weather conditions.
  • Limited equipment and people resources.
  • Event days on campus skew data.
Site Background

- Winnipeg’s population is approximately 780,000 ppl
- The campus has ~40,000 students, staff, and faculty members
- There are six main entrances at the campus
- Four main modes:
  - Pedestrians
  - Cyclists
  - Transit riders
  - Vehicles
Resources/Counting Modes

- **Pedestrians:**
  - 2 passive infrared sensors.

- **Bicycles:**
  - 1 selective pneumatic tubes (low vehicle volumes can travel on).
  - 1 mini pneumatic tubes (vehicles cannot travel on).
  - Classifying radar for roadways.

- **Transit:**
  - Data obtained through Automatic Passenger Counters (infrared sensors) on 25% of the transit fleet. Data shows as an average daily passenger load at a stop.

- **Vehicles:**
  - Classifying radar supplemented by existing tube counts conducted by the City of Winnipeg.
  - University of Manitoba Campus Commute survey for vehicle occupancy rate.
D’Arcy/Southwood Lands (SL)

AWDT of 210 peds & 450 bikes

Legend
- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- Shared AT Facility
- Sidewalk
- Bike Travelled Facility
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- PYRO and ZELT
- Transit stops
- Radar (vehicle and bikes)

Modes
- Pedestrians: PYRO counts minus selective tube bike counts with CoW PYRO and ZELT
- Bicycles: selective tube counts with CoW ZELT
- Transit: N/A
- Vehicles: N/A

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D’Arcy/Southwood Lands (SL)

Legend
- Mixed AT Movement
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- Bike Movement
- Transit Movement
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- PYRO box (peds and bikes)
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- Transit stops
- Radar (vehicle and bikes)

Modes
- Pedestrians: PYRO counts minus selective tube bike counts
- Bicycles: selective tube bike counts
- Transit: N/A
- Vehicles: N/A
**Introduction**

**Background**

**Methodology**

**Exp. Findings**

**Status**

**Conclusion**

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**Legend**

- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- Shared AT Facility
- Sidewalk
- Bike Travelled Facility
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- Transit stops
- Radar (vehicle and bikes)

**Modes**

- **Pedestrians:** PYRO counts minus selective tube bike counts plus two manual counts
- **Bicycles:** selective tube counts plus two manual counts
- **Transit:** N/A
- **Vehicles:** N/A

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**Smartpark (SP)**

- Manual Count
- Bayridge Ave

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Introduction

Smartpark (SP)

Legend
- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- Transit stops
- Radar (vehicle and bikes)

Modes
- Pedestrians: PYRO counts minus selective tube bike counts plus two manual counts
- Bicycles: selective tube counts plus two manual counts
- Transit: N/A
- Vehicles: N/A
 modes:

Pedestrians: 2 PYRO counts minus 2 bike tube counts
Bicycles: selective tubes on north side and mini tubes on south side
Transit: Eastbound and westbound stops
Vehicles: Radar alternating with manual counts

Legend:
- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- Transit stops
- Radar (vehicle and bikes)
University Crescent North (UCN)

Markham Rd

Manual Count

University Crescent

Legend
Mixed AT Movement
Pedestrian Movement
Bike Movement
Transit Movement
Vehicle Movement/lane
Shared AT Facility
Sidewalk
Bike Travelled Facility
PYRO box (peds and bikes)
Bike tubes (mini and sel.)
Transit stops
Radar (vehicle and bikes)

Modes
Pedestrians: PYRO counts minus mini bike tube counts and plus manual count
Bicycles: Bike tubes (mini and sel.), radar, and one manual count
Transit: Northbound and southbound stops
Vehicles: Radar
University Crescent North (UCN)

Legend
- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- Transit stops
- Radar (vehicle and bikes)

Modes
- **Pedestrians**: PYRO counts minus mini bike tube counts and plus manual count
- **Bicycles**: Bike tubes (mini and sel.), radar, and one manual count
- **Transit**: Northbound and southbound stops
- **Vehicles**: Radar

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University Crescent South (UCS)

Modes

Pedestrians: PYRO counts minus mini bike tube counts and plus manual count. Possibly radar.
Bicycles: Mini bike tubes, radar, and manual count
Transit: N/A
Vehicles: Radar

Legend

Mixed AT Movement
Pedestrian Movement
Bike Movement
Transit Movement
Vehicle Movement/lane
Shared AT Facility
Sidewalk
Bike Travelled Facility
PYRO box (peds and bikes)
Bike tubes (mini and sel.)
Transit stops
Radar (vehicle and bikes)
University Crescent South (UCS)
### Site Plans

#### Legend
- Mixed AT Movement
- Pedestrian Movement
- Bike Movement
- Transit Movement
- Vehicle Movement/lane
- PYRO box (peds and bikes)
- Bike tubes (mini and sel.)
- Transit stops
- Radar (vehicle and bikes)

#### Modes
- **Pedestrians**: PYRO counts minus mini bike tube counts and plus manual count
- **Bicycles**: Mini bike tubes and radar
- **Transit**: Northbound and westbound stops
- **Vehicles**: Radar

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**King’s Drive (KD)**

**Freedman Crescent**

**Manual Count**

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Data Collection Plan

- **Alternate** 4 count setups each semester with multiple weeks of data per setup
- NCHRP 797: **4-7 days** for accurate short duration counts
- Goal is to get an accurate mode split at each **site location**.
- Avoid all **event days**

- **Resources:**
  - 2 passive infrared sensors for pedestrians and bikes
  - 2 bike tubes
  - 1 radar for bikes and vehicles
Introduction

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Conclusion

Setup 3

Legend

Radar Allocated
PYRO box
Bike Mini Tubes
Bike Selective Tubes
Transit Stops
Study Area
Entry Point

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Summary

• Purpose
  • Understand the movement of people into and out of the Fort Garry campus for each mode for both spatial and temporal patterns.

• Current Status
  • Began collecting and calibrating pedestrian and cycling data at two sites.
  • Have access to transit data.
  • Working on procurement of the radar for bicycle and vehicular data.

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Questions?

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2016 Commuter Survey Results

University of Manitoba Campus Commute Survey Results 2016