Attribution of short-duration traffic counts to highway segments to provide system-wide coverage

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Outline

• Introduction

• Highway Segmentation
  • Purpose
  • Rules/Criteria

• Count Site Attribution
  • Purpose
  • Rules/Criteria

• Illustrative Findings

• Conclusion
Introduction

Motivation and Background
Introduction

• System-wide traffic statistics are often a required output of traffic monitoring programs, as they are vital in meeting a variety of user needs

• Current uses include:

  - Safety
  - Pavements
Introduction

• Many provinces and states struggle to properly manage their data
• A properly managed LRS is essential to data management
• An LRS has different needs based on its application
• A specific set of segmentation rules is necessary to work with the point-based nature of data used in traffic monitoring
Introduction

• Manitoba’s highway network is subdivided into traffic control sections for the purpose of referencing
• However, sections are too long for accurately attributing traffic flow
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• However, sections are too long for accurately attributing traffic flow
• Therefore, we must further subdivide the network in order to create a representative flow map
Introduction

Legend
- Short-duration Count Site
- Continuous Count Site
- Primary Highways
- Secondary Highways
- Tertiary Highways

Continuous Count (85)
Short-duration Count (1685)

1414 Traffic control sections
Introduction
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• At least three methods to produce system-wide traffic volume estimates:
  1. One-to-one sampling and attribution
  2. Stratified random sampling
  3. Hierarchical attribution
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Highway Network Segmentation
Why segment the network?

- **Assumption of Homogeneity** – a pragmatic simplification which disregards immaterial changes in traffic flow along a highway. Its application underpins the development of criteria used in subdividing the highway network, which in turn facilitates the attribution of count sites to sequences.
Why segment the network?

- **Assumption of Homogeneity** – a pragmatic simplification which disregards immaterial changes in traffic flow along a highway. Its application underpins the development of criteria used in subdividing the highway network, which in turn facilitates the attribution of count sites to sequences.
Highway Network Segmentation

• **Criterion 1:** Highway segments shall be subdivided at primary and secondary highway intersections
Highway Network Segmentation

- **Criterion 2:** Highway segments shall be subdivided at all intersections with tertiary highways
Highway Network Segmentation

- **Criterion 3:** Highway segments shall be subdivided at intersections with major municipal roads
Highway Network Segmentation

• **Criterion 4:** Highway segments shall be subdivided at urban boundaries
Count Site Attribution
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• **Principle 1:** Continuous count sites take precedence over short-duration count sites
Count Site Attribution

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Count Site Attribution

• **Principle 2:** Count sites on a highway segment take precedence over sites on adjacent segments

![Diagram showing continuous count and short-duration count](image)
Count Site Attribution

• **Principle 2:** Count sites on a highway segment take precedence over sites on adjacent segments
Count Site Attribution

- **Principle 3:** A count obtained on an adjacent segment may be attributed to a segment without a site if the intersecting highway is a tertiary highway.
Count Site Attribution

• **Principle 4:** A count obtained on an adjacent segment may be attributed to a segment without a site if the intersecting highway has less than 20% of the AADT on the adjacent segment.
Count Site Attribution

**Principle 5:** A count obtained on an adjacent segment may be attributed to a sequence without a site if turning movement counts show similar traffic flows on the two segments.
Count Site Attribution

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Count Site Attribution

- **Principle 6**: On segments with multiple count sites, the site with the most recent data takes precedence over others.
Count Site Attribution

**Principle 7:** The count site of the adjacent segment with the highest AADT may be attributed to the center segment at an offset intersection.
Count Site Attribution

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![Diagram showing count site attribution with AADT values.]
Count Site Attribution

• **Principle 8:** A segment with a count site that has been removed may be attributed flow from the former count site with a growth factor applied.
Count Site Attribution

- **Principle 9a:** For segments with multiple count sites and AADT of 500 or less – if segments have flows that are less than double/half one another, the highest flow count site is attributed to the segment and the remaining count sites are flagged.
Count Site Attribution

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Count Site Attribution

• **Principle 9b**: For segments with multiple count sites and AADT of more than 500 – if segments have traffic flows that are less than 20% different from one another, the highest flow count site is attributed to the segment and the remaining count sites are flagged.
Count Site Attribution

• **Principle 9b**: For segments with multiple count sites and AADT of more than 500 – if segments have traffic flows that are less than 20% different from one another, the highest flow count site is attributed to the segment and the remaining count sites are flagged.
Count Site Attribution

• **Principle 10:** Segments within city boundaries are attributed count sites based on the previous principles, however are flagged
Count Site Attribution

• **Principle 11:** Segments that do not follow any of the previous principles are attributed the same count sites as in previous years and are flagged
Illustrative Results
Illustrative Results

- South of province’s capital, Winnipeg
- No longer any count sites on highway

Data last collected in 2002, 2004, respectively
Illustrative Results

• Segment on the north Perimeter highway (ring road surrounding the city of Winnipeg)
• Sees some of the highest traffic flows in the province
• Currently attributed data from 2004 (from a site that has since been removed)
Illustrative Results

- Provincial Road 207 that goes through the town of Ste. Anne
- No count sites
- Site attributed to this highway is off the map to the west
Illustrative Results

• Bridge removed
• Count site further down highway used to drive AADT, but that no longer makes sense with the missing link
Conclusions
Conclusions

• System-wide traffic monitoring relies on a sufficiently detailed LRS – one that is specifically built to deal with traffic changes
• The assumption of homogeneity is a key component in segmenting the highway network
• Adding segmentation is easier from a data management perspective
• Objective segmentation criteria are established and applied
• Attribution principles used to objectively attribute flow to the network
• Routine maintenance of the LRS is essential to keep up-to-date with physical network changes and changes to the count site locations/types
Questions?