A simple, effective, and socially responsible approach to bus-stop consolidation

DON’T STOP JUST YET!

ABSTRACT

Bus-stop spacing is often too wide, making buses slow and unreliable. This paper creates a new methodology for removing redundant stops in Montreal.

METHODOLOGY GOALS

Simple. Avoid complex math, allowing transit agencies to easily understand and implement it.

Effective. Cut enough stops to decrease runtimes—so much that routes can be run at existing frequencies with fewer buses.

Automatable. Able to be coded, allowing for quick analysis of all routes on any modern bus network.

Socially responsible. Sympathetic to the needs of those with reduced mobility.

BASIC RULE FOR STOP REMOVAL

Determine each stop’s catchment

- Catchment areas are of variable size, based on factors such as:
  - Bus service quality;
  - Street grid connectivity; and
  - Population density.

- Min: 255m; Mean: 553m; Max: 832m

Classify each stop’s importance, from A (must-keep) to F (unimportant), based on whether:

- It serves health-care / seniors centres;
- It connects with other transit lines;
- It has high passenger activity; and
- It is the first or last stop on a route.

Use catchment & importance to decide which stops to remove

- For each stop S on a route, find the other stops in S’s catchment;
- Identify the most important stops before and after S; and
- Add 1 point to all other stops that are less important than S.

- Repeat for all stops on the route, then remove stops with points > 1.

- For consecutive stops with points > 1, only remove those with the most points.

RESULTS – SYSTEM-LEVEL

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops analyzed</td>
<td>8596</td>
</tr>
<tr>
<td>Routes analyzed</td>
<td>177</td>
</tr>
<tr>
<td>Stops removed</td>
<td>1977 (23%)</td>
</tr>
<tr>
<td>Service-coverage change</td>
<td>-1.06%</td>
</tr>
<tr>
<td>Time saved per route</td>
<td>1.2 minutes</td>
</tr>
<tr>
<td>Buses saved</td>
<td>42</td>
</tr>
<tr>
<td>Daily operating time saved</td>
<td>109 hours</td>
</tr>
</tbody>
</table>

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