Low-cost technologies to understand & mitigate traffic congestion at railway crossings

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Presentation for FreightWeek STL
America’s Center Convention Complex, Room 143/144
May 23, 2018
Outline

1. About TRAININFO
2. Project Background
3. ITS Technology
4. Performance & Results
5. Concluding Remarks
✓ We produce real-time railroad crossing blockage data.
✓ We measure traffic impacts caused by blocked railroad crossings.
✓ We provide ITS solutions to mitigate traffic impacts.
STAGE 1
Understand when & how long crossings are blocked

STAGE 2
Understand traffic impacts of blocked crossings

STAGE 3
Mitigate traffic impacts caused by blocked crossings
STAGE 1

Understand when & how long crossings are blocked
Trapped by a 'pain in the butt' train? Here's how to complain:

Federal regulations say trains can't be stopped on tracks blocking crossings for longer than five minutes

Colin Butler, Kate Dubinski - CBC News

Posted: May 03, 2018 7:00 PM ET | Last Updated: May 3

Adelaide Street is often paralyzed as massive freight trains rumble in and out of the nearby Canadian Pacific Railway, blocking one of the city's major arteries, often several times a day. (Colin Butler/CBC News)
This is despite Tuesday’s incident that saw a train straddle Adelaide for close to an hour and saw Londoners vent their frustrations on social media.

Don Minato @DonMinato
5 minutes am counting on Colborne St. this morning
@ldnonttrain ldnont walkingtowork
pic.twitter.com/ea3NoQgqlF

Don Minato @DonMinato
Update - now 10 minutes.
6:25 AM - May 1, 2018

Sue Pearce @spierce62_sue
Sitting at Pall Mall/colborne waiting for train to move 15 minutes so far 😞
6:09 AM - May 1, 2018
This is despite Tuesday's incident that saw a train straddle Adelaide for close to an hour and saw Londoners vent their frustrations on social media.

Don Minato @DonMinato 1 May
5 minutes am ounting on Colborne St. this morning
@ldnontrain ldnt #walkingtowork
pic.twitter.com/ea3NaOqiEF

While plenty of people reported waiting for up to an hour on social media, a spokesperson for the rail company would only say the train on Tuesday stopped at 6:45 a.m. because of a mechanical problem and refused to say for how long.

sue pearce @spearce62_sue

Sitting at Pall Mall/colborne waiting for train to move 15 minutes so far 😞
6:09 AM - May 1, 2018

See sue pearce's other Tweets
STAGE 2

Understand traffic impacts of blocked crossings
Cloud Server
Determines delay using patented, machine-learning algorithms

Bluetooth Sensors
Collect travel time data

Road Tubes (or other technology)
Collects traffic volume data

TRAININFO Sensor
Collects crossing blockage data
Train crossing blockage and duration

Expected travel time without a train
Actual travel time with a train
Delay caused by train
## Traffic Delays at Waverley St Railway Crossing

### Modeled vs Measured

<table>
<thead>
<tr>
<th>Metric</th>
<th>Modeled</th>
<th>Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate down time per train (min)</td>
<td>2.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Average trains per day</td>
<td>35</td>
<td>38.0</td>
</tr>
<tr>
<td>Vehicles delayed per day</td>
<td>1,923</td>
<td>4,277</td>
</tr>
<tr>
<td>Hours of delay per day</td>
<td>55.3</td>
<td>286.6</td>
</tr>
</tbody>
</table>

*5x higher*
STAGE 3

Mitigate traffic impacts caused by blocked crossings
PROJECT BACKGROUND
WAVERLEY ST
- Major N/S arterial
- 30,000 vpd
- 4-lanes
- Signalized
- 35-45 mph
- 30+ trains/day
ITS TECHNOLOGY
What we did

- Installed train detection and Bluetooth sensors
- Developed crossing blockage prediction profiles
- Developed travel time prediction profiles
- Calculated traffic delays
- Developed DMS messages
Current messages to NB Waverley drivers

Without Train

With Train
PERFORMANCE & RESULTS
25% GHG emissions
Driver feedback...

“I’m much more relaxed and calm as I approach the railway crossing now that I know when it will be blocked.”
Translation: Improved safety

“Now that I can re-route [around blocked railway crossings] I don’t think an underpass is needed anymore.”
Translation: Cost savings

“I use the [roadside] sign every day to decide if I should re-route around the crossing.”
Translation: Time savings
“Employees and customers find the live travel time information on the DMS very helpful. People traveling to north of the tracks select their route, Waverley vs Pembina or Kenaston, based on whether there are train delays at the time.

This sign has helped keep the number of customers and business fairly steady.”
CONCLUDING REMARKS
Grade separation is not always viable. ITS options are available as a cost-effective solution.

Many drivers just want information. They understand underpasses are not always possible.

Waverley project demonstrated feasibility & effectiveness. Winnipeg wants more locations.

Next generation ATIS is being developed for CAVs. Integration into Apple CarPlay and Android Auto.
Safe and seamless mobility at railway crossings

www.trainfo.ca

garreth.rempel@trainfo.ca
Live Railway Crossing Map

- Blocked
- Predicted
- Clear
Up-to-the-Minute Stats

<table>
<thead>
<tr>
<th>Stat</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longest Blockage Duration (Minutes)</td>
<td>55.15</td>
</tr>
<tr>
<td>Number of Blockages</td>
<td>15</td>
</tr>
<tr>
<td>Average Blockage Duration (Minutes)</td>
<td>9.79</td>
</tr>
<tr>
<td>Total Hours Blocked</td>
<td>2.45</td>
</tr>
</tbody>
</table>
Real-time Blockage Frequency & Duration

Screenshot taken at 8:30 am
Filter by Date & Download Record of Every Blockage

<table>
<thead>
<tr>
<th>Crossing</th>
<th>Blockage Start</th>
<th>Blockage Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 08:07:00 AM</td>
<td>1.58</td>
</tr>
<tr>
<td>Richmond St and Piccadilly St</td>
<td>05/17/18 07:42:00 AM</td>
<td>5.32</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 07:38:00 AM</td>
<td>7.12</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 07:23:00 AM</td>
<td>1.38</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 07:11:00 AM</td>
<td>2.57</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 07:06:00 AM</td>
<td>3.43</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 07:01:00 AM</td>
<td>0.48</td>
</tr>
<tr>
<td>Adelaide St and Central Ave</td>
<td>05/17/18 06:59:00 AM</td>
<td>1.27</td>
</tr>
</tbody>
</table>
Blockage Frequency & Duration

By Hour-of-Day
By Day-of-Week
Average blockage duration is 4.5 minutes

1 in 3 blockages are 10 minutes or longer
Train Detection Sensor