Friday, June 16, 2017
7:30 a.m. ITS-NY Board of Directors Meeting, Garden Room
7:30 Registration Desk and Exhibit Hall Open; Full Breakfast in Exhibit Hall

9:00 Panel 4: Using ITS for Performance Assessment
Panel Moderator: Dr. Camille Kamga, UTRC2
“Analyze This: Using NPMRDS for Multi-Geographic-Resolution (MGR) Performance Assessment,” Dr. Catherine Lawson, SUNY
“Artificial Intelligence Saving Lives on Highways (with Existing Infrastructure),” Branko Glad, Telegra
“ITS and Performance Assessment for Freight Transportation,” Shobna Varma, StarIsis Corp.

10:15 Break in Exhibit Hall (Exhibit Hall Closes at 10:45 a.m.)

10:45 Panel 5: ITS Security
Panel Moderator: John Bassett, NYSDOT
“Considering Cybersecurity,” Roderick Link, FBI Cyber Task Force Unit/Albany
“Cybersecurity,” Siva Narla, ITE

Noon ITS-NY Closing Luncheon
ITS-NY Officers and Board of Directors Election Results;
Free Weekend and CITE Course Drawings

1:15 p.m. Adjourn
Artificial Intelligence
Saving Lives on Highways
Traffic Management Goals

- Safety
- Congestion Reduction
- System Reliability
- Freight Movement and Economic Vitality
- Environmental Sustainability

Why Automatic Video Incident Detection
Why Automatic Video Incident Detection

- Wrong Way Driving
- Stopped Vehicle
- Congestion
- Slow Vehicle
- Pedestrian
- Smoke/Fire
- Tailgating
- Aggressive Driving
- Truck/Slow Vehicle in Fast Lane
- Reduced or Loss of Visibility (smoke, fog, etc.)
- Debris
VID Industry

PERFORMANCE

• Detection Rate
  Wrong-Way Driving
  Smoke/Fog
  Stopped Vehicle

• False Alarm Rate
  Cry Wolf Syndrome
  Irrational Expenses
  Frustrated Operators
  Not Using State-of-the-Art Automatic Procedures
Principle

- **OBJECT OF INTEREST**
  - Vehicle
  - Pedestrian
  - Debris

- Difference in PIXELS between *consecutive frames*
  - Difference in pixels
  - Different types of pixel changes
VID Industry Today

Problems

• Camera Shaking
• Shadows
• High Noise
  • Low quality image
  • Low light
• PTZ Camera Movement!
Next Generation of VID

Solution

Object Recognition

- Pedestrians

PROBLEM

- How to recognize objects in a frame?
- Computer Program?
- How does human brain recognize objects?
Next Generation of VID

SOLUTION

- Let computer write the program itself
- MACHINE LEARNING - Presenting a significant amount of pedestrian / vehicle images to the system
- System learns “OBJECTS OF INTEREST”
- Powerful computers and massive parallel computational units (such as GPUs – thanks gamers!)
Next Generation of VID

ARTIFICIAL INTELLIGENCE

• Detect objects of interest
• Background subtraction, multimodal background
• Edge detection
• Multitarget object tracking with Bayesian-based tracking
• Camera calibration techniques
• Key point extraction and matching
• Input signal decorrelation based on wavelet transform
Next Generation of VID

ARTIFICIAL INTELLIGENCE

Vehicle count: 1
Next Generation of VID

**ARTIFICIAL INTELLIGENCE**

By explicitly detecting object of interests, shadows will be discarded since they look significantly different than vehicles / pedestrians.
Next Generation of VID

ARTIFICIAL INTELLIGENCE
Next Generation of VID

ARTIFICIAL INTELLIGENCE
Next Generation of VID

ARTIFICIAL INTELLIGENCE
Next Generation of VID

ARTIFICIAL INTELLIGENCE

[Image of a highway with multiple vehicles and a software interface for video analytics and intelligence]
Next Generation of VID - SHOWING OFF ARTIFICIAL INTELLIGENCE
Next Generation of VID - SHOWING OFF ARTIFICIAL INTELLIGENCE
Next Generation of VID - SHOWING OFF ARTIFICIAL INTELLIGENCE

Vehicle Tracking
Next Generation of VID - SHOWING OFF ARTIFICIAL INTELLIGENCE
Next Generation of VID - SHOWING OFF ARTIFICIAL INTELLIGENCE
# Next Generation of VID

## Artificial Intelligence

### COMPARISON

<table>
<thead>
<tr>
<th></th>
<th>Traditional VID</th>
<th>AI VID</th>
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</thead>
<tbody>
<tr>
<td>Detection Rate:</td>
<td>70% – 90%</td>
<td>95%</td>
</tr>
<tr>
<td>False Alarm Rate:</td>
<td>13.00 – 15.80 Camera/Day</td>
<td>0.50 – 0.72 Camera/Day</td>
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</tbody>
</table>
Next Generation of VID

ARTIFICIAL INTELLIGENCE

THANK YOU

Branko Glad

Telegra, Inc.
info@telegra-inc.com
www.telegra-inc.com
ITS Performance Assessment for Freight Transportation

Shobna Varma
Freight Magnitude and Growth

Freight Volume (Tons)

Source: FHWA Freight Analysis Framework
Freight and the Economy

In 2013 the U.S. transportation system moved a daily average of about 50 million tons of freight valued at more than $49.3 billion.
Freight Values Rising

• Value rising faster than weight
• Per ton value in 2007 = $882
• By 2040 = $1377 per ton
• Exports even more valuable at $1826 per ton in 2007 and is projected to increase from 19% in 2007 to 30% in 2040
• This value represents the importance of manufactured U.S. exports
Imports, Exports High in Value

- Top 10 commodities by weight equal only 16% of freight value
- Top 10 by value equal 58% of all total freight value
- Highest value are items such as machinery, electronics, and cars and trucks
Just in Time Driven Economy

• Our just-in-time economy relies on our transportation network

• The transportation agencies support the economy’s conveyor belt

• We have limited options to expand our transportation network

• Squeeze more capacity from existing highways.

• 10 and 20-Year cycles versus real time cycles to improve freight mobility.
Freight Performance

Assess freight movement on the Interstate by the percentage of Interstate system mileage providing for reliable truck travel time (Truck Travel Time Reliability Index).

Freight Transportation Data in the US (Multiple Sources)

- National Performance Management Research Data set (NPMRDS) to measure traffic flow.
- INRIX
- ATRI
- Others...
Top 10 Freight Congestion Areas

**ATRI – 2017 Top 10 Truck Bottlenecks**

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<td>2</td>
<td>Fort Lee, NJ: I-95 at SR 4</td>
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<td>Chicago, IL: I-290 at I-90/I-94</td>
</tr>
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<td>4</td>
<td>Louisville, KY: I-65 at I-64/I-71</td>
</tr>
<tr>
<td>5</td>
<td>Cincinnati, OH: I-71 at I-75</td>
</tr>
<tr>
<td>6</td>
<td>Los Angeles, CA: SR 60 at SR 57</td>
</tr>
<tr>
<td>7</td>
<td>Auburn, WA: SR 18 at SR 167</td>
</tr>
<tr>
<td>8</td>
<td>Houston, TX: I-45 at US 59</td>
</tr>
<tr>
<td>9</td>
<td>Atlanta, GA: I-75 at I-285 (North)</td>
</tr>
<tr>
<td>10</td>
<td>Seattle, WA: I-5 at I-90</td>
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**American Highway Users Alliance - 2015 Freight Bottleneck**

This resulted in the following 2015 Top Ten worst freight bottlenecks list:

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Maximizing Use of ITS, Information and Technology to Improve Freight Movement

Source: Great Lakes Regional Transportation Operations
Active Traffic Management
Overhead signs advise southbound motorists which lanes are open to traffic.

Michigan DOT Using Flex Route
Innovative Capacity Expansion
ITS in Columbus, Ohio
Automated Traffic Surveillance and Control System
LA Memorial Coliseum
Rapid Advances in Technology

• ITS and active management are critical to keeping freight moving
• We in ITS and IT are key to these efforts
We Can

• Help decision makers understand the location, magnitude, and duration of bottlenecks

• We can help track by
  • Time of day
  • Weather
  • Special events

• Then, we can help monitor the success of strategies such as ATM

• We can use our existing technology infrastructure more effectively
  • RWIS, Weight in Motion, TMC,...
AV/CV Furthers This Trend

- We’ll get feedback from vehicles about
  - Speeds
  - Crashes
  - Effectiveness of ATM

Source: U.S. DOT
ITS and IT Challenges and Opportunities

• Treat them as high Priority Assets
• Assess State of the Asset
• Identify and Prioritize Risks
• Pro-actively Manage Risks
• How to keep the
  • System reliable
  • Secure
  • Accessible at all times
  • Sustainable
  • Transparent to users
  • Manage for Perpetuity
Conclusions

ITS and Information Systems are as valuable as roads and bridges. They

- Add capacity
- Increase reliability
- Improve safety
- Enhance freight mobility
Shobna Varma

svarma@starisis.com