Big Data & Winter Maintenance
The fields of automated and connected vehicle technologies will have a strong impact on winter maintenance operations in coming years. The emergence of remote sensing and mobile data collection technologies will also impact the amount of data that is collected to support winter maintenance operations.
Big Data & Winter Maintenance

- Mobile data collection – imagery, sensors, and vehicle state data
- Crowd-sourced road condition information
- Operations analysis using GPS/AVL
- In-cab considerations: informed and connected vs. distracted and data-overloaded
- Sharing maintenance data with the public and researchers
INTEGRATION OF FIXED AND MOBILE DATA

- Mobile data is used to fill gaps in fixed sensor data
- Mobile data is warranted for local/site-specific problems while fixed data is generally sufficient for area-wide or system-wide condition reporting
- There is ongoing research in UK on the use of fixed and mobile sensor data, along with user surveys, to influence travel behavior.
INTEGRATION OF FIXED AND MOBILE DATA

- Which of the data will be used as ground truth? Fixed data is generally used as reference.
- System coverage - Is mobile data going to be available everywhere?
USING PLOW DATA TO IMPROVE TRANSPORTATION OPERATIONS

- Feeding data to and from MDSS (e.g. fine tuning application rates)
- Using AVL data for asset management
- Some of the AVL data is being used for summer maintenance activities (e.g. mowing, spraying)
The AVL data is used to show the public, through the Weather Data Environment, that the plows and maintenance vehicles are being deployed and where they are on the network.
USING PLOW DATA TO IMPROVE TRANSPORTATION OPERATIONS

- The more automated maintenance data is provided to the agency (less operator intervention), the faster the info can be used for dissemination and decision-making. This needs improvement.

- Action/Research Items: Integrate data in forecasting, Retrospective event analysis
DATA QUALITY

- Inconsistent data formats from different data providers/sources is a barrier. Clear Roads has initiated study on inconsistent AVL data formats.

- Detecting biases and calibration errors -- use fixed sensors?

- Some systems use ‘zero’ to report no data, however it is a valid quantity for most observations. Need to leave the data cell blank or null
DATA QUALITY

- Quality checking takes time so there is delay involved in transmitting the data.
- More data (volume) is needed for redundancy and validation
TIMELINESS AND LATENCY OF DATA

- Need to communicate/push data quickly (in-real time) to the users, and also pull the data/message when it is no longer current or applicable (e.g. DMS)

- Automation in data processing and communication is needed to maintain timeliness and latency of data

- Computers need consistent formats for faster and more efficient data processing, Feedback needs to come faster
DIFFICULTY ASSOCIATED WITH GETTING THE DATA

- The most valuable CAN-BUS data is wheel speed
- CAN-BUS data is very hard to get/decode and the information often changes
- Need to work with OEM to facilitate access to CAN-BUS data
- Firewalls and other technical issues prevent easy access to data
- Need to get more camera images from vehicles
DATA OWNERSHIP AND DATA SHARING

- Who owns the mobile data and who is liable for its use? Generally agreed that whoever collects the raw data owns it, whoever adds value to it owns the value-added information.

- How does the Freedom of Information Act (FOIA) affect the ownership and sharing of data to the public?

- How do you store the massive volume of data?
HOW TO USE DATA

IMPROVE OPERATIONS

- More automated maintenance
- Using PLOW ARE data so operators don’t have to enter

- Are we making full use of the data we have
- Integrate in forecasting
- Feeding data to + from MDSS
- Fine-tuning rates
- Summer use
- Asset management
- Public info
DATA OWNERSHIP

- Agency to Agency vs Agency to All

- Who owns the mobile data and who is liable
- Freedom of Information Act
- How do you store the massive volume
- Raw data vs. Value Added

CRediT of Getting
Timeliness
- Pull messages or deploy fast enough
  - How to automate
  - People forget to pull messages
- Consistent formats are needed for computers to process efficiently
- Feedback needs to come quicker
Difficulty of Getting Data

- CAN info Changes
  - Which is most valuable
- Imagery
- Workaround for getting data w/o
- Density of Vehicles

- FIREWALLS + Technical issues
- Need more cameras

- Sensors
INTEGRATION OF FIXED AND MOBILE

- FILLING GAPS
- WHICH IS Ground TRUTH?
- WILL it Be Everywhere?
- Local needs vs. Wide-Spread
  - UK: Fixed sensors ongoing mobile
  - User surveys to influence travel choice

There are lots of gaps!