

Event coordinators:

Lauryna Šidlauskaitė Justas Kažys Jonas Kaminskas



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CONNECTED VEHICLE DATA – REALTIME ROAD CONDITION MONITORING

Björn Zachrisson, Johan Hägg
NIRA Dynamics, Wallenbergs gata 4, 58330 Linköping, Sweden,
bjorn.zachrisson@niradynamics.se

Summary

Winter roads pose a lot of challenges. Knowing the road friction during wintertime has been the Holy Grail for road maintenance actors for a long time. Unknown low friction can cause severe single accidents as well as massive collisions as braking might be impossible due to non-existent grip.

With increased digitalization, access to road surface information in real-time is getting better and better in a cost-effective manner. This makes more efficient and sustainable winter road maintenance possible, by using better tools, based on data from a combination of fixed and mobile sensors.

Measuring road conditions

Already today, there are several options for measuring road friction during winter conditions; mounted sensors or friction wheels are the most common ones, but they share a common challenge, they do not scale. There is no way to know the status of the entire road network using dedicated special equipped vehicles. The cost to cover all roads would be too high. Without knowing the road status there is no real way to measure maintenance performance objectively, nor is it possible to know if there are hazardous roads in the network or not.



Fig. 1. Connected vehicle data is key when gaining insights on current road conditions

What NIRA has been developing for the last 20 years and more intensely the last 5 years is friction measurement using normal passenger vehicles. No hardware is added, only utilizing existing sensors and a software component for processing the existing sensor data. Through this method, any connected vehicle with the software installed can act as a sensor and the scalability is almost limitless. (Fig. 1) How can this help road owners and road operators in their day-to-day operations?

When it comes to winter maintenance operations, reliable feedback is key – not only for being able to improve prioritization and the overall efficiency of the operation, but also for contract validation when working with road maintenance suppliers.

Analyze the outcome of performed road treatments

A key aspect when working with continuous improvements is to measure and compare outcomes between different methods. Without large-

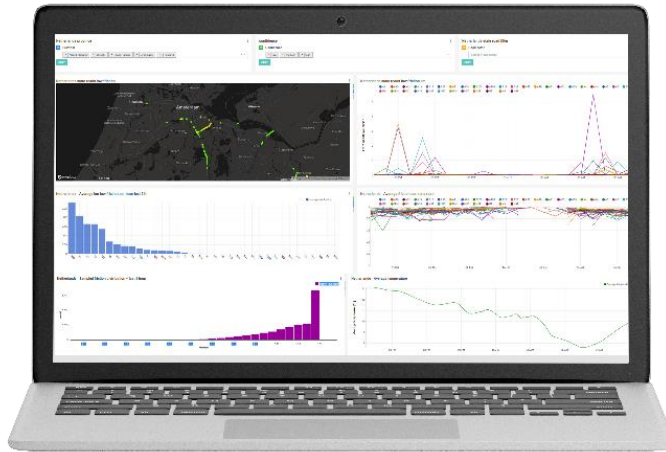


Fig. 2. Connected car data can evaluate the road network continuously, allowing objective analysis

scale data collection, however, it's not possible to work with Key Performance Indicators or to evaluate different methods and ways of working on a network level. Winter Road Insights provides the tools you need – and it's all made possible by the huge amount of friction and weather data information, collected by the vehicle fleet.

From the data, a universal KPI can be constructed, enabling effectiveness measurements of the winter road maintenance. In fact, the ability to analyze and look at events in hindsight, is what makes Winter Road Insights the first true performance evaluation system for winter maintenance and road safety.(Fig. 2)

Act instantly on slipperiness occurrence and detected road condition hazards

Car measurements does not only allow direct measurements on slippery roads in the area, it also enables preventive action by alerting citizens or instructing road maintenance to act on slippery road segments. Winter Road Insights lets operators redirect actions to certain locations to

avoid accidents. What's more, the live-view enables optimization on routes and salt usage that has a potential of saving 15-20% of the winter maintenance budget.

As NIRA's friction measurements are provided in real-time, they give an active view of the actual road friction situation. (Fig. 3) This means low friction is identified no matter if it is expected or not – and should any weather forecasts turn out to be faulty, the connected cars will pickup and correct those errors immediately.

Every minute counts: if a hazardous situation can be handled 10 minutes faster, the likelihood of an accident is reduced – substantially. Normally, an accident happens 30-90 minutes after slipperiness has been detected. An alert could call for immediate action that would be required to resolve or prevent bad road conditions.

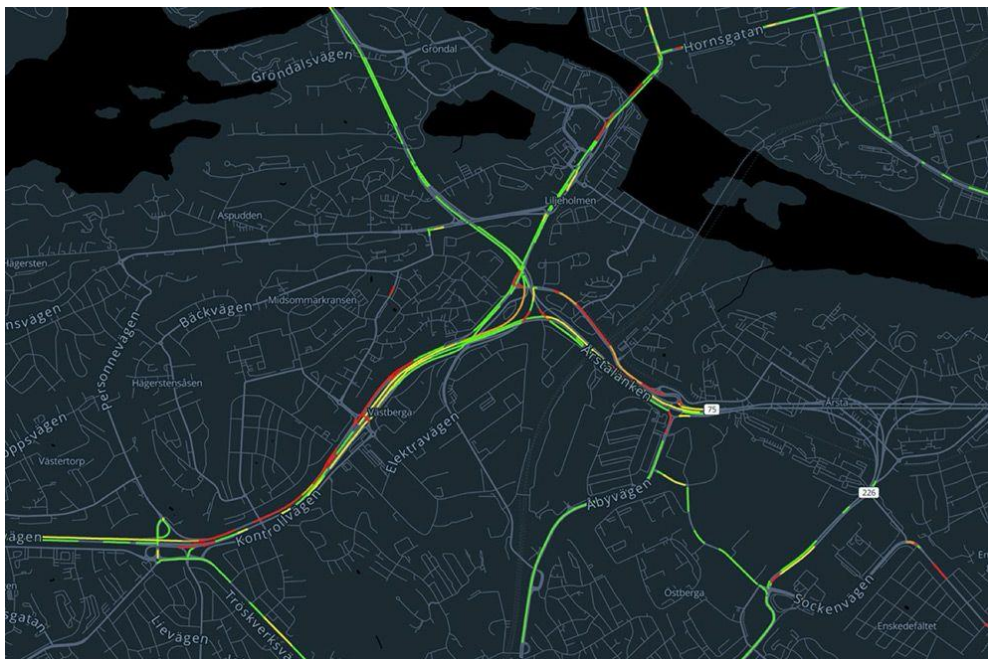


Fig. 3. Green indicates good friction; yellow is medium and red is very slippery. In this image we can see that a main highway of Sweden contains very low friction.

Making life easier for road crews

It is a fact. The situation for the road operator crew is difficult: Making the right decisions based on experience rather than objectivity, while having a huge responsibility to do what is best to maintain as safe roads as possible. Doing that while having very little access to live data from the road network.

Making the wrong calls may have severe impact on safety as well as productivity, both for the individual, but also on transportation and the society as a whole. Digitalization is changing the way of working, connected vehicles continuously monitoring the road surface conditions. New data types, applications and tools bring new possibilities for the operators to make better decisions based on objective measurements. Millions of vehicles collecting data means greater data availability than ever before.

What we have set out to do is to provide a solution that gives road operators access to real-time friction data, providing a clear picture of what the situation actually looks like. That's on any specific stretch of any road, at any given time.

The result – Roads can be maintained in a much more efficient way, making them safer, while lowering cost and reducing environmental impact.