

Service definition document RoadAI

Surveying Using Computer Vision With AI Enabled Learning

Revision History

Version	Status	Date/Name	Description of Change	Approver
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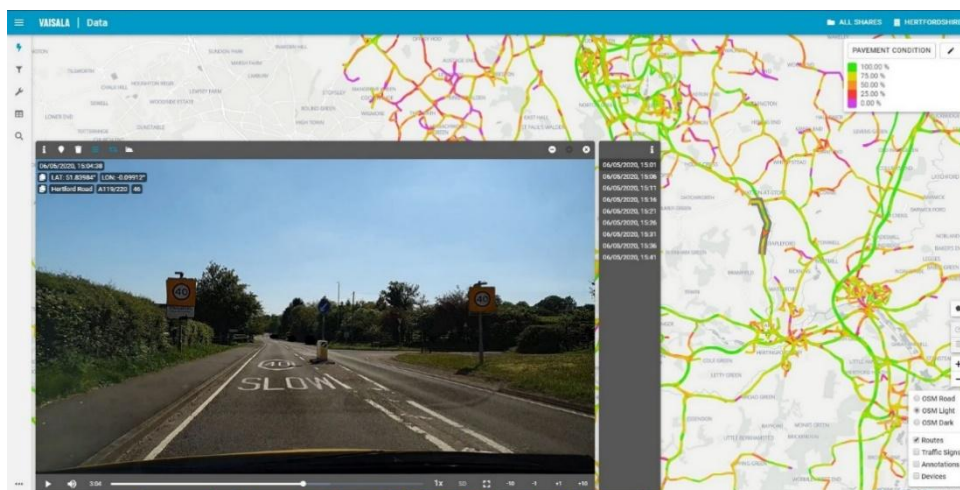
RoadAI

This document sets out Vaisala's proposal for the implementation of RoadAI technology to deliver efficiency gains, cost savings and service improvements to the surveying, inspection, auditing and ongoing asset management practices.

1 Overview

The technology uses a smart phone to collect video data which is then processed using Computer Vision; this process automatically analyses the video data and the Vaisala RoadAI applies PAS2161 and UKPMS methodology to categorize and report pavement defects, so that it can be integrated with existing asset management systems. Video data can be collected at normal driving speeds, and because the analysis process is fully automated, results are available within a few hours of upload, enabling data to be collected and results produced across the **whole road network multiple times** per annum, with **lower investment and resources** than current processes demand.

Figure 1 – Pavement Condition Heatmap



Road Condition data generated by RoadAI can replace the condition surveys currently carried out, and because of the frequency and repeatability of the data collection, identify any lengths of highway that are deteriorating rapidly in a more timely fashion, enabling the programming of maintenance works more efficiently.

2 The Strategic Case

2.1 Safety Inspections

RoadAI provides a range of tools that are designed to support reactive maintenance and safety inspection teams, taking a significant amount of network investigations and inspections off the network and into a desktop environment, reducing the number of ad hoc site visits, and bringing environmental and safety benefits, while providing greater oversight and efficiency to the process of network management.

Once the data is loaded onto the system, computer vision analysis is used to derive much more value that can be leveraged by other functions.

2.2 Road Condition Surveys

Road condition data is generated automatically, without allocating resource specifically to condition surveys, and reported at a much higher frequency, to enable the planning of maintenance works to be focused on areas where lower cost treatments can be deployed, to prevent the development of more serious defects, and ultimately extend the life of the asset. RoadAI enables road condition data to be generated using non-specialist tools and personnel, while still providing data that is consistent, accurate, and auditable. Using RoadAI in this way enables:

- Early intervention with lower cost treatments based on asset condition to deliver >5% increase to the life of the asset
- Data driven forward program planning – consistent, objective road condition data
- On demand reports – network deterioration modelling

2.2.1 Investment Model



2.3 Traffic Signs and Lines

Video data that has been collected by inspection teams can be further analyzed to generate traffic sign and surface markings inventory, and road marking condition data, to enable data driven risk-based management of these assets, and driving improvements in service delivery at a fraction of the previous cost.

3 Service Description

The RoadAI service will be configured in consultation with the customer's project team, and is based on a combination of the following core elements:

- Organizational Base License
- Recording License
- Application Layers
- Data Storage

3.1 Organizational Base License

The Organization Base License (OBL) covers provision of the core service including:

- Anonymization of data.
- Map based user interface (UI).
- Geospatial video.
- Annotation tools.
- Unlimited client logins and access to UI.

The cost of the organizational base license is based on the size of the organization, and the duration of the contract.

3.2 Recording License

Based on anticipated use profile and in consultation with the customer's project team, we will configure the proposal to include necessary number of hours included into recording license. Standard license includes 600 hours of video footage per year.

3.3 Application Layers

RoadAI can be configured to enable different application layers to suit the objectives of our customers. Application layers can be activated or deactivated each year, and the contract value adjusted to reflect the application layers in use. The application layers currently available are:

3.3.1 Road Condition

Data is analyzed following a process based on PAS2161 and UKPMS and reported in user defined sections tied to the sectional reference data¹ for customer's road network.

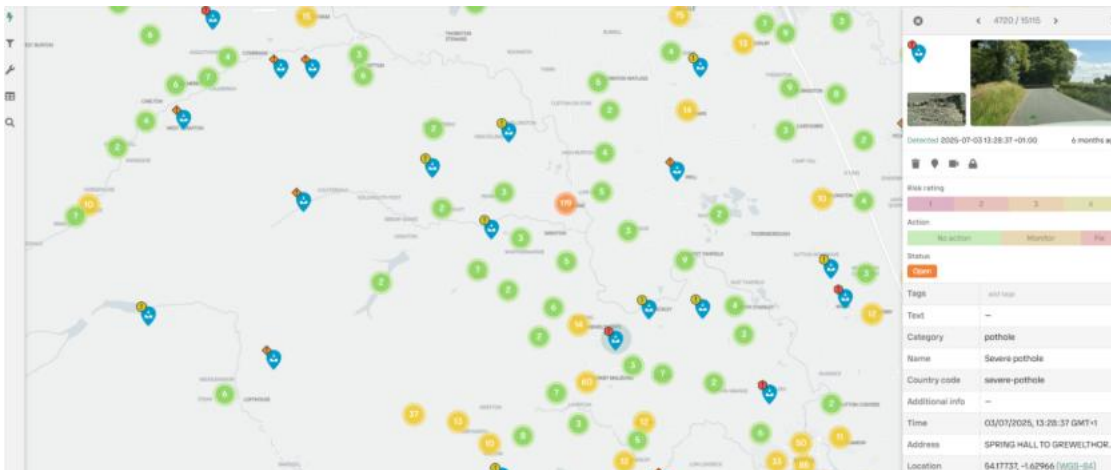
Defects can be viewed as discreet heatmap layers on the map-based UI, or as a combined overall condition heatmap.

Defects can be exported as Excel file, or as an HMDIF which can be imported into any UKPMS accredited asset management system.

Using the same data above, RoadAI provides a range of tools that are designed to support reactive maintenance and safety inspection teams, taking a significant amount of network investigations and inspections off the network and into a desktop environment, reducing the number of ad hoc site visits, and bringing environmental and safety benefits, while providing greater oversight and efficiency to the process of network management

Potholes are automatically detected as points with the location and the severity grading.

¹ Network reference data to be provided by the customer as shapefile.



The risk rating, actions, tags can be added in the UI during the review, or the potholes report can be created and uploaded into the asset management system for further assessment.

3.3.2 Road Markings

Data is analyzed using computer vision process to identify road marking condition based on visible deterioration. Road marking condition data is available to export in Excel format in user defined sections. Surface markings are automatically detected, classified and created as point objects on the UI map layer. They can be extracted in Excel reports with location and condition data, and URL linking back to UI to view images and video of surface marking location.

3.3.3 Road Signs

Road signs are automatically detected, classified and created as point objects on the UI map layer. Signs can be extracted in Excel reports with location and condition data, and URL linking back to UI to view images and video of sign location.

3.3.4 Connected vehicle data

RoadAI integrates connected car telemetry from almost two million vehicles to deliver actionable insights for your road network from day one. No surveys needed. Just instant intelligence on which roads need attention from the moment you start using RoadAI.

- Network-wide IRI scores from day one
- Fresh data every week with zero effort
- Historical trends to catch problems early

Available datasets:

- IRI
- Driver behaviour

4 Project Management

A series of project review meetings will be put in place for the purpose of reviewing progress against project objectives. It is critical that Strategic Managers and Operational Teams responsible for managing and delivering the project on behalf of the customer attend these meetings.

A project manager will be assigned to the project on day 1, project management meetings will be booked with the agreed project team, and at the first project meeting the project goals will be outlined, and in consultation with the customer's team, goals will be prioritized and built into the project plan that will be used as a working document to manage the project.

5 Terms and Conditions

Vaisala's General Conditions of Subscription Services apply. See our web page at [DOC250754-A-General-Conditions-of-Subscription-Services.pdf \(vaisala.com\)](#) All the information contained herein is confidential and the IPR remains the property of Vaisala. Copying or sharing of this information without permission of the author is prohibited.

All pricing quoted in pounds sterling subject to VAT which will be applicable at the prevailing rate at the time of invoicing.

6 Appendix

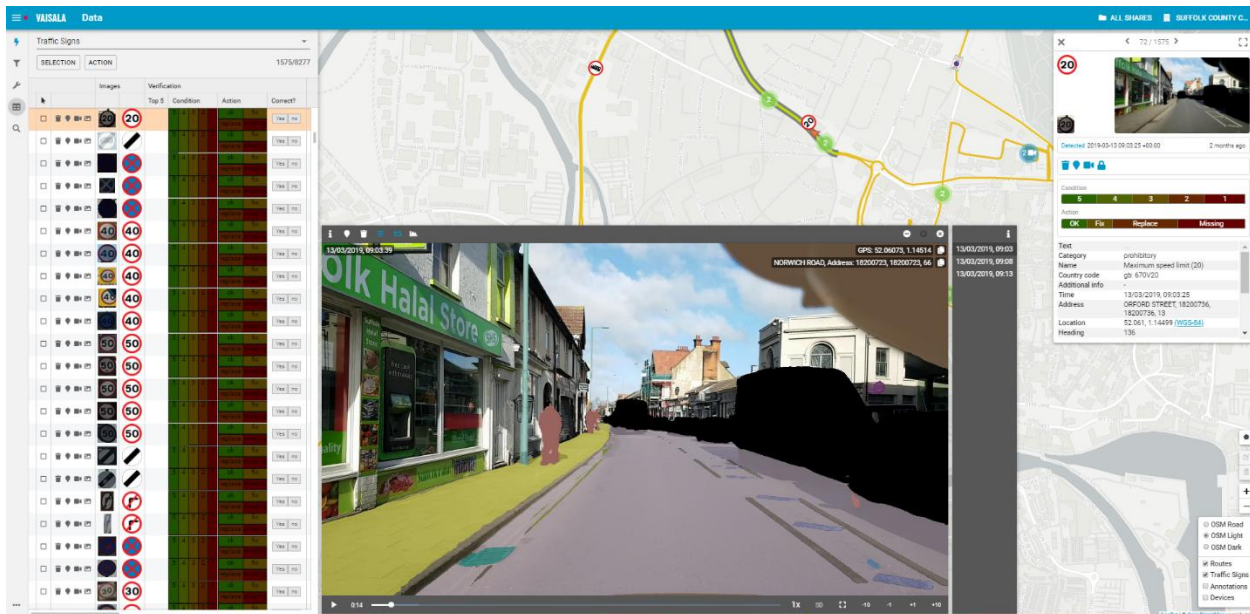
6.1 Data Collection Via Smartphone

Figure 1 - Smartphone is mounted outside the swept path of the wipers.



6.2 Sign mapping

Figure 2 - User Interface with access to video archive and computer vision detections



Various filtering tools are available within the UI to enable isolation of data by date and time.

Traffic signs can be filtered using label groups, categories, detection type (options: all detections, new detections, new or miss detections), misses in a row, detections from video and detection confidence.

6.3 Road defect mapping

Figure 3 - Segmentation model illustrating feature classification

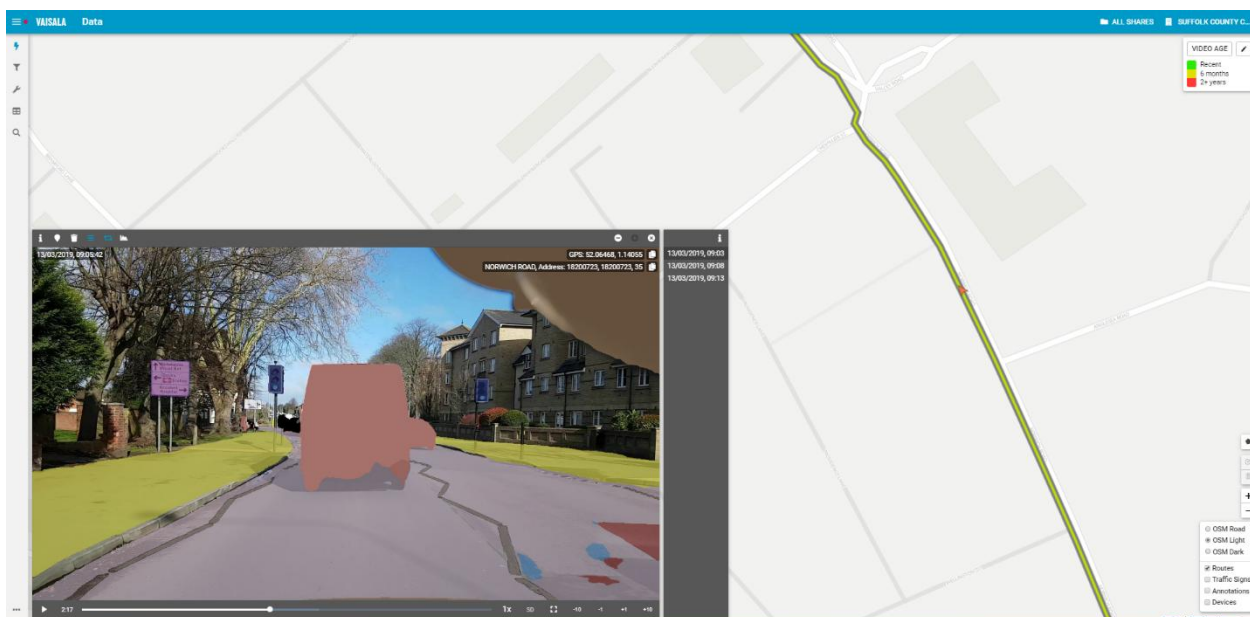


Figure 2 – Analysed Heatmap (Road pavement defects / road markings)

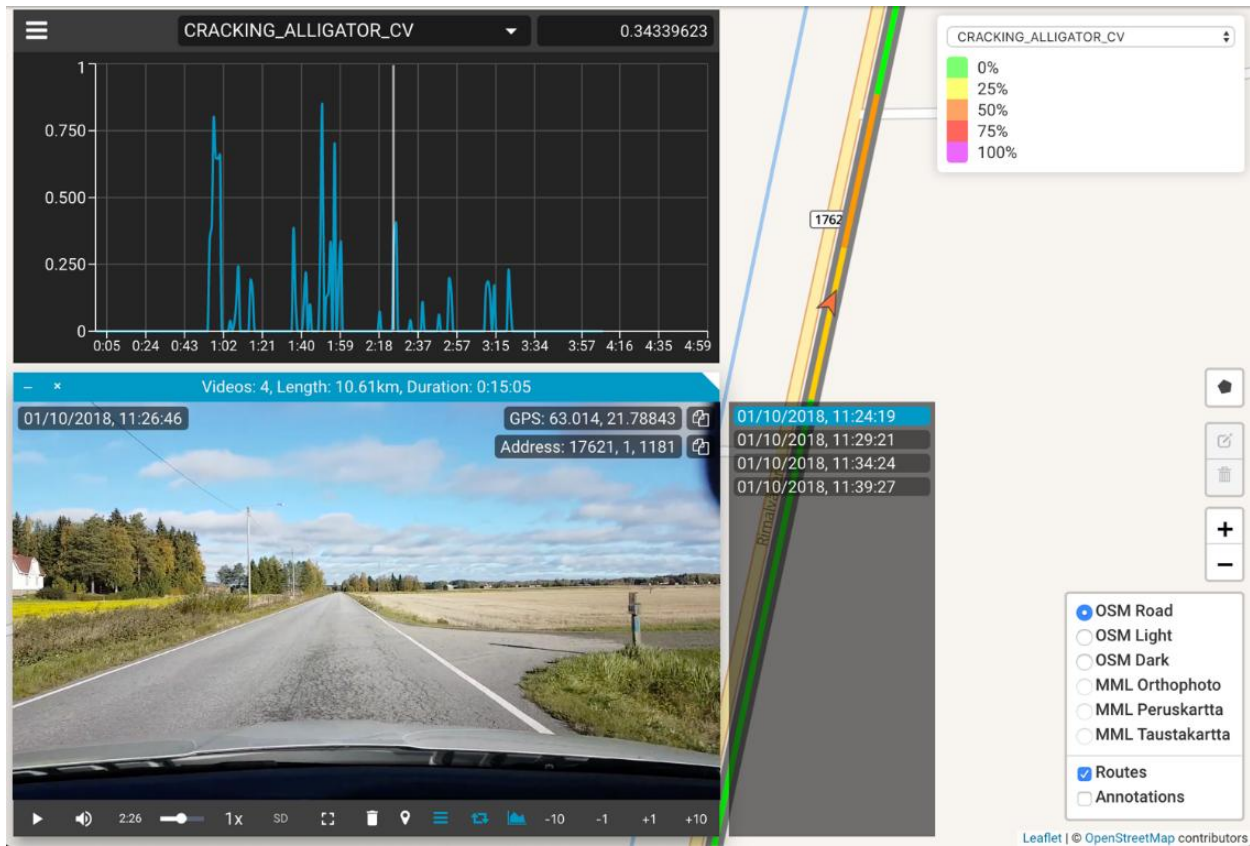


Figure 4 - Road condition data in HMDIF format

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