People-Centric Mobility

CASE STUDY

Optimized Mobility

ARCADIS Design & Consultancy for natural and built assets

Automatic image recognition for road defects

In the Netherlands, regional road authorities alone spend five to six billion euros a year on the maintenance of roads, bridges and viaducts. Automatic damage recognition makes road inspections faster, cheaper and more objective. With the aid of artificial intelligence (AI), road authorities can thus save hundreds of millions of euros in maintenance. What's more, carrying out less maintenance and in good time means fewer traffic jams.

Image recognition prevents inspection and maintenance costs. The model that Arcadis has employed for Rijkswaterstaat for highways automatically recognizes the type of damage, type of repair and other assets on or alongside the road such as traffic signs, road markings and street lights. The images are analyzed at the push of a button using a software module developed in-house. As a result, visual inspections can be carried out cheaper and more safely, roads can be inspected faster and more easily and road authorities can intervene more quickly, preventing more major repairs.

How does the method work?

Images are taken with a camera of a certain road section using annual images from CycloMedia or with a GoPro. These images are then read in to a custom developed software module, which is based on an image database that the Arcadis experts have filled with data on inspected roads. This is used by the deep neural network model to automatically recognize road defects and assets.

The model determines the exact location of the defect, the type of defect, the extent of the defect and ultimately the recommended maintenance measure. Based on the results visualized in GIS, the asset manager can take immediate action. The results and the internal properties (such as service life and use) and the external properties (such as type of soil and salinization) are the basis for a machine learning model. Using historical data, this model can calculate the deterioration of roads, allowing road authorities to draw up a predictive maintenance plan.

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More than 95% accuracy with visible defects

Automated road inspections reduce the manual inspection time by more than 80% and road analysis reports are available more quickly, because the inspector no longer wastes time assessing road sections that are in good condition. The program selects only the locations with damage that have to be examined by an inspector. Because we work with a self-learning model, it learns to recognize the requirements of the inspector or asset manager and can ultimately take decisions independently.

The image recognition model can recognize 95% or more of all road defects (such as transverse cracks, longitudinal cracks, raveling, craquelure and holes), repairs (such as expansion joints, junctions and bitumen), road wear (such as wheel rim marks), traffic signs, street lights and road markings. With clearly visible defects, this percentage is even higher.