



Royal Netherlands
Meteorological Institute
Ministry of Infrastructure
and Water Management

Fog detection from camera images

Analysis of traffic camera images can improve fog detection and nowcasting

Fog is a meteorological phenomenon that has impact on the safety and capacity of transportation and logistic activities on land, water and in the air. Fog is responsible for extreme conditions causing several accidents and casualties.

The presence of fog is difficult to detect as it may be a local phenomenon that suddenly appears. Therefore, fog detection is a challenge. Our network of automatic weather stations is by far not dense enough. Optical and thermal satellite images have unfavourable acquisition times and/or resolution. However, the department of public works (RWS) operates a network of more than 5000 traffic cameras that have potential to detect fog at locations where this information is needed via image analysis.

Together with RWS, KNMI Datalab is exploring the possibilities to detect fog conditions from traffic camera images using machine learning to classify fog and non-fog conditions. First results using 160 traffic cams are promising. Ultimately, this research should lead to a detection system that directly interact with traffic participants hence improving safety and traffic flow. Furthermore, fog detection data can be used to improve fog forecasting models.

'KNMI Datalab,
a better prospect'



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Applications

Using 10 minute images from 160 RWS traffic cameras, a deep learning model has been trained to classify fog and non-fog conditions. The model is updated over time to improve detection by providing more and more images. The current detection system provides reasonably good detection results. Therefore, an initial proof-of-concept (POC) application has been realized. This POC will be tested by RWS traffic control center and KNMI weather room to warn for fog conditions. In the future, detected fog can be communicated to nearby cars via smartphone or navigation system.

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Future

In order to tackle the detection in non-daylight conditions, KNMI has partnered up with Jülich Supercomputing Centre. The partnership is aimed at performing joint research to improve further the detection by using advanced neural network models. In addition, other fog condition proxies such as weather circumstances and land use will be used as additional variables for the future model.

Users

Typical users of fog detection from camera images are traffic control rooms and weather rooms (e.g. KNMI) that warn for fog conditions. Also app-builders and navigations systems can use detected fog data to inform car drivers directly.



Figure 1. Fog on the highway.



Figure 2. Traffic cameras around Amsterdam.



Figure 3. Preprocessed images: lower resolution and blurring to avoid overfitting.

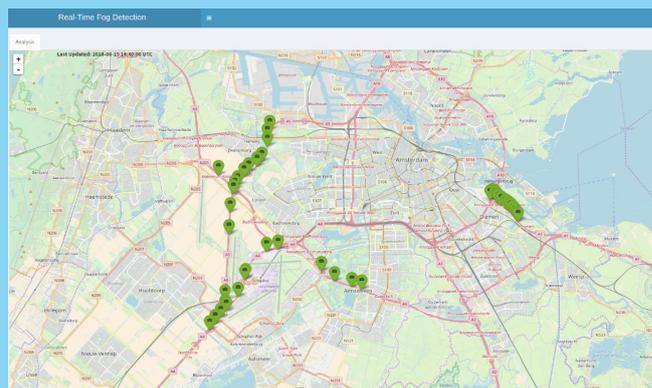


Figure 4. Fog detection system proof-of-concept.