



Deep Learning in action on the Millau Viaduct

Compagnie Eiffage du Viaduc de Millau (CEVM) - Millau, France

Mission

The Millau viaduct is a critical element in the national and European highway network, providing the link between the north of Europe, the Mediterranean areas and the Spanish peninsula. The Viaduct has been open to traffic since December 16, 2004.

This cable bridge structure is 2,460 meters long and 245 meters above ground at its highest point.

Since its opening the group EIFFAGE is managing the traffic and operation from a dedicated Control Centre, which, from

the beginning, has been using a video surveillance system coupled to a Citilog Automatic Incident Detection system (AID). The AID coverage is provide through 14 optical IP cameras and 2 thermal IP cameras, tasked to automatically and in real time, alert the operators in case of an accident, a breakdown or even a debris on the viaduct which could create a potential danger to the users.

The current system is providing detection abilities with an acceptable average number of false or unwanted alarms. However, under certain weather

conditions, and especially under sunny or heavy rain conditions, the shadows of the cables and other fixed elements of the bridge do create a number of false alarms higher than what the operators would like to see.

The purpose of the latest implementation was to demonstrate the ability of the most recent Deep Learning based product to reduce the average number of false alarms to less than 1 per camera per day while maintaining the high detection rate.

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CEVM (Compagnie Eiffage du Viaduc de Millau)

Solution

The new CT-ADL, Citilog Applied Deep Learning, has been tested in parallel to the operational system on the 14 IP cameras monitoring the viaduct.

CT-ADL is powered by a purposely designed neural network trained on a large dataset of traffic surveillance videos including a massive number of good and false detections examples gathered over the years.

The purpose of the training is to enhance the capabilities of the network to differentiate the vehicles from any other visible artifacts (shadows and reflections for the most part) that typically lead to a false detection and therefore eliminate these shadows and artifacts from the detection process.

In order to confirm the stability and reliability of this new technology, it has been tested during two distinct periods, in the summer of 2018 and the winter of 2019.

Results

The results show that during the high false alarm period, in summer when the shadows are very frequent, the Citilog AID system enhanced with CT-ADL delivers 10 times less false alarms per camera than the system in operation, reaching a ratio of less than one false alarm per camera every 4 days only, which turns

out to be much less than the target objective.

In winter the reduction is proportionally less impressive because the operational system was already quite stable.

However, the CT-ADL technology also allows the system to go below the 1 false alarm per day and per camera mark.

The validation process did not specifically monitor the detection rate, however preliminary analysis shows that the CT-ADL also improved the detection rate compared to the operational system, providing a double positive effect.

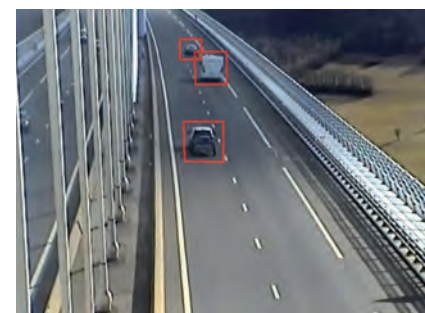
Next Step

Convinced by the results of this validation, the operators (Compagnie Eiffage du Viaduc de Millau) decided to implement this new generation of AID in operation: «The Citilog AID system achieves the required performances in terms of detection rate, but the ability of this new generation to drastically reduce the number of false alarms will strengthen the confidence of the operators in the system and therefore increase their efficiency to deal with traffic management issues and overall help us raise the level of service for our users». Since the implementation of this new generation only requires an upgrade of the main server hardware and of course an overall software upgrade, the

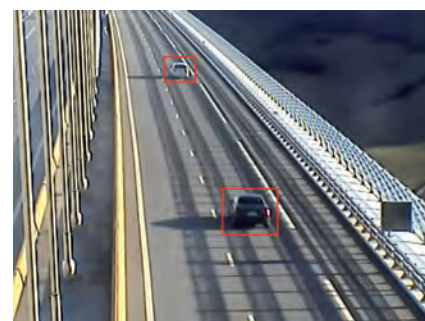
new AID system augmented with CT-ADL has been deployed in 2019.



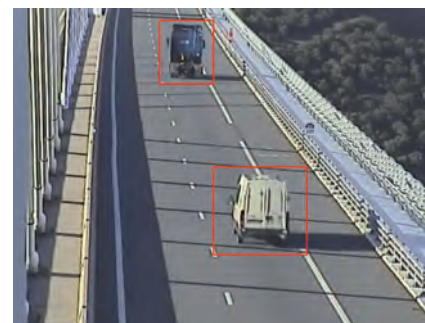
Night



Cloudy period



Guard rails shadows



Cables shadows