



TECHNICAL NOTE

Wrong-way drivers cannot hide from thermal imaging cameras

Thermal imaging cameras combined with smart video analytics offer fast and continuous wrong-way driver detection along highways.

Wrong-way drivers present an obvious danger to all motorists on our highways. Detecting wrong-way drivers as early as possible can help reduce the chance of severe accidents and fatalities. FLIR Systems is now presenting a detection system based on smart thermal imaging cameras that is able to detect ghost drivers in a very early stage.

Wrong way drivers on motorways are relatively rare, but – in many cases – cause severe accidents, often with harmful consequences. Numbers on the occurrence of inverse direction drivers vary from country to country. A study performed by ASECAP, the European Association of Operators of Toll Road Infrastructures, reports that wrong-way drivers represent 4.6% of all fatal accidents on the French toll road network from 2000 to 2016. In Germany, about 2,000 ghost driver incidents are recorded yearly which on average lead to 200 accidents. The Arizona Department of Transportation (ADOT) calculated that in 2016 wrong-way drivers killed 28 people out of a total of 950 Arizona traffic fatalities.

CAUSES OF WRONG-WAY DRIVING

Research shows that wrong-way driving is mainly the result of reckless driving behavior, distracted driving and driving while being tired. Most wrong-way driver incidents involve a vehicle entering an exit ramp. This may in part be due to unclear signage or a driver's unfamiliarity with a city. Wrong-way collisions are also more likely to occur at night.

The combination of tired drivers, intoxicated drivers, and lack of visibility due to darkness make it much more likely that wrong way accidents will occur at night.

Preventing wrong-way driving collisions is therefore no easy task. Traffic authorities around the world have been taking a variety of measures with varying degrees of success, including better traffic signage and road markings. In addition, more and more traffic agencies are looking into dynamic incident detection and signaling.

FAST INCIDENT DETECTION

A dynamic incident detection system allows traffic authorities to detect wrong-way drivers very fast, right at the highway's entry point. Fast detection speeds up the process both of warning the wrong-way driver and warning the other traffic about the upcoming vehicle. A number of detection technologies are frequently used, including induction loops and CCTV video cameras, but the technology that is the most efficient and robust on a 24/7 basis is thermal imaging.



A warning signalization system (e.g. a flashing beacon) along the exit ramp can be activated upon detection in order to warn the unsuspecting wrong-way driver about his or her mistake.

Thermal imaging cameras pick up heat coming off the environment and are therefore the ideal tool to detect vehicles on highways or on highway ramps. Because they see heat, not visible light, they don't get confused by sun glare, darkness, headlights, shadows, wet streets, snow and fog, like conventional video cameras do.

Combined with smart video analytics, thermal imaging can detect practically any traffic irregularity, including stopped vehicles, pedestrians, lost cargo, and more specifically: wrong-way drivers.

SYSTEM DESCRIPTION

A typical set-up for wrong-way driver detection would be along a highway exit ramp, which is a frequent place for incidents. A single thermal imaging camera combined with video analytics – either onboard analytics or provided via an external video image processor – will be able



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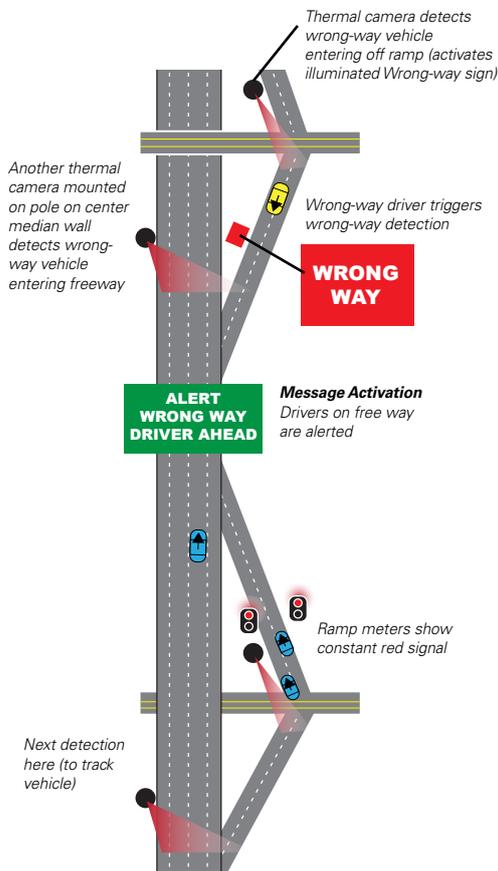
to detect an inverse direction movement within seconds. This detection will serve as input for warning systems.

First of all, a warning signalization system (e.g. a flashing beacon) along the exit ramp can be activated upon detection in order to warn the unsuspecting wrong-way driver about his or her mistake. At the same time, the thermal detection can also activate VMS boards along the highway informing highway users of the presence the wrong-way driver. And last but not least, the detection can be used to close off the highway entries by means of red lights.

Thermal imaging camera feeds can be linked up with a remote control room, allowing operators



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to monitor the wrong-way driver in real time, or use the pre- and post-incident thermal video footage as evidence or for statistical purposes.

REDUCING THE RISK OF FATALITIES

In the French report 'Preventing and Managing Ghost-Driver Incidents: the French Experience' by Pierre Vicedo, the criticality of detection speed is demonstrated even more. "On average, vehicles on the French motorway travel at speeds of 120 kph (75 mph), (...) at a pace of 200 vehicles per hour (...). It can be assumed that drivers driving the wrong way are traveling more slowly, about 60 kph (37 mph) (...). Even if traffic were light, with a density of one vehicle per kilometer, for example, a car driving the wrong way could encounter or cross over five correctly traveling vehicles a minute, representing equally as many potentially serious, and likely, accidents."

Also here, smart thermal imaging cameras can help reduce the number of fatalities, by measuring the speed of the wrong-way driver and by exactly calculating the time needed for that vehicle to reach a specific point. In the moment of truth, this information can be invaluable to make VMS signalization even more efficient, and to display the right kind of information at the right time.

NON-INTRUSIVE, COST-EFFECTIVE TECHNOLOGY

With thermal imaging, there is finally a technology that is easy to install and easy to maintain. Unlike with induction loops, a thermal imaging camera does not require extensive road works. A camera can be installed on an existing pole or other infrastructure and the road does not necessarily need to be closed off during installation. Because thermal imaging cameras can see in the dark, no additional lighting needs to be installed, which is a huge cost-saver. Also for maintenance, there is no need to break up traffic. A camera can easily be cleaned or replaced while traffic is flowing.

THERMAL IMAGING: IMPOSSIBLE TO HIDE FROM

Fast wrong-way driver detection means fast warning and signalization. At times when wrong-way collisions are most likely to happen – at night and in moments of poor visibility – thermal imaging camera technology demonstrates its true power and ability to reduce the number of incidents and even prevent them. Thermal imaging cameras combined with smart video analytics offer fast detection speed at all times, during the day, at night, and in the most adverse weather conditions.



For more information about thermal imaging cameras or about this application, please visit:

www.flir.com/traffic

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