



**Institute of Transportation,
Ministry of Transportation
and Communications,
R.O.C.**

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AI Image Recognition Technology for Large Vehicle Safety Management

The Institute of Transportation, MOTC, National Yang Ming Chiao Tung University, and freeway bus carriers have cooperated to collect the dash cam recorder video, Advanced Driver Assistance Systems (ADAS) warning records, vehicle speeds, and data of various driving behaviors in actual operations. The image recognition technology has been applied to find driver abnormal events (including tailgating, traffic lane weaving, and abrupt turns) of which the risk level is high and highly likely to lead to accident. They serve as the basis for operators to engage in long-term safety management, education training, and various improvement strategies.

According to statistics in the recent decade, large vehicle (buses and trucks) accidents result in 336 deaths and more than 10,000 people injured every year. As of the end of May this year (2022), 120 deaths and 3,938 injuries have resulted, with overall social costs and losses reaching NT\$10 billion. In order to improve safety, transportation operators have introduced ADAS in recent years. Through real-time detection of hazardous events, warnings can be sent to drivers to react for preventing crashes with other vehicles. However, these warnings cannot present whether hazardous situations are caused by driver misconduct or negligence, nor give appropriate post-warning avoidance maneuvers. Often times, considerable manpower is needed to inspect extensive vehicle videos to confirm if warning records can be attributed to drivers, so as to find the actual abnormal events that involve accident risks. Therefore, as far as the operators' need for the safety management of drivers under supervision is concerned, the integration of ADAS warning records and vehicle images and enhancing the efficiency of interpreting abnormality events are keys to enhancing safety management momentum.

The Institute of Transportation, MOTC has, since 2021, cooperated with National Yang Ming Chiao Tung University on promoting the multi-year project. The first year of the plan was 2021. Targeting out-of-vehicle abnormality events, through the importation of image recognition technology and the collection of nearly 1,000 hours of actual vehicle travel videos, the freeway bus drivers' own driving behaviors before and after warnings went off and their interactions with vehicles nearby were observed in order to determine the degree of warning risk. Based on nearly 1,000 hours of video collected and analyzed, up to 2,532 ADAS warning record entries, and through image recognition technology, it was found that 4% of all the ADAS warnings were abnormal safety events that likely caused occurrences of accidents, while 19% were minor abnormal safety events arousing safety concerns. These key events found in this research can assist transportation operators in more appropriately determining the safety level of the drivers, adopt corresponding strategies, take the correct actions, and enhance roadway safety.

The Institute of Transportation, MOTC will continue to develop in-vehicle image recognition technology in the coming year. It will also further integrate in-vehicle (such as driver distraction, improper operations, etc.), and out-of-vehicle abnormality event in order to develop high-risk driver analysis tools for domestic transportation operators, which will be an efficient tool for large vehicle safety management.

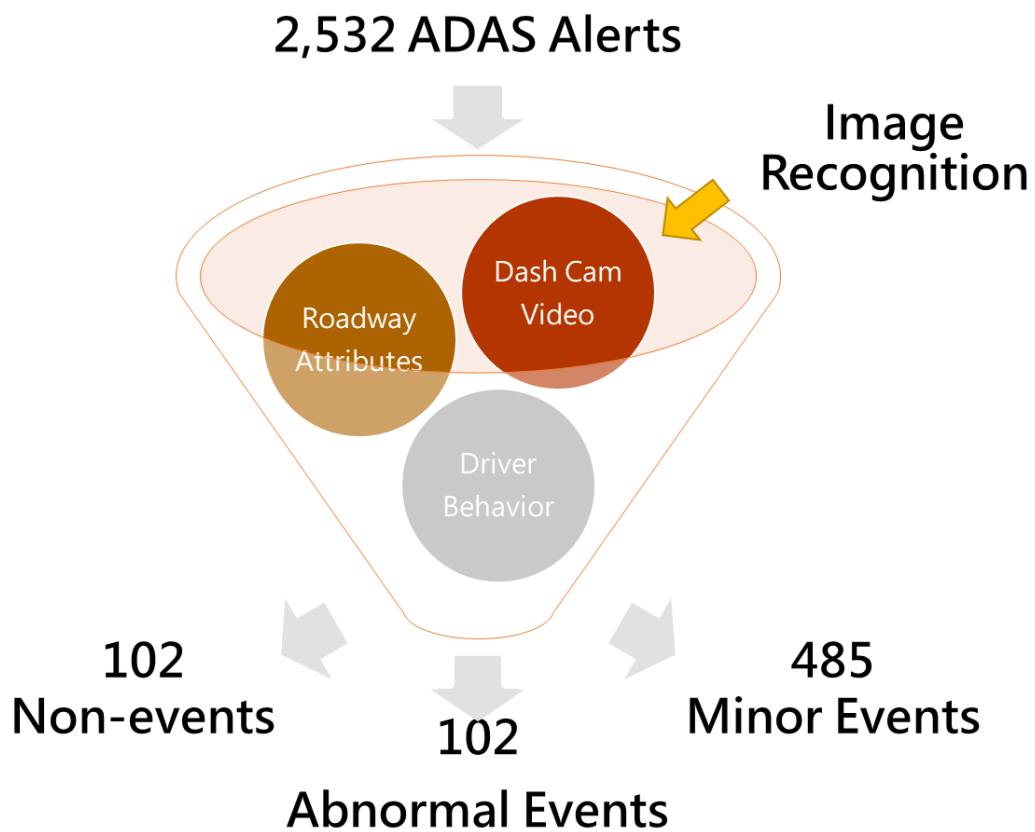


Figure 1 Conceptual schematic of applied ADAS warnings and image recognition technology in analyzing vehicle-based abnormal travel events

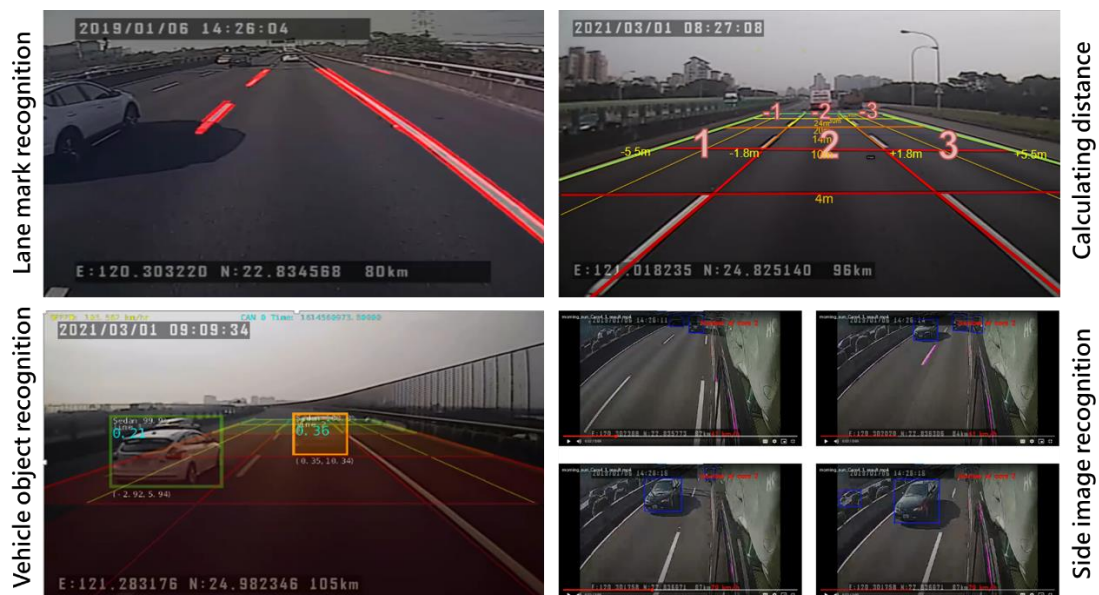


Figure 2 Examples of the development of vehicle-based abnormal travel event image recognition technology



Figure 3 Cases of abnormal events