

Assessment of rural road line markings for suitability with Lane Departure Warning

Jamie Mackenzie^a, Jeffrey Dutschke^a, Andrew van den Berg^a, Martin Elsegood^a, Mario Mongiardini^a, Lynn Meuleners^{bc}

^aCentre for Automotive Safety Research – University of Adelaide, ^bThe University of Western Australia, ^cCurtin-Monash Accident Research Centre

Abstract

An assessment of line markings in rural WA was performed using vehicles equipped with lane departure warning (LDW) systems. Crossing events were performed by drifting slowly towards the line of interest. A video system was used to record whether a warning was triggered in response. Overall, 189 crossing events were measured with 154 (81%) triggering an accurate warning and 35 (19%) failures. Warning failures were attributed to a range of factors, such as low travel speed or faded line markings. However, in general, LDW systems were deemed capable of providing appropriate warnings in rural road environments where there are suitable line markings.

Introduction

A significant proportion of fatal and serious injuries occur in rural and remote areas (BITRE, 2017). Many of these casualties are the result of run-off-road type crashes (BITRE, 2017). A suggested solution to these types of crash is the use of Lane Departure Warning (LDW) systems, which alert the driver when there is an unintentional lane departure. However, to operate successfully these systems rely on line markings, which may be less than optimal in rural locations. This study describes an assessment of rural road line markings in WA using commercially available LDW systems.

Method

Two vehicles (anonymised in this study), equipped with commercially available, in-built, video-based LDW systems were used to collect data during three days of on-road trials, in daylight conditions, that assessed various line markings and road edges on rural roads in WA. Data was collected at five planned sites along the Great Southern Highway, approximately 155 km South-East of Perth, in the Wheat-Belt region of WA. The five sites were selected to provide a variety of line marking types for assessment. Additionally, data was also collected at a further four ad-hoc sites, in the same general area as the planned sites, where interesting line markings or LDW system behaviour were observed.

Details on relevant factors were collected from each site, such as line marking types, lane widths, and retro-reflectivity (a measure of line 'brightness') of line markings. Then, a number of line crossing events were performed with each trial vehicle by initially travelling in the centre of the lane and then instigating a drift to the left or right. A video system with two cameras, one viewing the left/right wheel of interest and one viewing the vehicle's dashboard, was used to record whether a warning was triggered for each crossing event. Other pertinent details regarding each crossing event were also recorded, such as the daylight brightness, temperature, and the presence of sun glare.

Results

Overall, 189 crossing events were recorded. Of these, 154 (81%) gave an accurate warning, with 35 (19%) failures. Accuracy was high at the planned locations (96%) where the line markings had been recently remarked, but lower at the ad-hoc sites (61%) that were deliberately chosen as locations where warning failures might occur. The results were generally similar for both of the vehicles used in the study.

Discussion

The findings of this study show that LDW systems are capable of providing appropriate warnings in rural road environments where there are suitable line markings. In most cases the situations leading to warning failures were noted as limitations in the LDW system user manuals.

While it was not possible to determine a quantitative definition of a suitable line marking, there were some indications of what may be important. The level of retro-reflectivity, combined with the level of available daylight brightness, did appear to indicate (though not with any kind of statistical power) where LDW systems may have difficulty in detecting a line marking. It was also considered that line marking visual contrast may be an important factor to consider.

References

Bureau of Infrastructure, Transport and Regional Economics (BITRE). (2017). Road trauma Australia 2016 statistical summary. Canberra ACT.