

Study on methodologies to validate the algorithm for the emergency/automatic collision notification system using ITARDA's in-depth accident data

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Five years have passed since the start of Emergency/Automatic Collision Notification system (D-Call Net), and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) started D-Call Net in-depth accident study in FY2021. On the other hand, the ISO project on “Methodology for creating and validating algorithms for injury level prediction” has moved to AWI, and validation methods are being discussed. Therefore, the authors attempted to study the algorithm validation method using the in-depth accident data that has been accumulated over 5 years.

- (1) ITARDA has accumulated 78 D-Call Net accident cases (19 single vehicle and 59 vehicle to vehicle) through previous collaboration with HEM-Net. Of those, 75 cases were able to define SIP Accident Code. Using them, classification by accident type and road profile was carried out. On public roads, 9 crossing accidents at signalized intersections, 9 at unsignalized intersections, and 9 rear-end collisions near intersections were occurred. (Fig. 1)

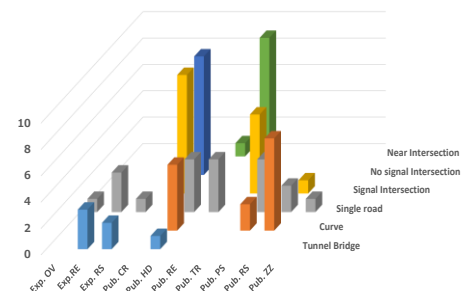


Fig. 1 Categorization by accident type and road profile

- (2) In 72 cases, both the probability of death or serious injury estimated by the algorithm and the actual level of driver injury (no, minor, and serious injury) from the in-depth accident studies were available, and the relationship between them was summarized. In two cases, the driver was confirmed to suffer serious injuries. In both cases, it was also confirmed that the D-Call Net activated a helicopter emergency medical service, which treated the driver at the scene. On the other hand, in two cases, it was confirmed that the driver sustained only minor injuries, but the other seriously injured driver was treated. (Fig. 2)

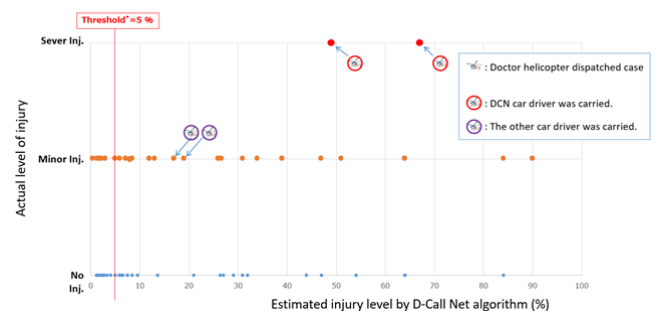


Fig. 2 Estimated and actual injury level for ITARDA's cases

- (3) In the ISO activity on methodology for creating and validating algorithm, “Confusion Matrix” has been proposed, and adapting it provided the results in Table 1. Here, 5% was used as the threshold for serious/minor injuries. This threshold was targeted at UTR < 10% and OTR < 50%, but the OTR was a little high at 61%. If 8% threshold was used, OTR will drop to 49%.
- (4) The number of vehicles equipped with D-Call Net has already exceeded 3 million in Japan. In order to improve this system, it is strongly suggested that D-Call Net in-depth accident study be continuously supported by the Ministry of Land, Infrastructure, Transport and Tourism.

Table 1 Confusion matrix for ITARDA's cases

		Estimated injury level	
		Sever (+)	Minor or No (-)
Actual injury level	Sever (+)	TP: True positive 2	FN: False negative (Under triage) 0
	Minor or No (-)	FP: False positive (Over triage) 43	TN: True negative 27