Exploring SHRP2 NDS for the perspective of Self-Driving Cars in Difficult Driving Conditions

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Research Conducted by:

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ABSTRACT

• Self-Driving cars have potentials to improve safety by eliminating driving error. To reach that goal, these vehicles have to follow certain standards to ensure improved safety.

• Real world self-driving test drives can help in understanding the potential pitfalls. In the U.S., drivers drive 3 trillion vehicle miles each year. The total self-driving car hours are still limited in number.

• This project used Roadway Inventory Data (RID) and Naturalistic Driving Study (NDS) data acquired by the Second Strategic Highway Research Program (SHRP2) to determine safety thresholds during difficult driving situations.

• Driving during low visibility condition is considered as a difficult driving scenario. This study determines certain safety thresholds for this driving condition. Overcoming these thresholds could be a pivotal point in making a case for adaptation of self-driving cars on roads.

DATA COLLECTION AND PROCESSING

To accomplish the research goals, databases from these sources were used:

• Airport weather station data,
• SHRP2 RID, and
• SHRP2 NDS

The data collection procedure requires spatiotemporal pattern analysis in preparing the final dataset.

METHODOLOGY

To determine safety thresholds during difficult driving condition, three different methods were applied:

1) parametric model (ordinal logistic regression) development to quantify visibility issues,
2) non-parametric analysis (multiple correspondence analysis [MCA]) to identify key associated factors for low visibility related crashes, and
3) topic model development by analyzing low visibility related crash narratives.

CONCLUSIONS

• Higher speed is associated with fatal and injury crashes during reduced visibility conditions.

• Younger and older drivers seem to appear as a meaningful factor by itself for low visibility associated crashes.

• Older drivers face difficulty in certain roadway characteristics (two way undivided arterial roadways with posted speed 41–50 mph) during low visibility driving.

• Rural roadways with no lighting at dark are more risky.

• Five specific areas require attention: friction, friction and lighting, intersection, signalization of intersection, and undivided roadways.

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