Korea Transportation Safety Authority
Korea Automobile Testing & Research Institute

EDR/DSSAD

Autonomous Vehicle's Testing Policy with Investigation Cases in South Korea

Korea Automobile Testing & Research Institute(KATRI)

Special Accident Investigation Office

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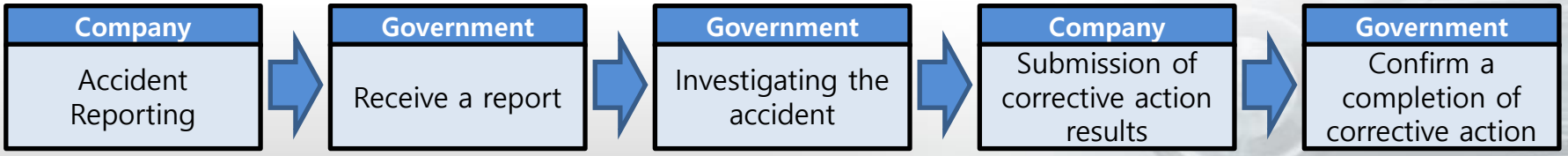
Introduction of AV's Testing Policy

Introduction

- To promote the development of autonomous vehicles(AV), Korean government offers temporary licenses to AV for driving on the road.
- The test vehicle(AV) has to be operated for the purpose of testing and researching and AV has to be operated in the terms of AV meets the safety driving requirements in the regulations.
- If AV has an accident, the company has to pre-report to the government in advance by using a phone or fax. And they have to submit a document including an overview of the accident within 2 weeks.
- The government requires various datas and materials to the company to identify the cause of the accident.
- (If necessary) If AV doesn't meet the safety requirements or there is a high possibility of an accident, the government can order a corrective action and suspension of operation.

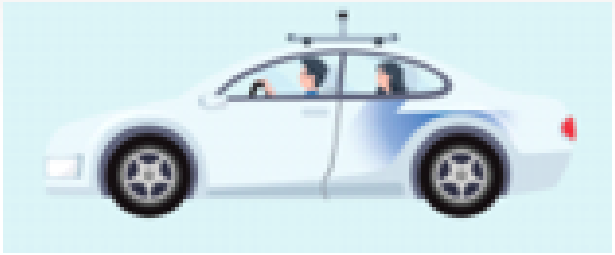


< Process of accident investigation for autonomous vehicle >

Introduction of AV's Testing Policy

AV's Level in Korea

- **In Korea, AV is generally Level 3**
  * (Level 3) Test drivers and Passengers can take an AV with a driver's seat
  - because the test driver rides in the AV, and AV requests the driver to take over when it can't control driving anymore.



- **AV are not usually equipped with DSSAD, because the vehicles on sale are equipped with ADS. However, the AV is equipped with ADS records various data of driving and sensors in real-time.**

Introduction of AV's Testing Policy

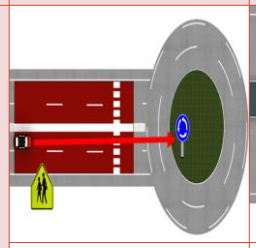
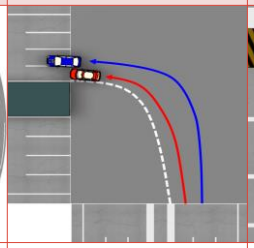
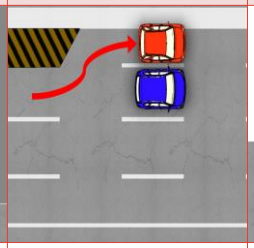
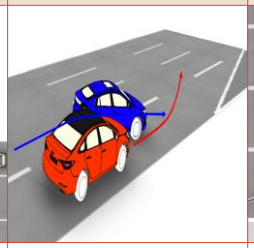
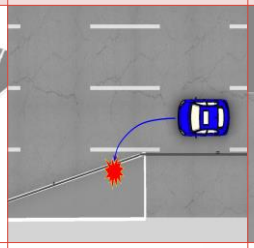
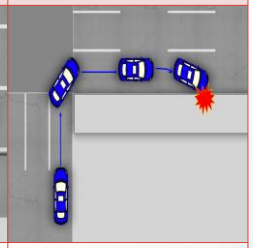
Requirements for AV's safe driving

- AV has to install the data recorder. Below are the required data recorder list.
  - Digital tachograph(DTG), additional data recorder, video recorder
- It is necessary to record driving information by installing a DTG, and if there are data elements that DTG can't record, the company has to install an additional data recorder.
- (additional data recorder) since the testing vehicle is operated for testing or research, it gathers more data than DTG. It has various data about perception and controlling in ADS.
- Video recorders have to be installed for recording the front and rear sights and the inner of the vehicle. because it can be helpful to check the operation situation at the time of an accident.
- We analyze the above data together when investigating an AV accident.

Investigation Cases for AV

Investigation Cases

- In a normal situation, the test driver takes over in a dangerous situation for safe driving, but, the cases we investigate occurred because the test driver did not predict.
- Accidents can be divided into single and colliding with non-AV in ADS or Driver mode.
- EDR is not recorded in most accidents.

구분	A	B	C	D	E	F	G
개요							
	Deactivated of ADS mode in school zone, no driver took over, collided with road sign on roundabout	Collision accident on the left turn at an intersection, curvature of guideline was increased sharply	Contact accident after entering the pocket lane, the side mirrors were broken from each vehicle	Following vehicle rear-ended the AV at a 3-way intersection. AV went slowly, and repeat to go and stop to enter the intersection.	The AV departing from the pocket lane collided with the rapidly entering non-AV.	When AV tried to enter the pocket lane to turn left, AV suddenly steered to the left and collided with the guardrail.	As soon as AV started ADS mode, AV crashed into a curb on the right side of the road.
Accident	single	With non-AV	With non-AV	With non-AV	With non-AV	single	single
Mode	ADS → Driver (driver didn't take over)	ADS	Driver	ADS	ADS	ADS	ADS
EDR	X						
Airbag	Non Deployment						

Investigation Cases for AV

Consideration of DSSAD's trigger condition

- AV accidents that we investigated were minor accidents. So, the DSSAD trigger conditions that can be considered in a minor crash are as follows

(a) If EDR is recorded even with a minor crash (triggering of EDR)

(b) EDR cannot be recorded in minor crash, and also AV cannot drive if the sensor is broken or be in need of calibration

(c) ADS failed

(d) No impact has occurred, but AV can't drive the planned route anymore because the near object is blocking the route.

(e) When AV is out of the planned path, or unintentionally manoeuvres.

Investigation Cases for AV

Data elements at investigation

- Below are the data elements used in the AV investigation and are recorded in a time series method
  - Vehicle speed, GPS Location, Driver's manipulation(APS, Brake Switch on/off, steering angle), Acceleration(controlled, demand by ADS), Etc…

- We also used video data. Video data helped understand to situation of the accident. It was also able to prove text data's reliability by synchronizing it with video data.

Conclusion

Conclusion

- Regarding the trigger of DSSAD, based on AV accident cases in Korea, I think it is important how DSSAD will record data elements in minor accidents in the future.
- But, if the data is recorded by video or continuous image, we can reduce the data element lists based on text. From the synchronizing text and video, we can prove the reliability of data based on text. It also helps to understand the driving situation at the time of an accident.

THANK YOU

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