

INSTRUCTIONS:

Fill out the hazard analysis and risk assessment below.

HA-001 should be for the lane departure warning function as discussed in t

HA-002 should be for the lane keeping assistance function as discussed in

Then come up with your own situations and hazards for the lane assistance

When finished, export your spreadsheet as a pdf file so that a reviewer can

Hazard ID			
	Operational Mode	Operational Scenario	Environmental Details
HA-001	Normal Driving	Highway	Rain
HA-002	Normal Driving	Country Road	Normal
HA-003	Normal Driving	City Road	Normal
HA-004	Normal Driving	Tunnel Road	Normal

discussed in the lecture.
discussed in the lecture.
the assistance system. Fill in the HA-003 and HA-004 rows.
viewer can easily see your work.

Situational Analysis		
Situation Details	Other Details (optional)	Item Usage (function)
High speed	N/A	Correctly used
High speed	N/A	Incorrectly used
Low speed	N/A	Correctly used
High speed	N/A	Correctly used

Situation Description	Function	Deviation
Normal driving on highway during rain with high speed	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	actor effect is too much
Normal driving on country road during normal condition with high speed. (the driver misusing lane keeping assistance function as autonomous function)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Function always activated
Normal driving on city road during normal conditions with low speed	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	Function unexpectedly activated
Normal driving in tunnel road during normal condition with high speed	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Sensor detection is wrong

Hazard Identification		
Deviation Details	Hazardous Event (resulting effect)	Event Details
The lane departure warning function applies and oscillating torque with very high torque amplitude (above limit) and with very high torque frequency (above limit)	Front collision with traffic ahead	Vehicle crashes into the traffic ahead with injury to the driver and passengers if there are any
The lane keeping assistance function is not limited in time duration which leads to misuse as an autonomous driving function	Front collision with oncoming traffic	Vehicle crashes into the oncoming traffic with injury to the driver and passengers if there are any
The lane departure warning function unexpectedly activates and starts oscillating the steering wheel during normal city driving	Front collision with traffic ahead	Vehicle crashes into the traffic ahead with injury to the driver and passengers if there are any
The lane keeping assistance function is not able to recognize the lane and detect the lane in tunnel	Front collision with traffic ahead	Vehicle crashes into the traffic ahead with injury to the driver and passengers if there are any

Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)
Losing control of steering	Medium probability	Driving on highway during raining occurs from a couple of times a month to more often for regular commuters
Driving on country road at high speed and misusing the system	Low probability	Driving on country road and misusing the system does not happen often
Driving on city road at low speed and partially losing control of steering	High probability	Driving on the city road condition happens regularly for average drivers
Driving in tunnel at high speed and partially losing control of steering	Low probability	Driving in tunnel at high speed is not regular activity for most drivers

Hazardous Event Classification

Severity (of potential harm)	Rationale (for severity)	Controllability (of hazardous event)
Life threatening or fatal injuries	Speed for the vehicle driving on highway is expected to be high	Hard to control or uncontrollable
Life threatening or fatal injuries	Fewer cars on the country road influences the driver to drive at high speed	Hard to control or uncontrollable
Moderate injuries	City local driving speed is low speed	Controllable
Life threatening or fatal injuries	High speed tunnel driving is high speed	Hard to control or uncontrollable

	Determin
Rationale (for controllability)	ASIL Determination
Driver loss control of steering in case of the Lane Departure Warning (LDW) malfunction and it applied too much oscillating torque and frequency. This loss control of steering at the high speed would be uncontrollable and highest level of hazardous situation	C
Since the Lane Keeping Assistance (LKA) was always on, the driver would take both hands off from the steering wheel at the high speed and the situation would be uncontrollable and highest level of hazardous situation	B
At the city driving speed, the vehicle is controllable and it would be lowest level of hazardous situation	QM
At the high speed most drivers would not be able to control the situation and this would be highest level of hazardous situation	B

Definition of ASIL and Safety Goals
Safety Goal
<p>Oscillating steering torque and frequency from LDW shall be limited</p>
<p>Shall limit the duration of Lane Keeping Assistance function to ensure the driver from misusing the function as autonomous function</p>
<p>Camera sensor ECU shall check malfunction warning status before sending the oscillating torque request to LDW system</p>
<p>Camera Sensor ECU shall notify the Lane Keeping Assistance function when it cannot detect the lane and the Lane Keeping Assistance function shall warn the driver that it is deactivated</p>