

INSTRUCTIONS:

Fill out the hazard analysis and risk assessment below.

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

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

Then come up with your own situations and hazards for the lane assistance system. Fill in the HA-003 and HA-004 rows.

When finished, export your spreadsheet as a pdf file so that a reviewer can easily see your work.

Hazard ID	Situational Analysis					
	Operational Mode	Operational Scenario	Environmental Details	Situation Details	Other Details (optional)	Item Usage (function)
HA-001	Normal driving	Highway	Rain (slippery road)	High speed		Correctly used
HA-002	Normal driving	Country Road	Normal conditions	High speed		Incorrectly used
HA-003	Normal driving	Highway	Snow (slippery road)	High speed		Correctly used
HA-004	Normal driving	Road with construction site	Normal conditions	Low speed		Correctly used

Hazard Identification				
Situation Description	Function	Deviation	Deviation Details	Hazardous Event (resulting effect)
Normal driving on a highway during rain (slippery road) with high speed and correctly used system.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	Actor effect is too much	The LDW function applies an oscillating torque with very high torque (above limit) or very high frequency (above limit)	Collision with other vehicle
Normal driving on country road during normal conditions with high speed and incorrectly used system.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Function always activated	the driver misuses the function by taking both hands off the wheel and incorrectly treating the car as a fully autonomous vehicle	Collision with other vehicle
Normal driving on a highway during Snow (slippery road) with high speed and correctly used system	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Sensor detection is wrong	Sensor could not detect lane or detect incorrect lane	Collision with other vehicle
Normal driving on road with construction site during normal conditions with low speed and correctly used system	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	Actor effect is too much	torque added by LKA is too strong for the narrowed road due to construction site	Side collision with obstacle

		Hazardous		
Event Details	Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)
High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with other vehicle or road infrastructure	The LDW function applies a too high oscilating torque to the steering wheel	E3	driving on high way at rainy days is common	S3
Misusing the function as a fully autonomous vehicle could leads to distracted driver. The vehicle could cause collision with other vehicle or road infrastructure	The LKA function is misused by driver as a fully autonomous function	E2	driving on country road and hands off the wheel is uncommon	S3
Mistaken lane lines could leads to incorrect steering torque and cause collision with other vehicle or road infrastructure	LKA mistaken the lane lines and add incorrect torque	E2	driving on high way at snowy days is uncommon	S3
High steering torque applied on narrow road leads to leaving lane. The vehicle could cause collision with road infrastructure	The LKA function addes a too high torque	E2	driving on roads with construction site is uncommon	S1

Event Classification			Determination of ASIL and Safety Goals	
Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)	ASIL Determination	Safety Goal
accident at high speed leads often to life threatening injuries	C3	unable to control for most of the drivers	C	The oscillating torque from the LDW shall be limited
accident at high speed leads often to life threatening injuries	C3	hands off the wheel, driver not able to control the vehicle	B	The lane keeping assistance function shall add extra steering torque for a limited amount of time and then stop providing extra torque.
accident at high speed leads often to life threatening injuries	C2	driver could correct steering torque of LKA at high speed	A	The lane keeping assistance shall deactivate if sensor detection is unstable during snowy condition
accident at low speed	C1	driver could correct steering torque of LKA at low speed	QM	The torque added by the LKA shall be limited on narrow road