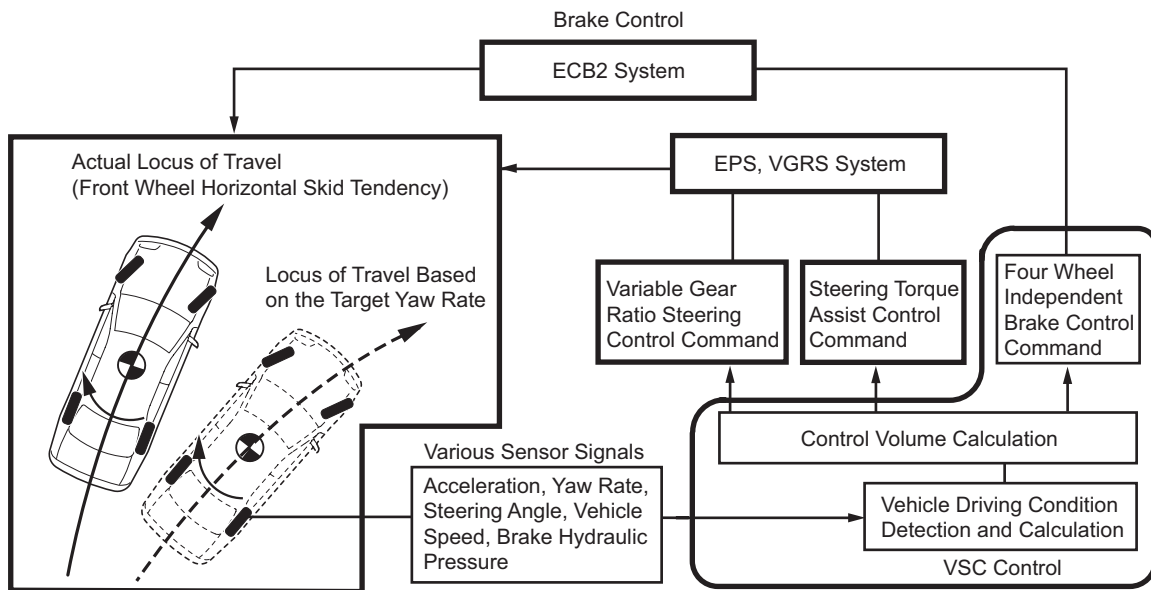


Steering Coordination Function

- The VDIM system effects coordinated control consisting of VSC (Vehicle Stability Control), EPS (Electric Power Steering), and VGRS (Variable Gear Ratio Steering). By integrating these preventive safety functions, the VDIM system ensures excellent driving stability and maneuverability of the vehicle.
- This is the world's first system to use the following steering coordinated control functions: Steering control with braking on sprit μ , Steering control with driving on sprit μ , and Steering control in understeer condition.
- If the vehicle loses stability due to a slippage, this function effects brake control by applying hydraulic pressure to the wheels. At the same time, the EPS provides steering torque assist control or active steering wheel angle control and the VGRS provides variable gear ratio steering control to facilitate the driver's steering maneuver.



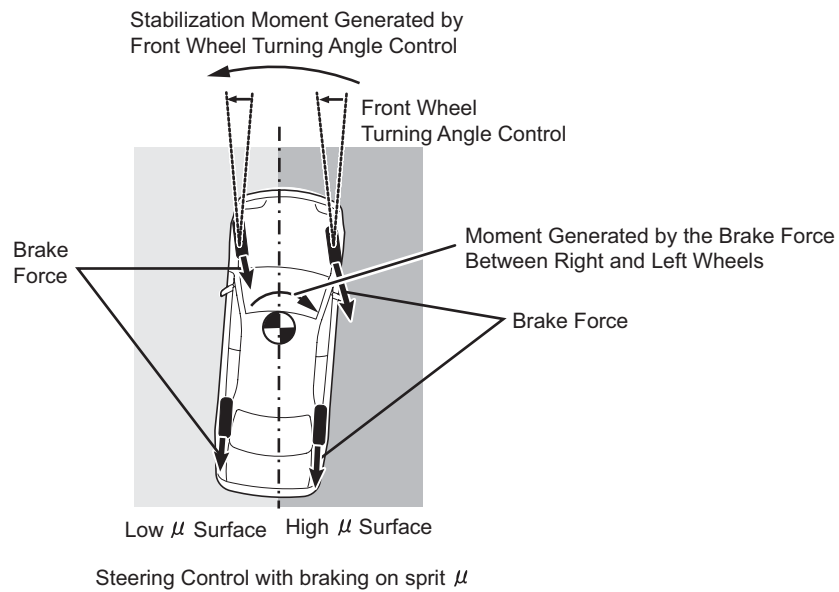
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Steering Coordination Function List

	First in the world
Steering control with braking on sprit μ	○
Steering control with driving on sprit μ	○
Steering control in understeer condition	○
Steering control in oversteer condition	
Variable Gear Ratio Control (VGRS function)	
Differential Steering Control (VGRS function)	

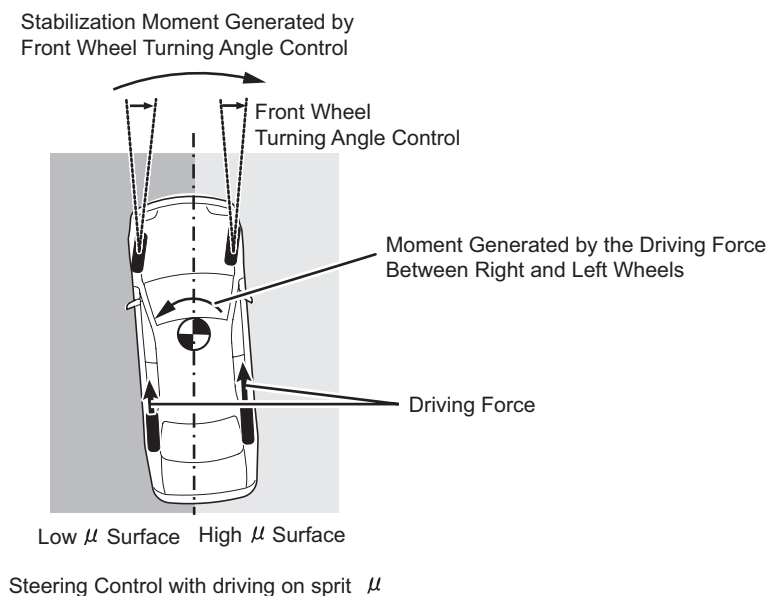
Steering Control with Braking on Sprit μ

- When the driver applies the brakes, the surface could have different slippage rates, such as when the right wheels are on asphalt pavement and the left wheels are on the snow. In this case, the difference that is created in the brake force between the right and left wheels could cause the vehicle to veer to the side that has the higher friction coefficient. The VDIM (Vehicle Dynamics Integrated Management) controls the turning angle of the front wheels in the direction that suppresses the moment that is generated by the brake force difference between the right and left wheels. Thus, this system makes the driver's corrective steering maneuver practically unnecessary and ensures a high level of vehicle stability. Consequently, it maintains the brake force that is generated between the surface and the tires at an even higher level than in the past, thus ensuring vehicle stability.



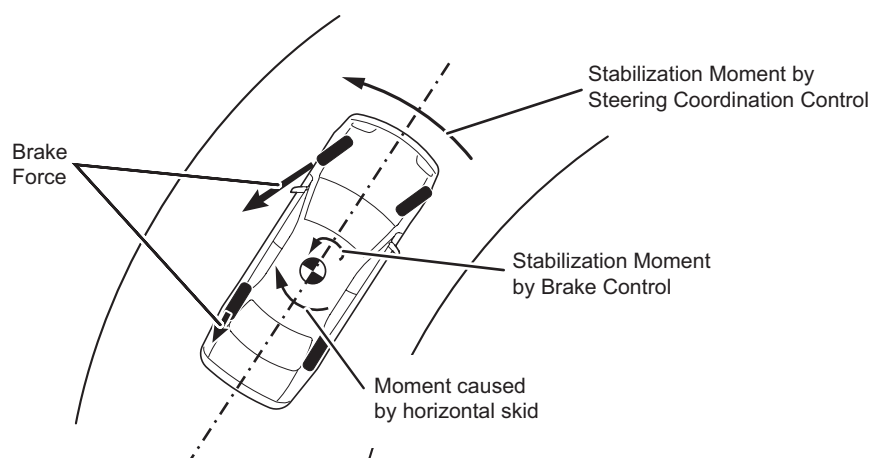
Steering Control with Driving on Sprit μ

- The driver might start off the vehicle on a surface with different slippage rates, such as when the right wheels are on asphalt pavement and the left wheels are on the snow. In this case, the difference that is created in the drive force between the right and left wheels could cause the vehicle to veer to the side with the lower friction coefficient.
- The VDIM (Vehicle Dynamics Integrated Management) controls the turning angle of the front wheels in the direction that suppresses the moment that is generated by the drive force difference between the right and left wheels. Thus, this system makes the driver's corrective steering maneuver practically unnecessary and ensures a high level of vehicle stability. Consequently, it provides driving performance of a higher level than in the past, thus ensuring vehicle stability.



Steering Control in Oversteer Condition

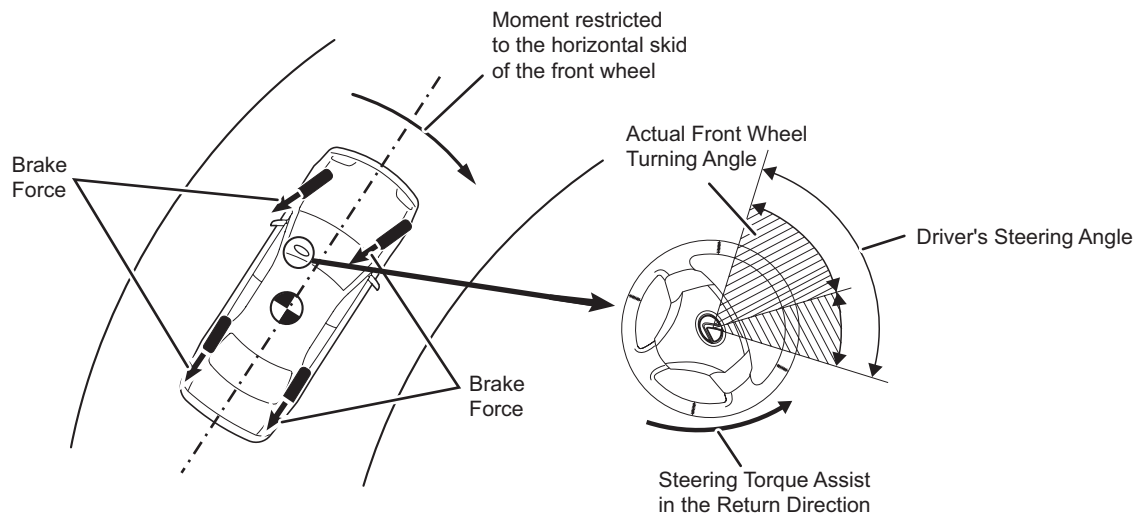
- The system determines the existence of a rear wheel sideslip tendency based on the information provided by various sensors that detect the conditions of the vehicle. Then, it applies the brakes primarily on the outer wheels of the turn, depending on the extent of that tendency. This generates a stabilization moment in the outward direction of the turn, thus suppressing the rear wheel sideslip tendency.
- The VDIM uses a VGRS (Variable Gear Ratio Steering) actuator to control the front wheel angle to suit the extent of the aforementioned sideslip, thus generating a stabilization moment. Unlike the conventional stabilization control that relies solely on the brakes, this system stabilizes the vehicle by effecting steering control in addition to brake control. Thus, this system ensures stability without causing the driver to feel an excessive feeling of deceleration.



Steering control in oversteer condition

Steering Control in Understeer Condition

- The skid control ECU calculates the driver's target yaw rate based on the steering angle and vehicle speed. Then, it determines whether a front wheel sideslip tendency exists based on a comparison of the target yaw rate and the vehicle's actual yaw rate value. Then, it controls the engine output characteristics and operates the brakes in accordance with the extent of that tendency, thus generating a moment in the turning direction of the vehicle, in order to suppress the front wheel sideslip tendency.
- When the vehicle exhibits this type of front wheel sideslip tendency, in which the vehicle's direction of travel will not change even if the driver steers the front wheels further, the VDIM employs the VGRS to increase the steering gear ratio and the EPS to provide steering torque assist in the direction to return the turning angle of the front wheels. Thus, it suppresses the front wheels from turning in excessively.



Steering Control In Understeer Condition

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Steering Gear Ratio Changed to Suit Vehicle Speed

- In the conventional steering system, the steering gear ratio is set to enable the vehicle to respond gently to the amount of steering effort, with high-speed driving in mind. This requires the driver to increase the amount of steering effort while driving at low speeds. Because the VGRS can change the steering gear ratio at will, it is able to optimize the steering gear ratio in accordance with the driving conditions.
- For further details regarding the above, [refer to page ST-7](#).

Driving Feel Through Differential Steering Control

- The system controls the VGRS actuator with very small angles in accordance with the speed of the driver's steering maneuver (differential of the steering turning angle), in order to correct the response delay of the vehicle. Thus, it supports the vehicle with the proper driving feel during lane changes or while driving on a winding road.
- For further details regarding the above, [refer to page ST-8](#).