

Case Examples of Accidents Due to Accelerator and Brake Pedal Misapplication

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Overview

- Description
 - Classify case examples of pedal misapplication accidents that actually happened
 - Sort out human factors that led to pedal misapplication
- Results
 - Pedal misapplication will occur even during normal driving when it is necessary to slow down.
 - Pedal misapplication is induced by the fact that drivers have to do a lot of steering wheel and pedal operations in parking lots and need to pay attention to many things.
 - Inattention, carelessness, and absent-mindedness lead to pedal misapplication.
 - “Surprise,” “impatience,” and “rushing” lead to pedal misapplication.
 - Improper operation posture and pedal operation may cause the driver’s foot to slip from the brake pedal to the accelerator pedal.
 - The characteristics of elderly driver’s attention and cognitive functions seem to be related to the large number of pedal misapplications.

Objectives

- To clarify the process leading to accidents based on case examples of accidents that actually happened due to pedal misapplication
 - Classify the circumstances under which accidents occurred
 - Sort out what kind of actions drivers took at the time an accident occurred or just before it happened.
 - Extract factors that lead to pedal misapplication from among various patterns of conditions under which accidents have occurred.

Case Examples Subject to Analysis

- We collected 212 case examples of accidents due to pedal misapplication.
 - They were accidents in which “brake and accelerator pedal misapplication” was selected as human factors in the accident factor classification code.
 - There are differences in the period of the survey and the details of the accidents covered in the survey depending on the prefecture that were surveyed (cases in which the survey applied only to accidents involving fatalities and serious injuries or to all accidents).



It is not appropriate to conduct a statistical analysis of the accident case examples collected in this survey.

(1) Classification of Circumstances Under Which Accidents Occurred

Traveling

Situation	Number of cases	Average age
Traveling normally	28	69.9
Trying to stop after the preceding car	28	74.3
Going straight through an intersection	6	77.6
Turning right or left at an intersection	18	75.2
Currently among cars in a traffic jam	2	70.0
Changing direction or turning around	5	70.6

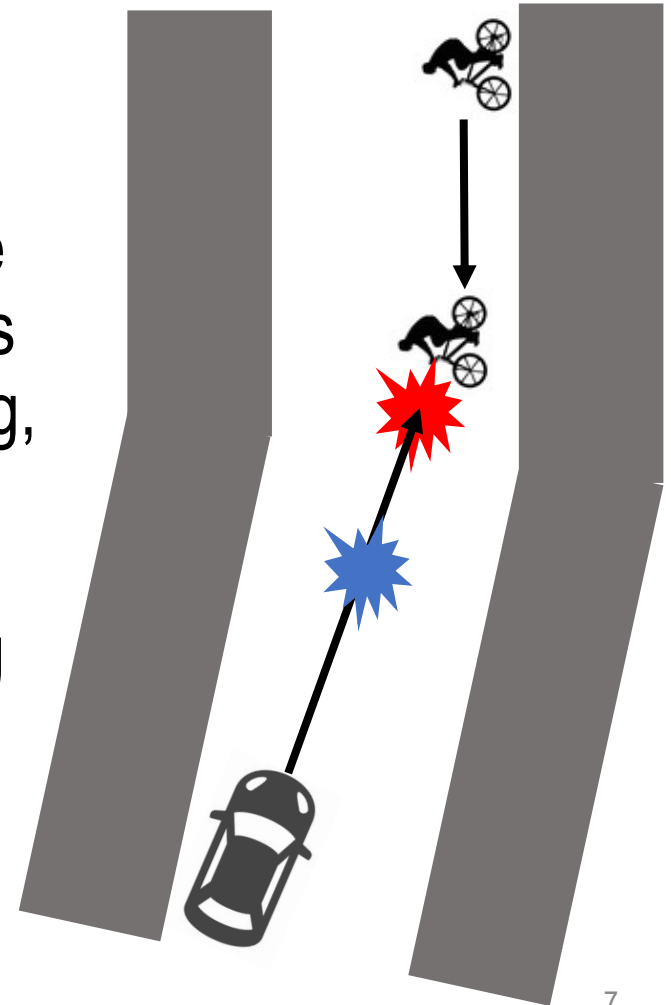
(2) Classification of Circumstances Under Which Accidents Occurred

Stopping/parking related

Circumstances	Number of cases	Average age
Entering a parking lot from a roadway	11	71.6
Moving into a parking lot	13	74.0
Moving forward toward a parking spot in order to park	25	72.7
Moving backward toward a parking spot in order to park	17	72.8
Starting off from a parked or stopped state	14	74.4
Car moving unintentionally while getting off	3	80.3
Starting unintentionally from a parked or stopped state	5	70.0
Gear operation error	6	74.2
Moving into a roadway from a parking lot	20	77.3
Circumstance unclear	11	

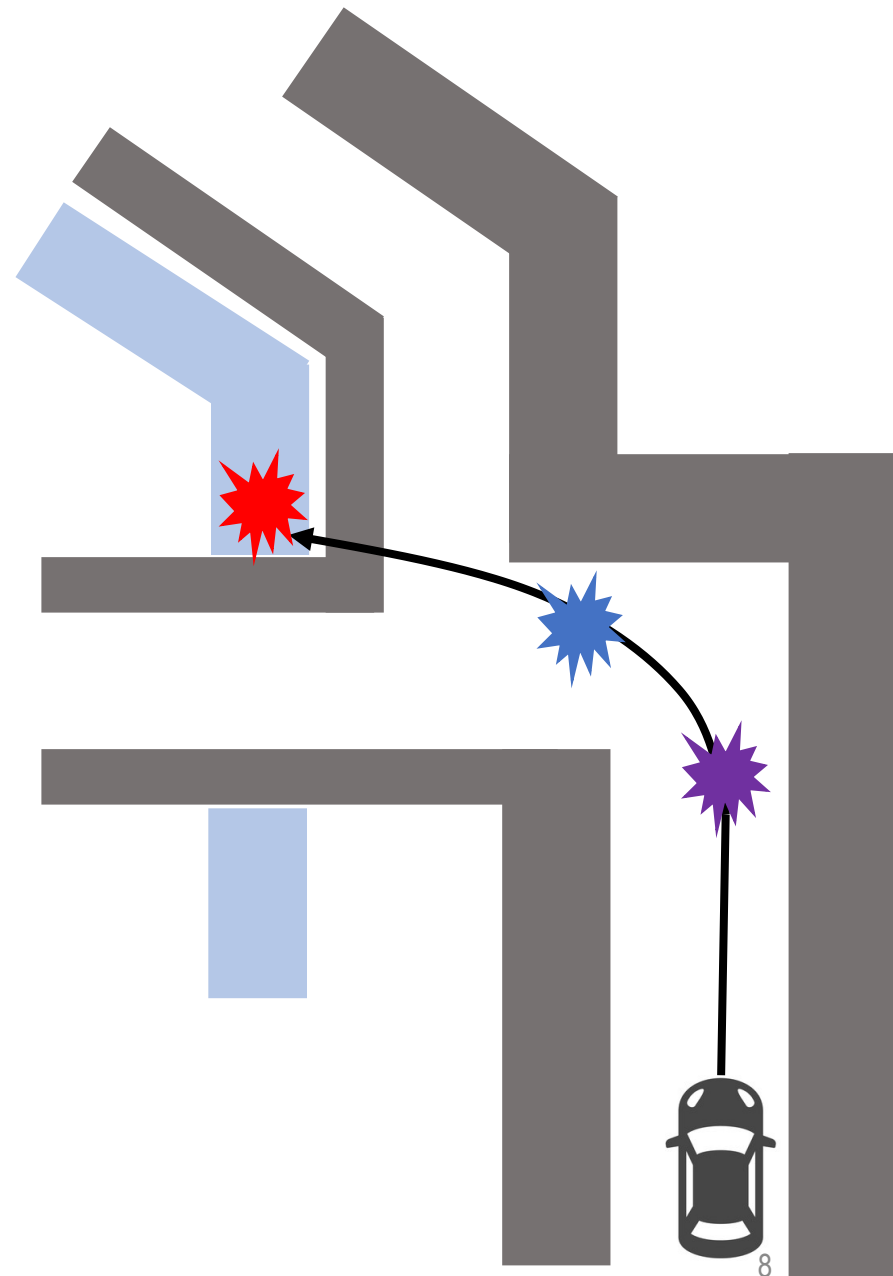
While Traveling Normally (1)

- Overview
 - Although the driver noticed a bicycle coming from the opposite direction, the driver kept going as he/she was thinking of something, and as the bicycle came closer, the driver tried to apply the brakes but stepped on the wrong pedal.



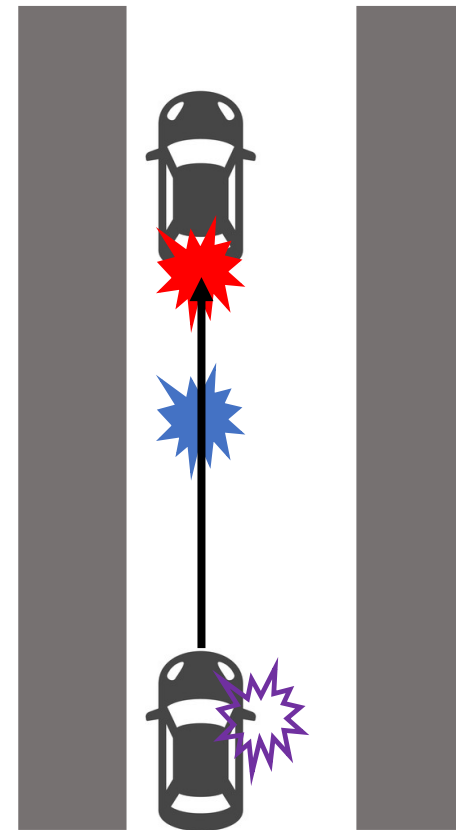
While Traveling Normally (2)

- Overview
- The driver entered a corner and turned the steering wheel in the wrong direction.
- The driver subsequently stepped on the wrong pedal, veered off the road, and fell into a river.



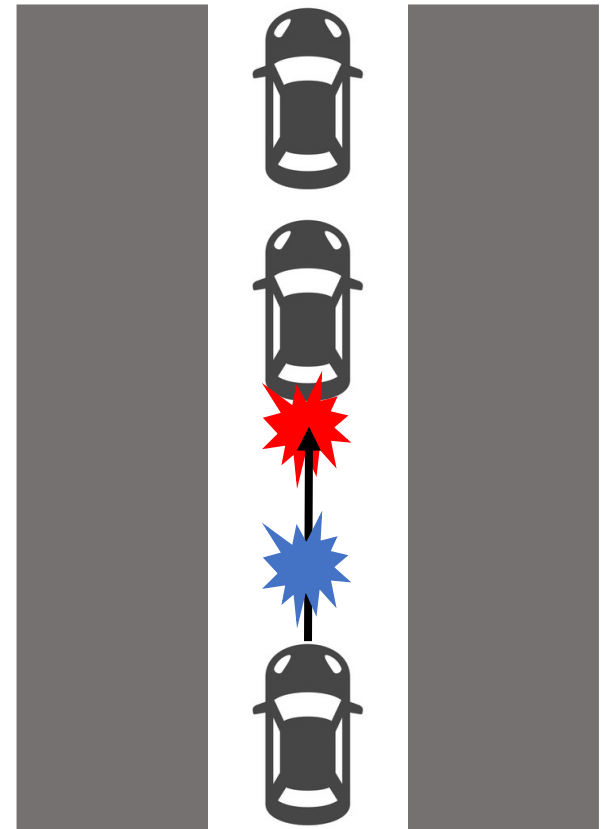
While Traveling Normally (3)

- Overview
 - As the driver was trying to unfold the door mirror that was folded, he/she came too close to another car, panicked, and stepped on the wrong pedal.



Stopping after the Preceding Car

- Overview
 - In response to a car that had already stopped, the driver tried to slow down and stop, but stepped on the wrong pedal.
 - The driver was thinking of something.
 - The driver was careless.
 - The driver thought he/she was stepping on the brake pedal, but it was the accelerator.
 - The position of the driver's foot shifted/slipped.
 - The driver became distressed.



Summary:

While traveling normally / Stopping after the preceding car

- Not paying attention to driving, such as thinking about something or being careless, resulted in delayed response and stepping on the wrong pedal by trying to operate the pedal quickly.
 - Impatience and rushing cause effects.
- Although there is no oversight or delayed response, pedal misapplication may occur.
 - The state/position of the foot is erroneously perceived.
 - The foot was on the accelerator pedal despite thinking that it was on the brake pedal.
 - The foot slipped.
 - Not stepping on the correct pedal

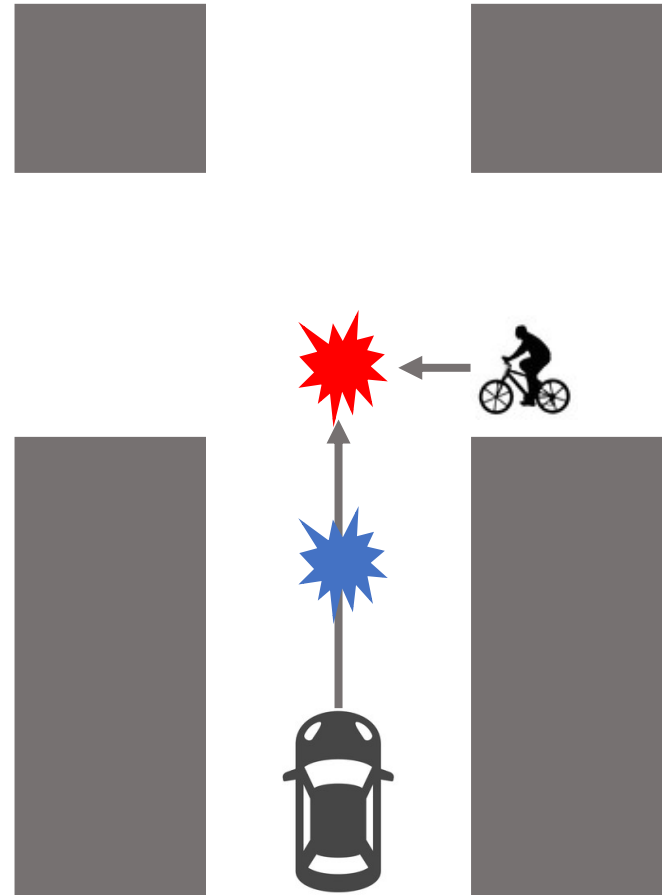
Going Straight Through an Intersection

- Description of accident

When passing straight through the intersection, the driver was slow to confirm a bicycle approaching from the right side.



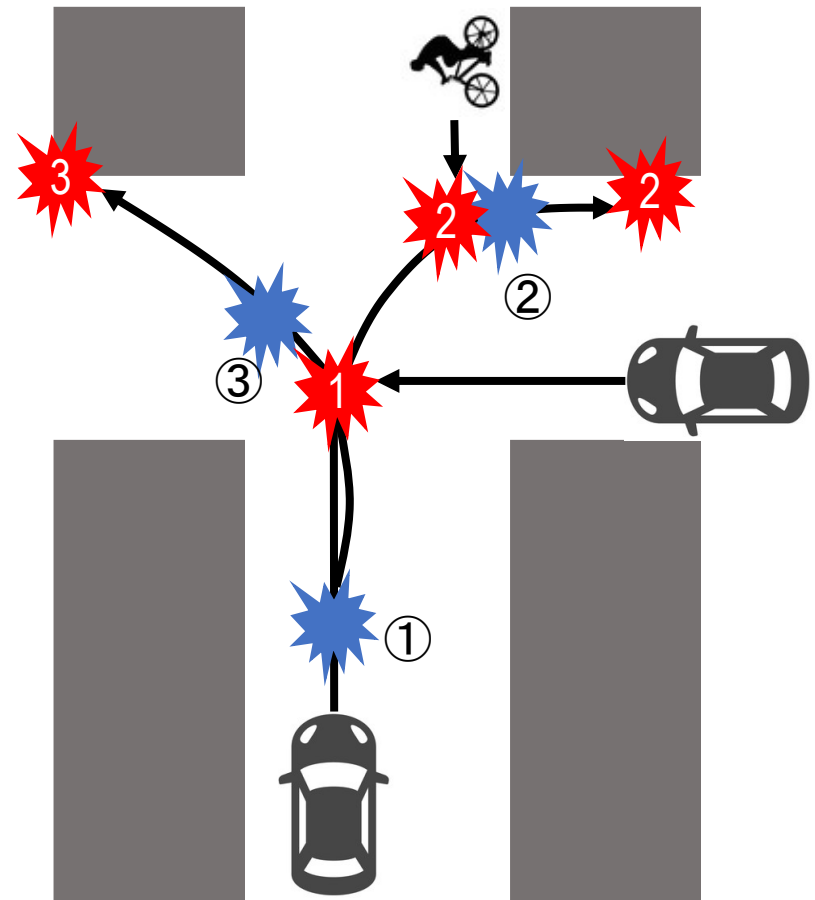
Feeling distressed, the driver tried to stop but stepped on the wrong pedal.



When Turning Right or Left at an Intersection

- Description of accident

- ① Trying to come to a temporary stop when entering the intersection, the driver stepped on the wrong pedal.
- ② While turning right, the driver noticed a bicycle, etc. and tried to avoid it but came into contact, became startled, and stepped on the wrong pedal.
- ③ Realizing that he/she was traveling in the wrong direction, the driver impulsively tried to apply the brakes but stepped on the wrong pedal.



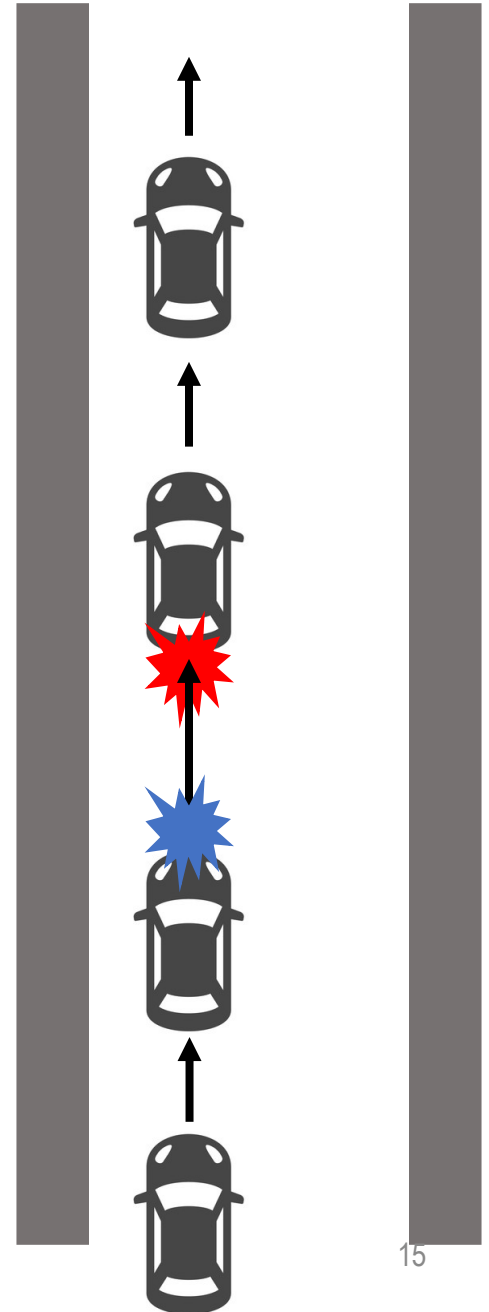
Summary:

Going Straight through or Turning Right or Left at an Intersection

- Other cars or bicycles appear from the right or left, and the driver tries to slow down but steps on the wrong pedal.
 - If the driver was not expecting the other party, he/she is affected by impatience and panic.
- When entering an intersection, the driver tries to slow down but steps on the wrong pedal.
- When the driver realizes that he/she is turning in the wrong direction at an intersection, he/she tries to slow down but steps on the wrong pedal.

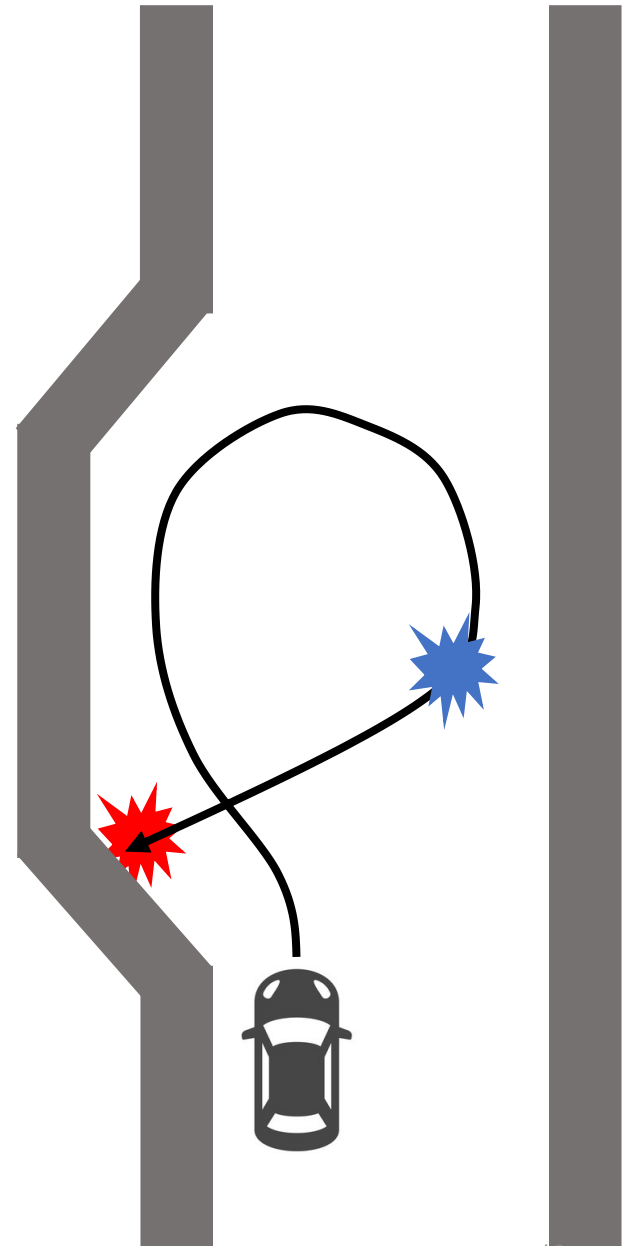
Traffic Congestion

- Description of accident
 - Due to congestion, the driver has repeatedly been stopping and going. As he/she tried to stop behind a car directly in front after starting, the driver's right foot that was on the brake pedal slipped to the right, and the driver inadvertently stepped on the accelerator pedal, resulting in a rear-end collision.



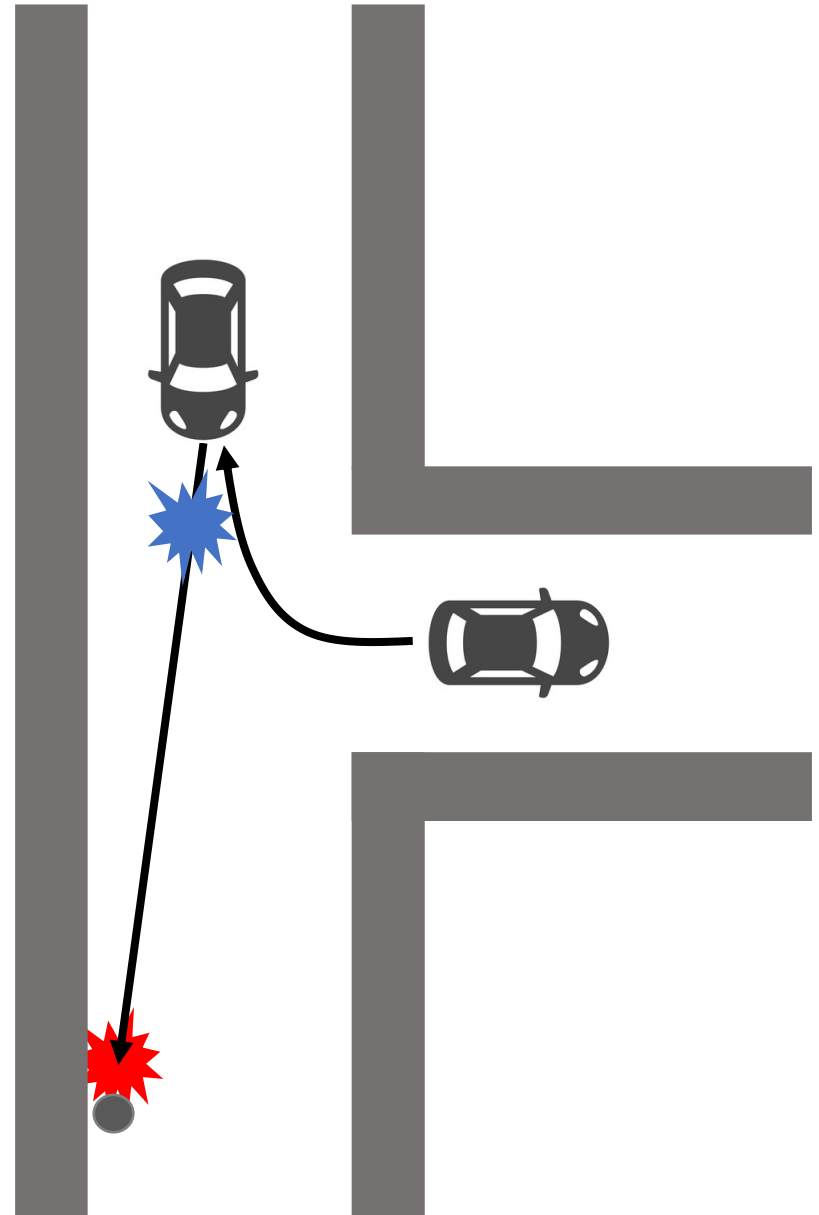
Turning Around

- Description of accident
 - After making a U-turn at a place where the driver has regularly been turning at, he/she stepped on the wrong pedal, trying to slow down after making an excessively wide turn. The car ran onto the road slope.



Changing Directions

- Description of accident
 - The driver stepped on the wrong pedal when he/she tried to go forward in an attempt to change directions after backing up the car at a T-shaped intersection.
 - Collision into a utility pole.



Summary:

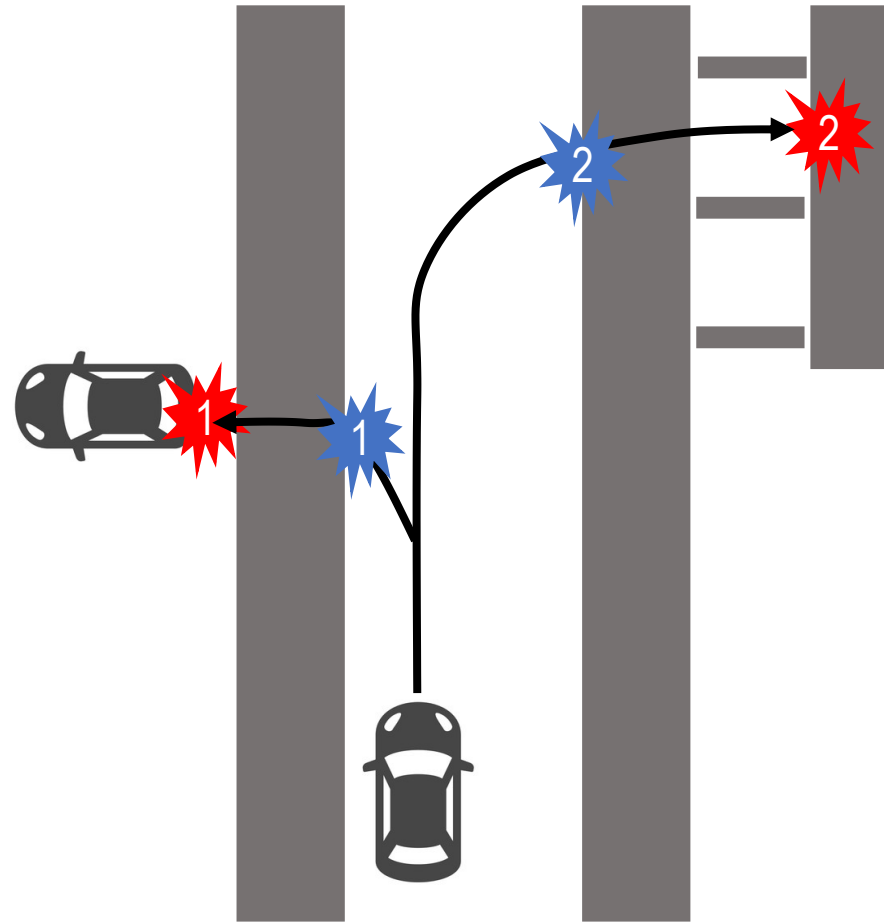
Traffic Congestion, Turning Around

- Drivers step on the wrong pedal while repeatedly stopping and going in a traffic congestion.
 - There is a possibility that a reduction in alertness may be responsible for this.
- Pedal misapplication occurs when a driver turns the steering wheel widely and performs a pedal operation at the same time when turning around the car.
- Pedal misapplication when changing directions.
 - Being unfamiliar and not performing individual operations with certainty leads to pedal misapplication.

Entering a Parking Lot from the Roadway

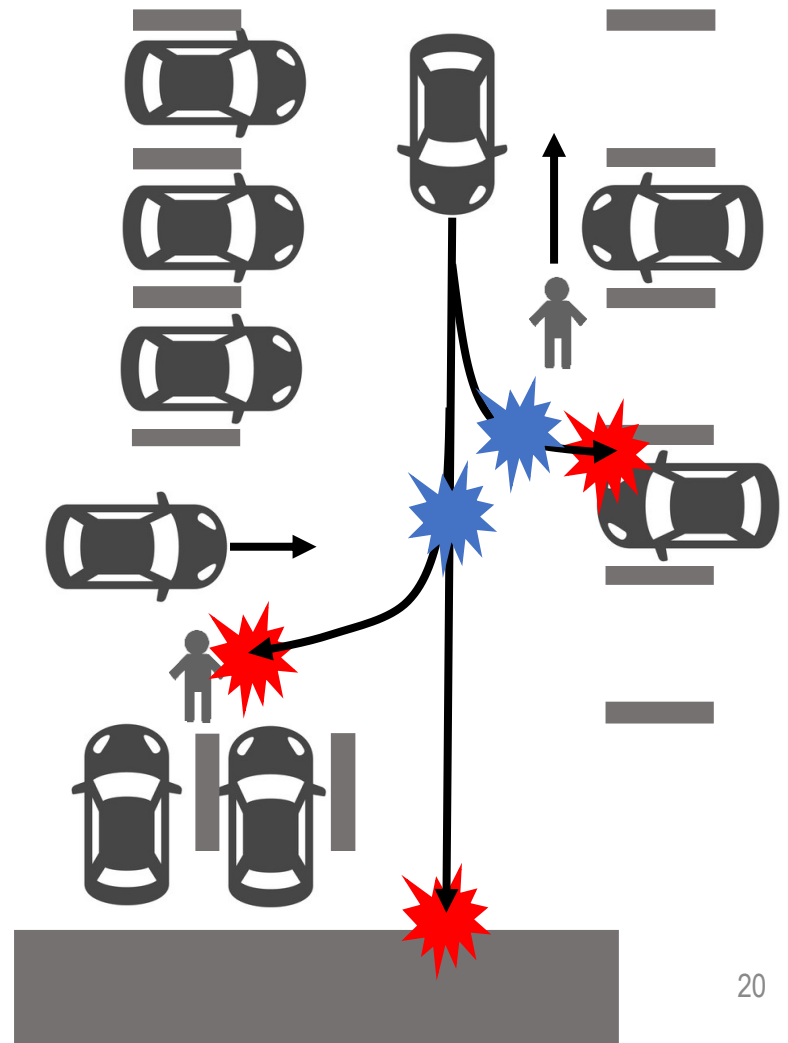
- Description of accident

1. The driver entered the parking lot by turning left from the roadway. Upon going over the sidewalk curb, the driver panicked, stepped on the wrong pedal, and crashed into a car that had entered the parking lot earlier.
2. The driver entered the parking lot by turning right from the roadway. When the driver tried to park the car by moving forward, he/she stepped on the wrong pedal and crashed into the wall.



Moving Inside a Parking Lot

- Description of accident
 - While looking for a parking space
 - While trying to slow down
 - While trying to turn left
- ↓
- Crashing into a wall or parked car, or hitting a pedestrian



Summary:

From Roadway to Parking Lot; Moving within a Parking Lot

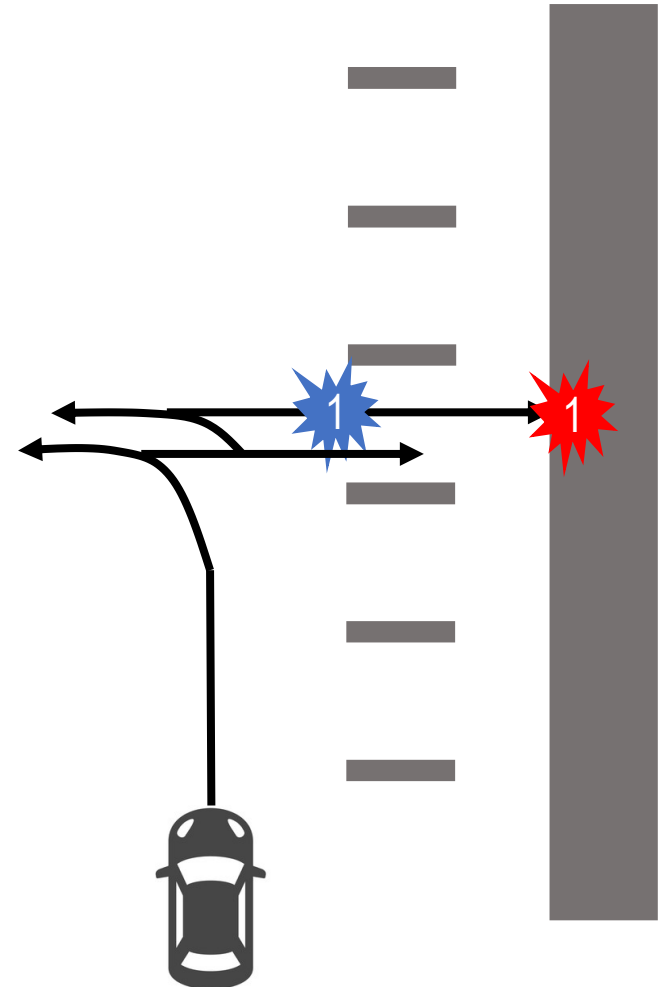
- When leaving an off-road parking lot, it is necessary to stop temporarily for confirmation or to operate the parking fee payment machine, and pedal misapplication occurs in doing so.
- Feeling startled upon hitting a curb could trigger a pedal misapplication.
- Moving within a parking lot requires frequent steering wheel and pedal operations as well as being alert for various things. Therefore, there are many elements that may triggers pedal misapplication.

Moving Forward within a Park Parking Lot in Order to Park

- Characteristic description on human factors
 - The driver was distracted by a passenger's conversation on a mobile phone.
 - The driver was distracted when he/she cautioned a passenger who removed his/her seatbelt.
 - The driver became distressed at causing an accident and stepped on the wrong pedal.

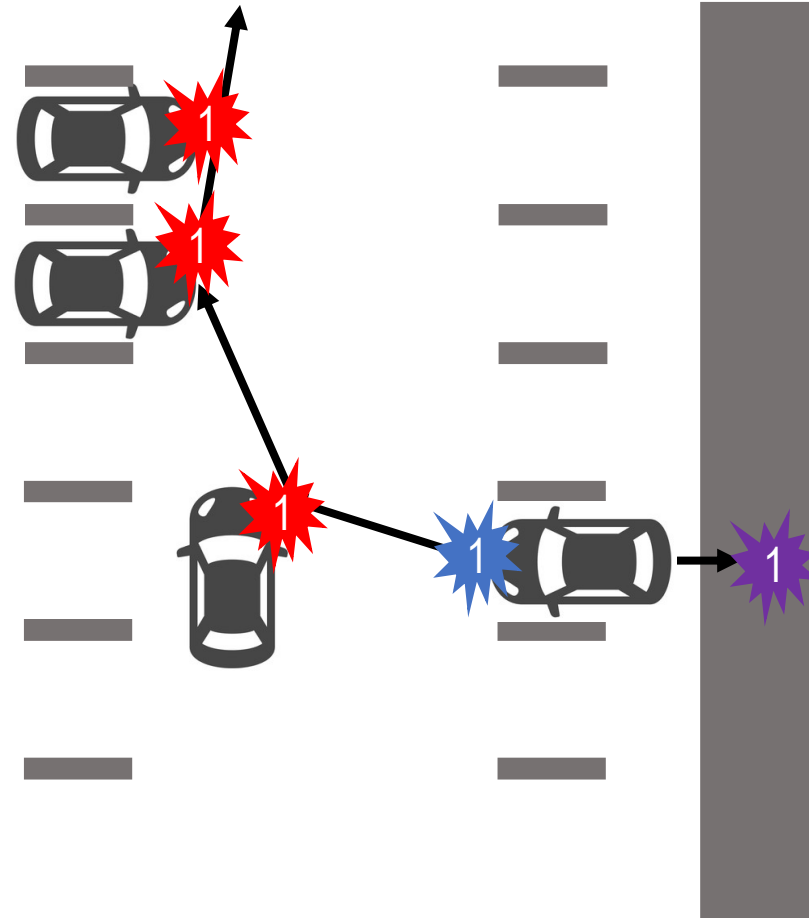
Backing up within a Parking Lot in Order to Park

- Description of accident
 - After going back and forth to backing and moving forward to adjust the parking position, the driver stepped on the wrong pedal.



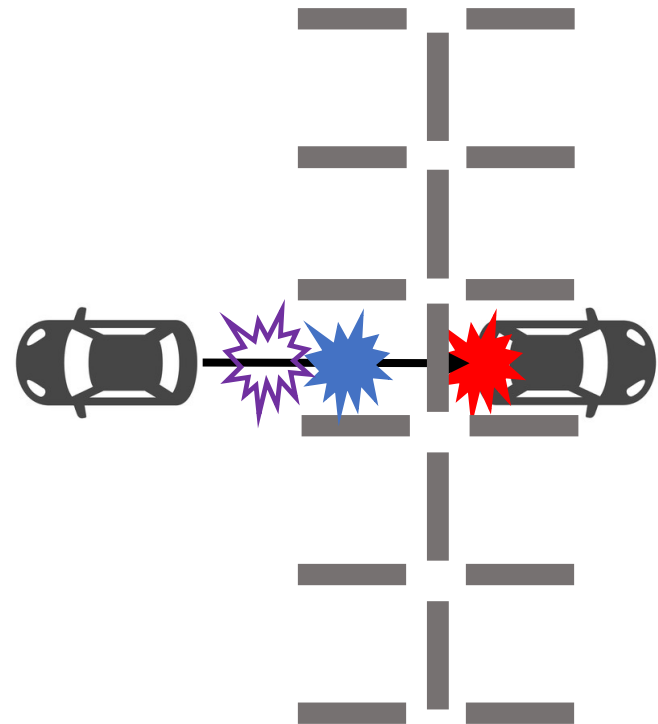
Backing up within a Parking Lot in Order to Park (2)

- Description of accident
 1. The driver panicked when he/she crashed into a wall at a supermarket after backing up at first.
 2. The driver panicked when he/she inadvertently stepped too hard on the accelerator pedal.
 3. The driver panicked when the car accelerated when he/she stepped lightly on the accelerator at the moment the driver would have normally stepped on the brakes.



Backing up within a Parking Lot in Order to Park (3)

- Description of accident
 - When the driver backed up after confirming the rear, he/she was distracted by the wheel stopper and stepped on the wrong pedal.



Summary:

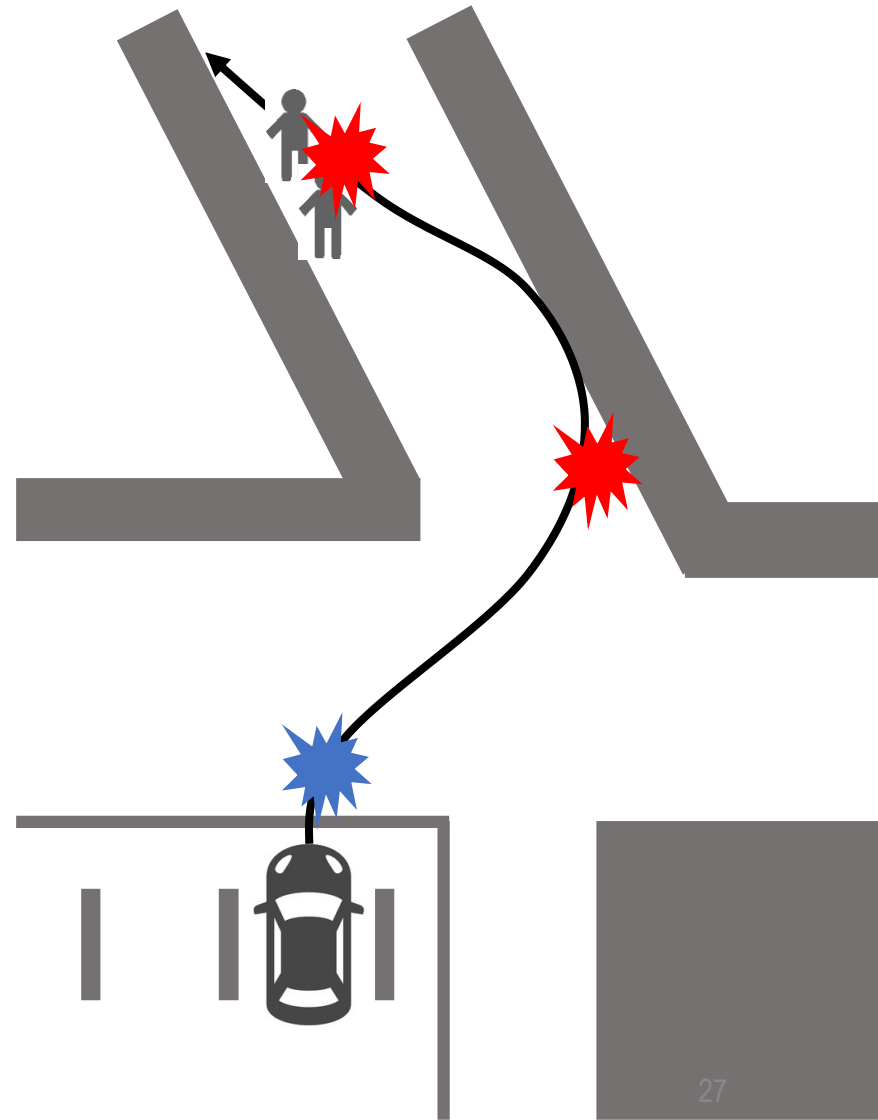
Moving Back and Forth in Order to Park

What triggers pedal misapplication:

- Distraction due to what made the driver feel uneasy such as the passenger's behavior
- Erroneous operation and the resulting accident
- Frequent steering wheel and pedal operations for adjusting the parking position

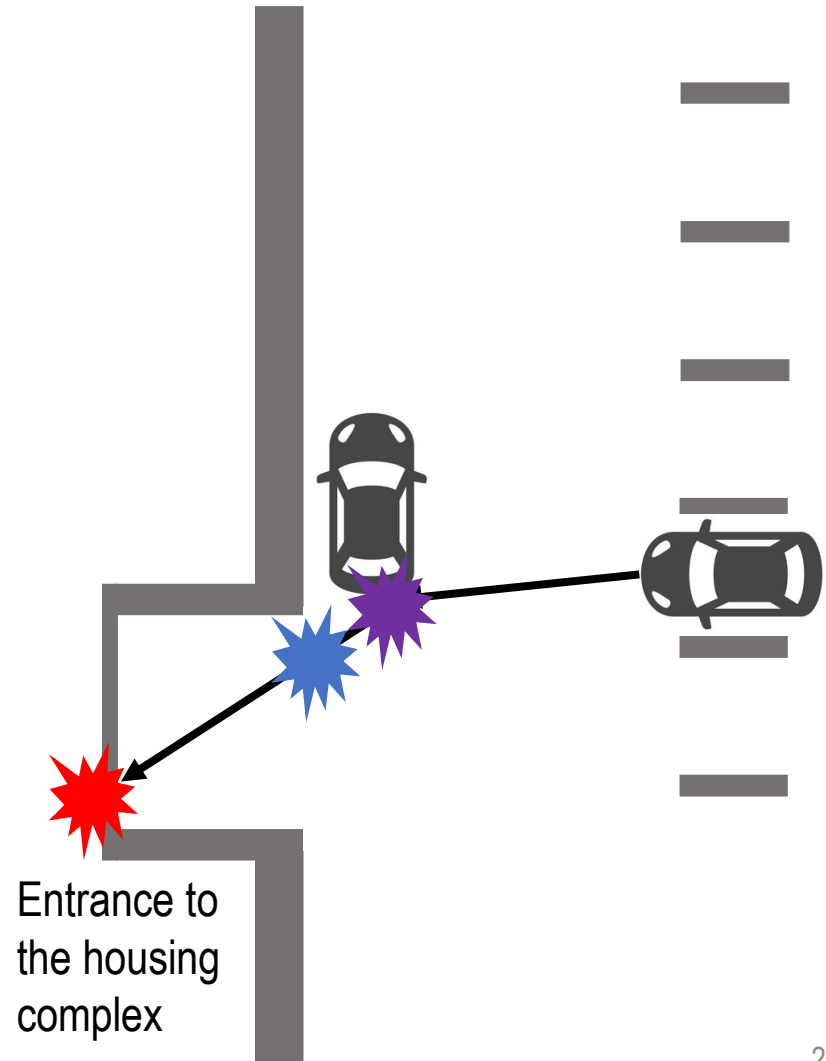
Starting from a Parked Position (1)

- Description of accident
 - In starting off from a parking lot, the driver was surprised that the tires were turned to the right. Therefore, the driver tried to stop but stepped on the wrong pedal.
 - The car ran into a wall and hit pedestrian(s).



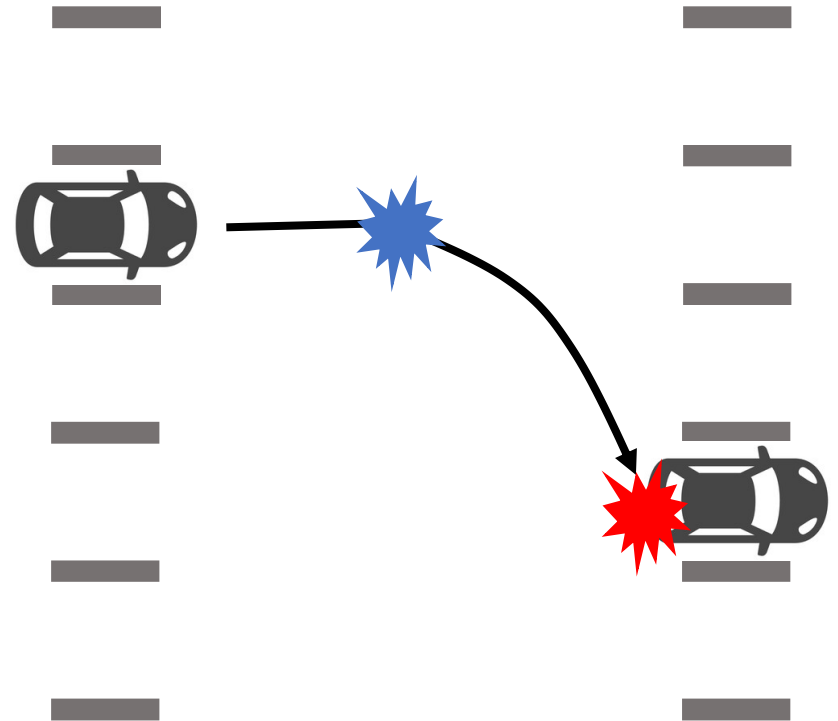
Starting from a Parked Position (2)

- Description of accident
 - When the driver started off by moving forward from a parking lot in a housing complex site, his/her car hit other parked cars and subsequently stepped on the wrong pedal.



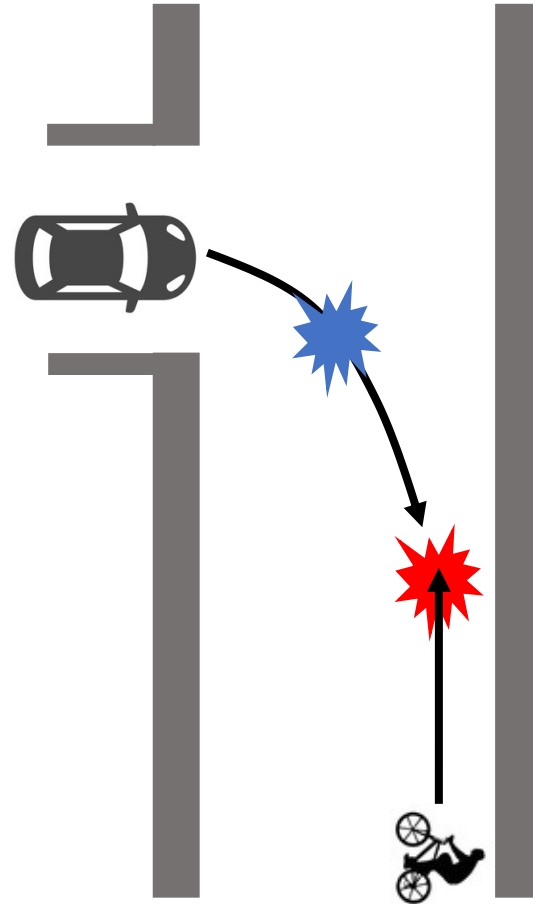
Starting from a Parked Position (3)

- Description of accident
 - When the driver tried to slow down after starting off, he/she thought that he/she had moved his/her foot from the accelerator to the brake pedal and subsequently stepped on the accelerator pedal.
 - After the car ran away, the driver could not do anything, as he/she was shaken up.



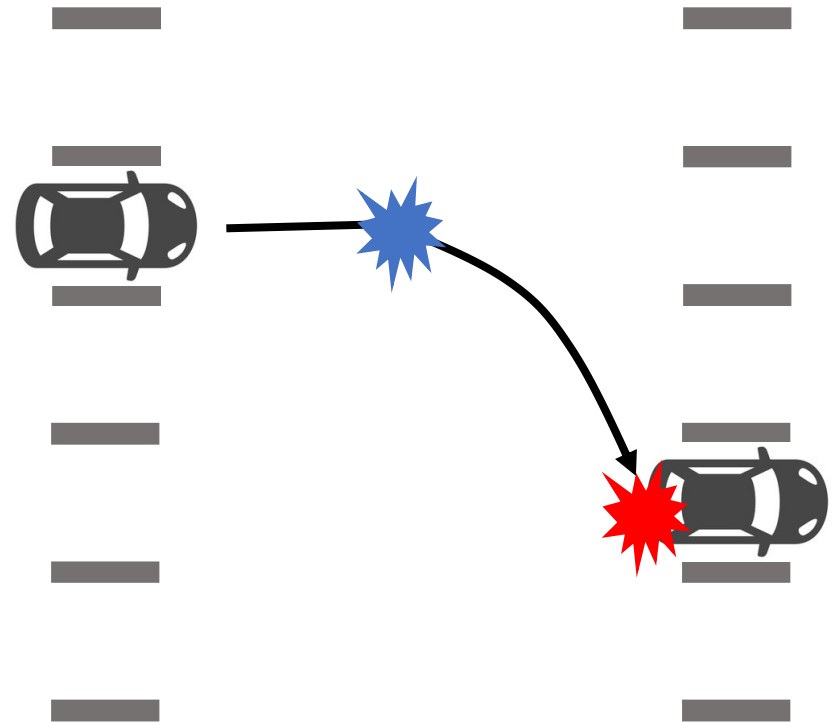
Starting from a Parked Position (4)

- Description of accident
 - The driver noticed a bicycler approaching from the forward direction when he/she started off toward the right.
 - The driver tried to apply the brakes but stepped on the wrong pedal.



Starting from a Parked Position (5)

- Description of accident
 - The driver started off by turning the steering wheel to the right in leaving the parking lot, and when he/she tried to apply the brakes, his/her foot slipped and stepped on the accelerator.



Summary:

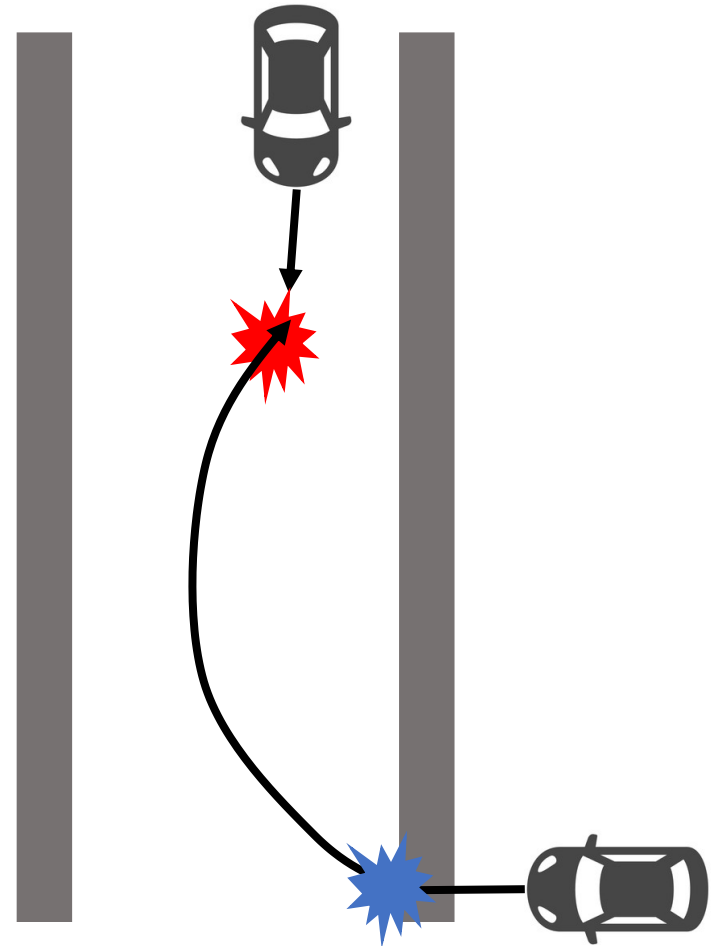
Starting from a Parked Position

What triggers pedal misapplication:

- When starting off, the driver's car moved in an **unexpected** way.
 - Direction of the tires
 - Level of acceleration corresponding to the accelerator operation
- A **sudden change** occurred at the time the driver started the car.
 - An approaching bicycle
- While accelerating and decelerating, the driver **misidentified the position of his/her foot**.
- The driver was **shaken up** as a result of a minor collision accident.
- The driver's **foot slipped** during a pedal operation.

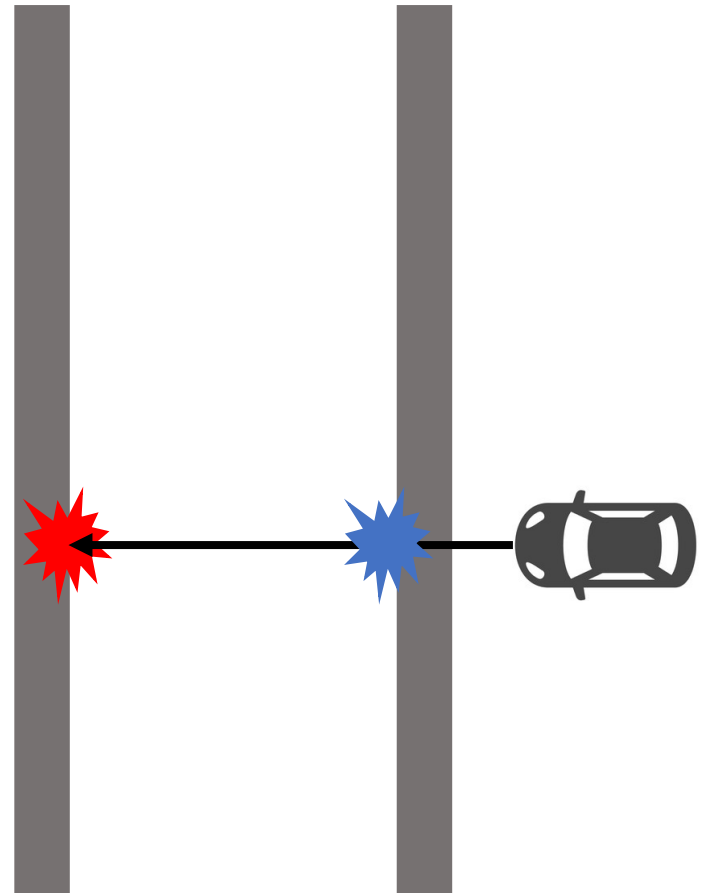
Moving on to the Roadway from a Parking Lot (1)

- Description of accident
 - Due to the difference in level between the road and the sidewalk, the steering wheel turned to the right, causing the driver to panic and step on the wrong pedal.
 - The driver's car collided with a car coming from the right side.



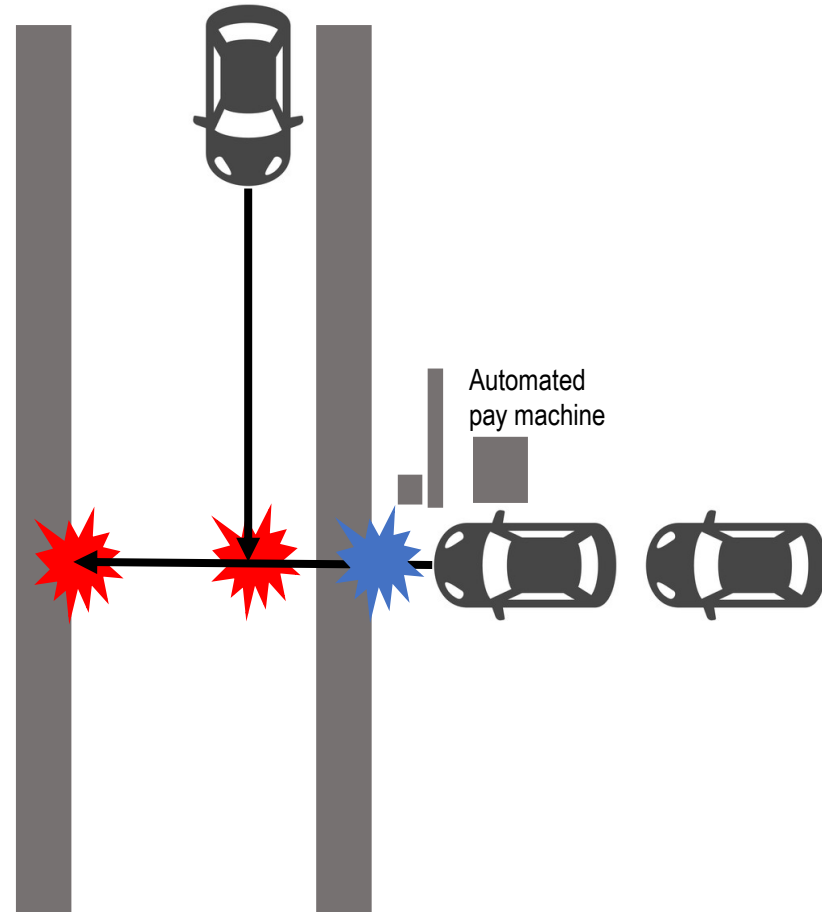
Moving on to the Roadway from a Parking Lot (2)

- Description of accident
 - The driver drove toward the roadway while stepping on the brake pedal, but due to the difference in level between the road and the sidewalk, his/her foot slipped and stepped on the accelerator pedal.
 - The car ran into a concrete-block wall across the street.



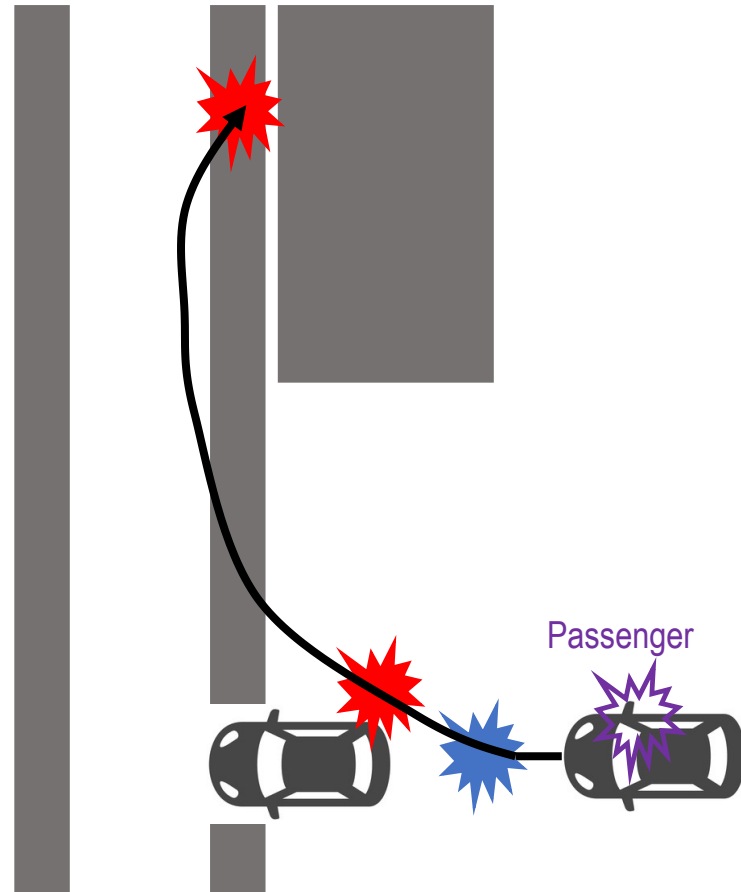
Moving on to the Roadway from a Parking Lot (3)

- Description of accident
 - The driver inadvertently switched pedals when he/she inserted the parking ticket into the automated pay machine.
 - The driver had difficulty trying to shift gears at the automated pay machine.
 - The driver panicked because there was a car waiting behind his/her car.



Moving on to the Roadway from a Parking Lot (4)

- Description of accident
 - Looking at the front after looking at the passenger to confirm whether the passenger fastened his/her seat belt, the driver noticed a car stopped in front of his/her car, so the driver tried to stop but stepped on the wrong pedal.



Summary:

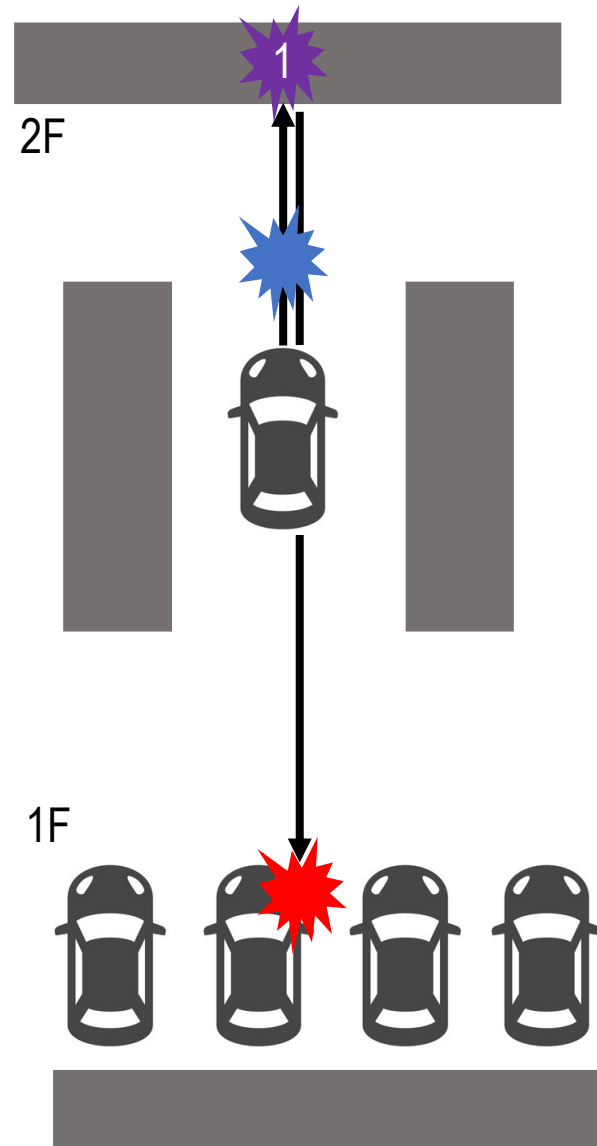
Moving on to the Roadway from a Parking Lot

What triggers pedal misapplication:

- Hitting the curb on the road / Driving over the ramp
 - Surprise, impatience
 - Impact on driving operation such as losing control of the steering wheel
- Distraction due to what made the driver feel uneasy such as the passenger's behavior
- Operation of the automated payment machine at the parking lot exit
 - Impatience and haste when there are cars waiting behind the driver's car
- Failure to respond properly to other cars in front of the driver's car

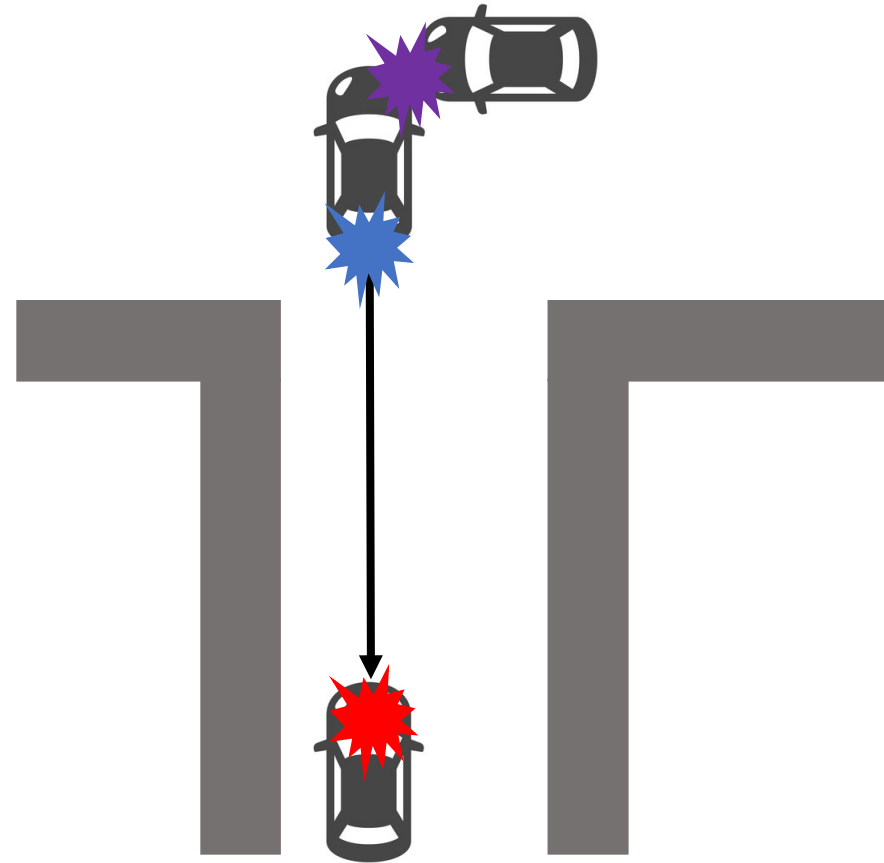
Gear Operation Error (1)

- Description of accident
 - When trying to slow down after accelerating to go to the second floor, the driver stepped on the wrong pedal and crashed into a wall. Then, while feeling impatient, the driver shifted the gear in reverse, accelerated abruptly, and ran into cars, etc. behind the driver's car.



Gear Operation Error (2)

- Description of accident
 - The driver panicked upon causing an accident, shifted the gear into reverse from the drive position, stepped on the wrong pedal, and started off abruptly.



Summary:

Gear Operation Errors

- There are cases where pedal misapplication causes an accident and cases where pedal misapplication occurs as a result of an accident.
 - Drivers become startled due to pedal misapplication, inadvertently shift gears into reverse, and start off abruptly.
 - Drivers inadvertently shift gears into reverse and start off abruptly.
- In some cases, drivers shift gears into a position contrary to their intention, resulting in an accident with their cars moving in unexpected directions.

Car Moves When Getting Off

- Description of accident
 - When the driver got off the car after parking on the sidewalk, the car took off and hit pedestrians.
 - Trying to stop a car that took off by itself, the driver stepped on the wrong pedal, and the car ran into a traffic signal pole installed on the sidewalk across the street.
 - When the driver got off his car in trying to caution another driver with whom he/she got in a dispute, the car started moving backwards, and when the driver rushed to get back to the car, he/she stepped on the wrong pedal, causing the car to run away.

Unintentional Starting from a Parked Position

- Description of accident
 - When the driver twisted his/her body and braced his/her right foot trying to get a bag from the back seat while stopped, his/her foot slipped and stepped on the accelerator.
 - As the driver searched inside his/her bag while stopped, the brake slacked off, and although the driver immediately realized that, he/she stepped on the wrong pedal.
 - While waiting at a traffic light, the driver panicked and stepped on the wrong pedal when he/she was notified by the driver of a car passing by on the left side that the former's gas tank cap was open.

Summary:

Car Moves When Getting Off / Unintentional Starting

- If there is something inside or outside the car that distracts the driver's attention, there are cases where the driver may apply the brakes insufficiently and the car may move in unintended ways.
- When a car moves in unintended ways, it can surprise the driver or cause him/her to panic, thus inducing pedal misapplication.

Factors Leading to Pedal Misapplication (1)

- The driver steps on the wrong pedal as he/she repeatedly accelerates and slows down while driving.
 - The driver perceives the state/position of his/her foot erroneously.
 - As a result of having something in mind, etc., the driver is distracted from his/her driving.
 - Even under the same driving conditions, the driver's foot may be in a different state/position.
 - Which pedal the foot is resting on
 - Whether the driver is stepping on the pedal, or just has his/her foot resting on the pedal

To prevent pedal misapplication

- If, in particular, the driver intends to slow down when there is a car in front that is slowing down or stopping, the driver should pay attention to the pedal and the position of his/her foot.

Factors Leading to Pedal Misapplication (2)

- When a car is moving in unexpected ways, or if there emerges a dangerous situation as a result of that, it causes a feeling of “surprise,” “panic,” or “impatience” in the driver.
 - Coming into contact with a curb or wall, or driving over a ramp can cause the driver to lose control of the steering wheel.
 - By responding to what the driver feels uneasy about or by being inattentive, the car moves in unexpected ways.

To prevent pedal misapplication

- Concentrate on driving so that the car does not move in unexpected ways.
- Avoid sudden acceleration or operations that can cause a car to move in unexpected ways.

Factors Leading to Pedal Misapplication (3)

- When other cars, bicycles, or pedestrians appear unexpectedly and it becomes necessary for the driver to respond quickly, it can cause “surprise,” “panic,” or “impatience.”
 - A pedestrian appears while the driver is moving within a parking lot.
 - While turning right or left at an intersection, the driver recognizes a bicycle, etc. in front of his/her car.

To prevent pedal misapplication

- Be sure to be able to predict danger with certainty.

Factors Leading to Pedal Misapplication (4)

- In situations where there are many things to pay attention to, it is difficult to focus attention on pedal operations.
 - When moving around within a parking lot looking for a parking space, there are many things for the driver to watch out for while driving such as the direction he/she is moving, other cars and pedestrians, and open parking spaces.
 - It is necessary for the driver to frequently perform steering wheel and pedal operations.

To prevent pedal misapplication

- Drive at sufficiently slow speeds. Stop temporarily depending on circumstances.
- Stop talking, etc. with passengers, and stay focused on driving.

Factors Leading to Pedal Misapplication (5)

- The foot slips from the brake pedal and depresses the accelerator pedal.
 - The expression “the foot slips” is frequently seen.
 - The fact that “the foot slips” indicates that there is a problem with the driver’s driving position or how the driver steps on the pedals.

To prevent pedal misapplication

- The driver should check how he/she is stepping on the pedals
- The driver should adjust the seat position appropriately so that he/she can step on the pedals accurately.
- The driver should drive with the correct driving position. It is particularly important in a situation requiring frequent switching between pedals.

Factors Leading to Pedal Misapplication (6)

- Carelessness causes pedal misapplication.
 - Distraction, thinking about something, and being absentminded are factors that lead to pedal misapplication.
 - There are two processes as follows.
 - Carelessness → oversight / delayed recognition → panic → pedal misapplication
 - Carelessness → erroneous pedal operation → pedal misapplication

To prevent pedal misapplication

- In situations requiring frequent steering wheel and pedal operations, the driver should concentrate on driving and avoid becoming careless.

Issues Related to Elderly Drivers (1)

- Why does pedal misapplication occur frequently among elderly drivers?

(1) Deterioration of alertness function

- Age-related decline in attention and cognition
 - Spatial range of attention becomes narrower
 - Range of storing information becomes narrower
- Oversight increases; unexpected situations and subjects increase
- Due to delayed recognition, cases of “surprise” increase
- Pedal misapplication occurs as a result of impulsive reactions

Issues Related to Elderly Drivers (2)

- Why does pedal misapplication occur frequently among elderly drivers?

(2) Age-related decline in behavioral control functions

- Failing to perform actions in the correct order, skipping steps on the way, and performing incomplete actions impulsively increase.

→ Reactions occur in which the driver needs to “step on a pedal after switching pedals,” but he/she skips switching pedals and steps on the wrong pedal immediately.

→ Even when the driver realizes that he/she has stepped on the wrong pedal, the driver is unable to immediately perform the corrective action of “releasing the depressed pedal.”