Assessment of Socioeconomic Impacts of Automated Driving

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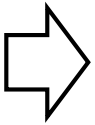
Outline of automated vehicle diffusion simulation

Overall picture of the research project titled “Socioeconomic Impacts of Automated Driving on Reducing Traffic Accidents and on Others” conducted by The University of Tokyo and Doshisha University

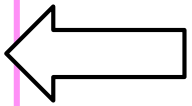
Relevance of automated driving to SDGs

Diffusion simulation



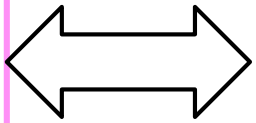
Socio-Economic Impact Analysis

- Impact on road traffic
- Impact on transportation services
- Impact on industry and society



Advice

Advisory committee



International cooperation

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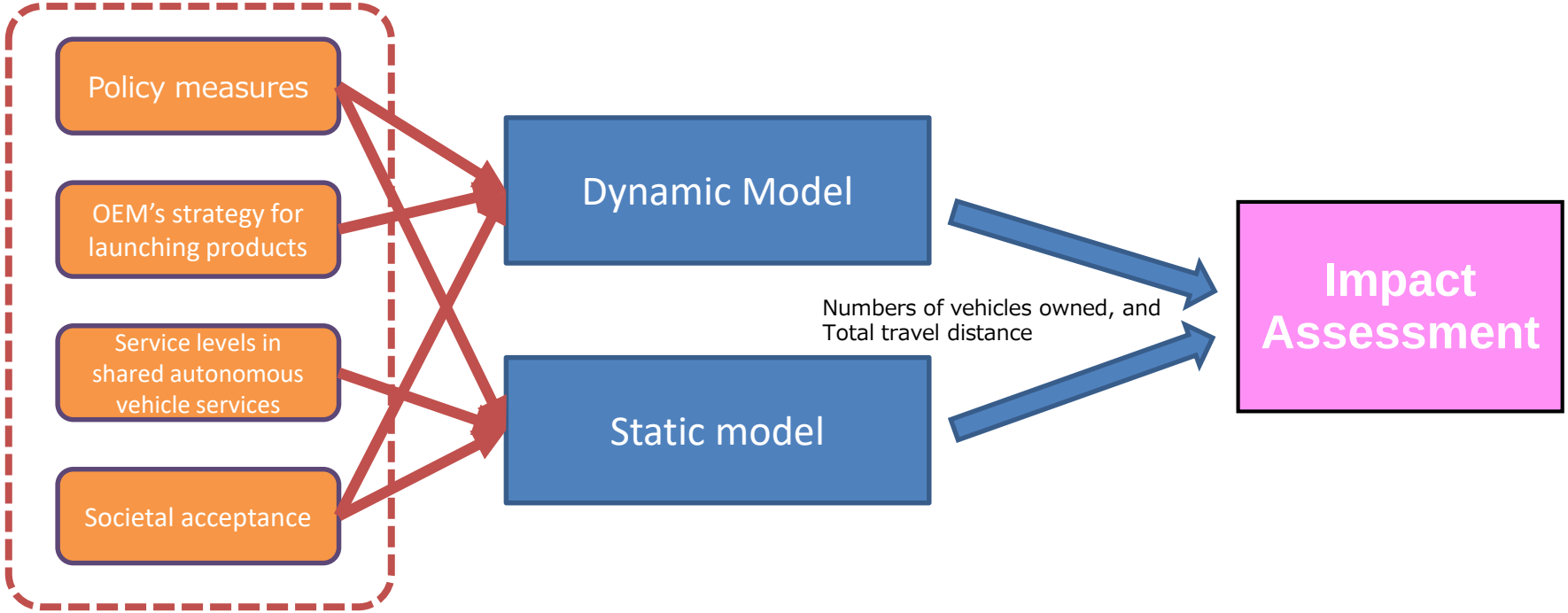
Two types of diffusion simulation

- To establish two types of diffusion simulation models of automated vehicles to use the simulation results as common data for various impact assessments in this project.
- Dynamic model : To simulate the diffusion of automated vehicles up to SAE Level 4.
- Static model : To simulate the diffusion of AD vehicles assuming a situation where driverless automated vehicles are realized.

Objectives of simulation



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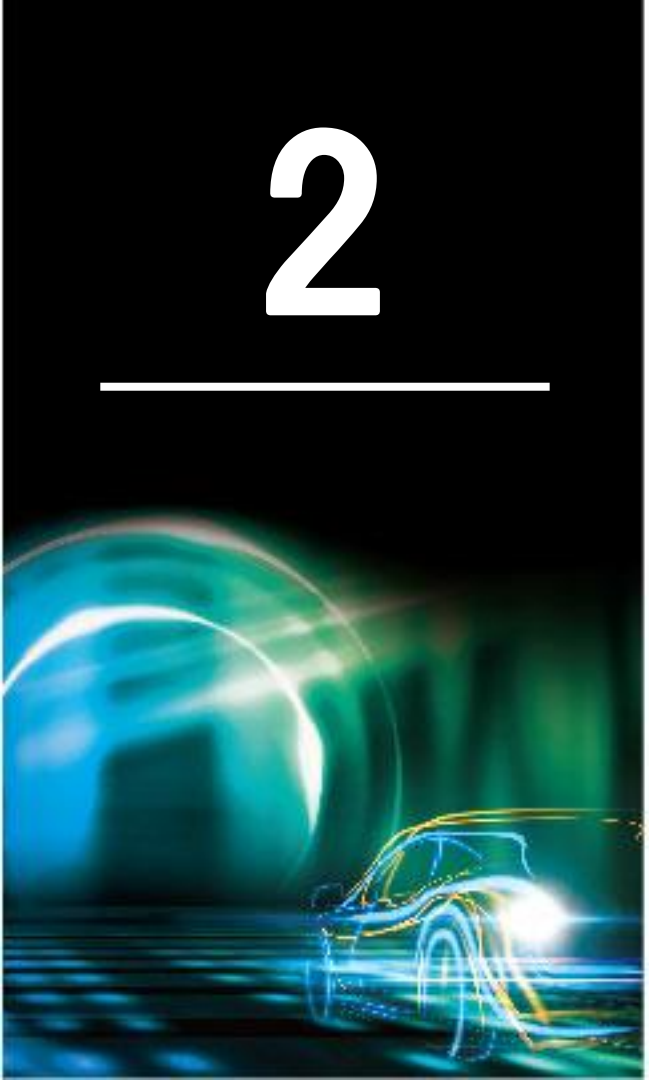

Dynamic model

Categories of self-driving vehicle

Category	Highways	General roads	Compatible technologies
C0	SAE Lv. 1 or less	SAE Lv. 1 or less	Level under C1.
C1	SAE Lv. 1 Driver assistance	SAE Lv. 1	Equipped with all the following four devices: ・Collision-damage-reducing brakes, ・Acceleration limiters for accidental accelerations (due to driver error), ・Lane-departure warning system, and ・Car distance warning system.
C2	SAE Lv. 2 Partial automation	SAE Lv. 1	In addition to C1: ・On highways, lane keeping systems (LKAS) + adaptive cruise control (ACC), and ・Automatic lane changing on highway
C3	SAE Lv. 3 Conditional automation	SAE Lv. 2	In addition to C2: ・Lv. 3 on highways, and ・Lv. 2 on general roads
C4	SAE Lv. 4 High automation	SAE Lv. 3 on major arteries and thoroughfares	In addition to C3: ・Lv. 4 on highways, ・Lv. 3 on major general roads, and ・On general roads, take-over requests (TORs) for driving operations will be issued in response to system demand
C5	SAE Lv. 4 High automation	SAE Lv. 4 on major arteries and thoroughfares	In addition to C4: ・Lv. 4 on major general roads, and ・Take-over requests (TORs) will not be issued

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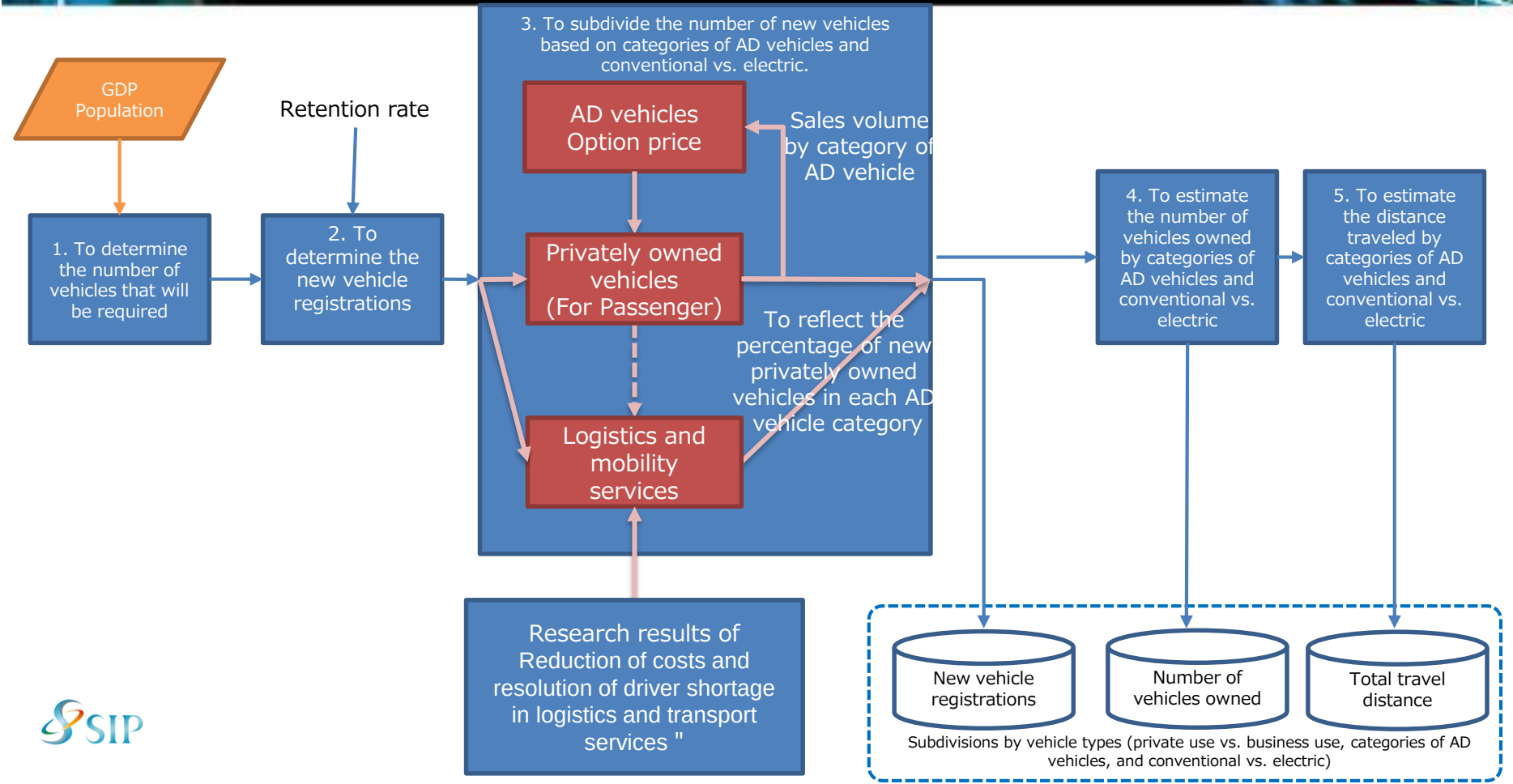
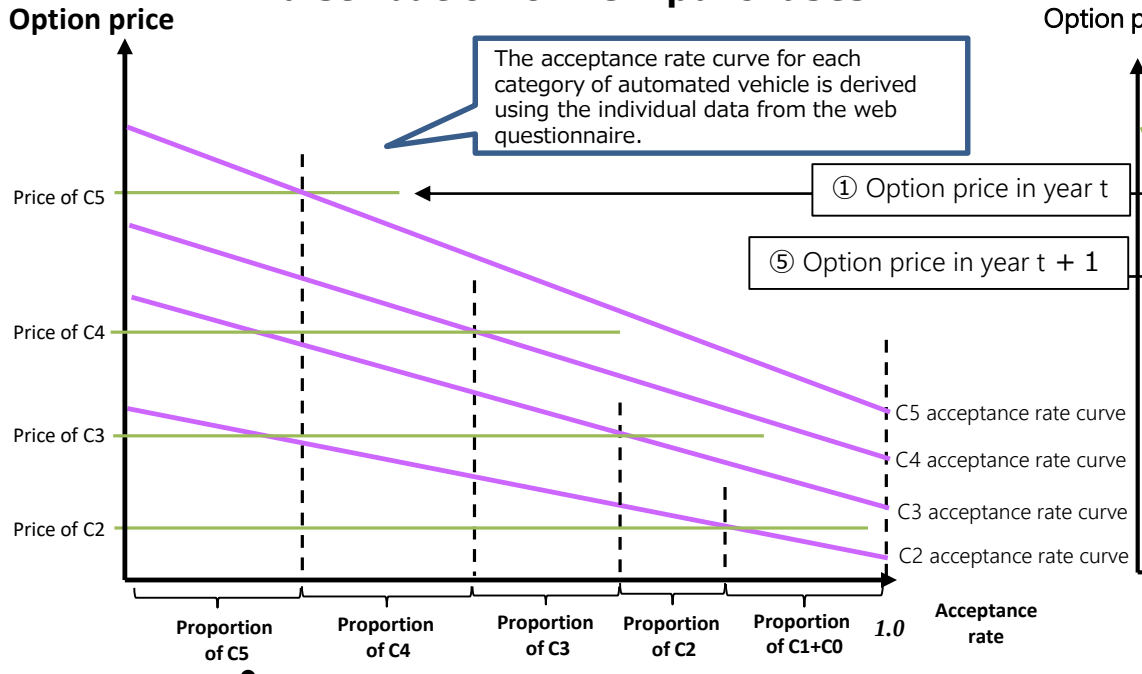
Overall picture



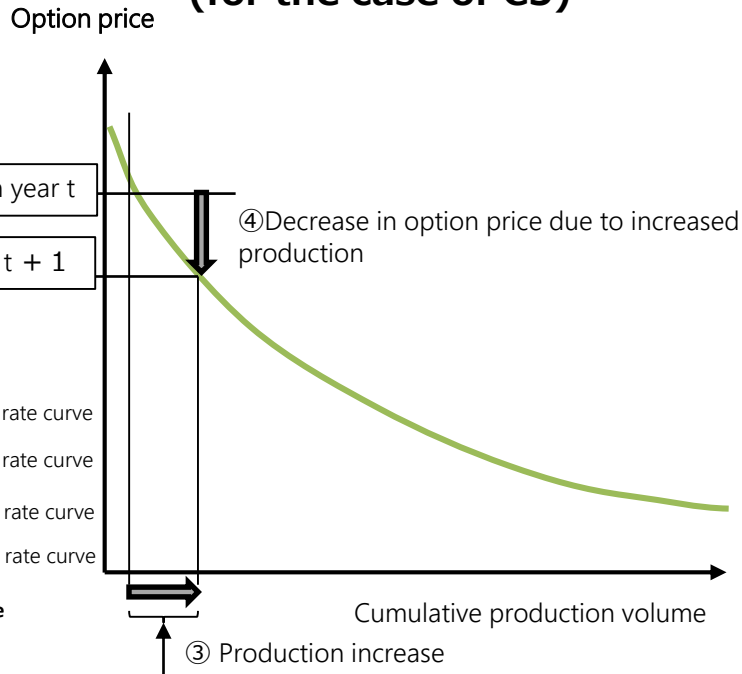
Distribution of AD vehicle categories among new privately owned passenger cars

Method for determining category distribution of new purchases



②Determination of category distribution of new-vehicle purchases:
Among automated vehicle categories for which prices lie at or below the price a consumers is willing to pay, the highest-ranking automated vehicle category is assumed to be purchased.

Determination of option price (for the case of C5)



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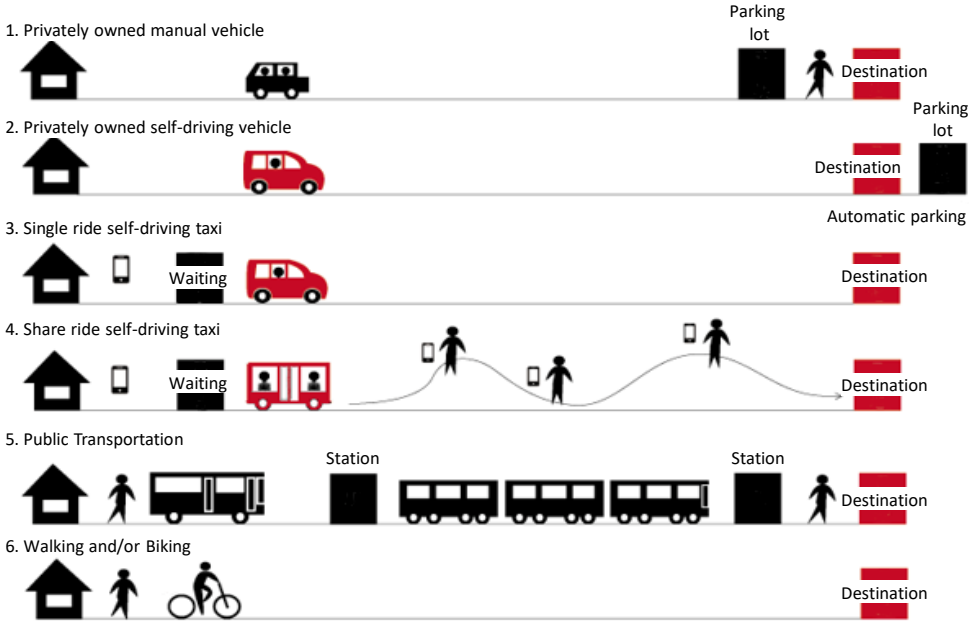
Static model

Purpose of the modelling

- To estimate how car ownership and usage will be in a society where driverless automated are implemented.
- Six types of transportation modes are assumed to be available to consumer, assuming that car-sharing/ride-sharing by driverless automated taxies is possible,



Analyses

To estimate how the followings will change depending on the price of automated vehicles, the level of service of and usage fees for self-driving taxies, and consumers' expectations for using automated vehicles

- Consumers' transportation mode choice,
- Ownership and travel distance of private passenger cars and self-driving taxies.

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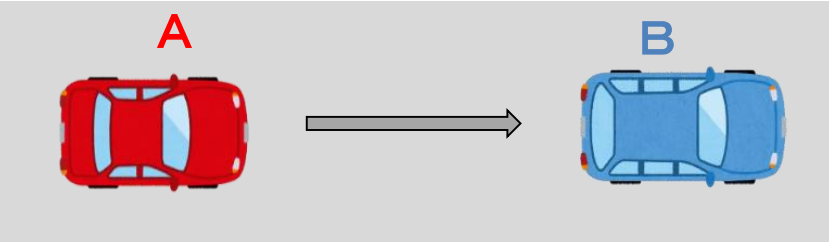
Effectiveness at Reducing Traffic Accidents

Economic feature of automated driving systems

Vehicle A is about to collide with vehicle B running ahead



Note: Vehicle illustrations were downloaded from irasutoya.com

Air bag system in vehicle A protects the driver in vehicle A.

AEB in vehicle A protects the drivers in both vehicle A and vehicle B

Web-survey regarding perpetrator's non-monetary losses

Two types of web-survey are conducted : survey for virtual perpetrators and one for virtual victims.

Survey for virtual perpetrators : To evaluate the willingness to pay (WTP) of annual usage fee for the device that reduces the probability of causing accident where a driver of other party is killed in an accident between 4-wheel vehicles, by 50 % (90%) under the following assumptions:

1) Probability of causing fatal accident between 4-wheel vehicles in a year is a 1/200,000,
2) Percentage of fault of respondents is 100%.

Survey for virtual victims : To evaluate the willingness to pay (WTP) for the annual usage fee of the device that reduces the probability of encountering accident between 4-wheel vehicles where each respondent is killed, by 50 % (90%) under the following assumptions:

1)Probability of encountering fatal accident between 4-wheel vehicles in a year is a 1/200,000,
2)Percentage of fault of respondents is 0%.

Thank you