

A Society Coexisting with Autonomous Vehicles: Comprehensive Recommendations for Building the Foundation Project 2402C PL: Takeyoshi Imai

April 11, 2025 Research and Study Report Meeting









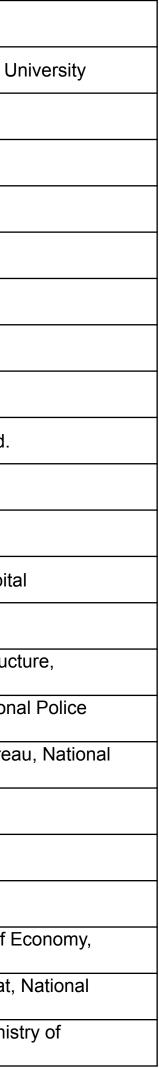
公益財団法人 国際交通安全学会 International Association of Traffic and Safety Sciences

(Titles omitted)

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Project Members







Activity Review of the 3-Year Project

2022: Project Initiation = Basic Studies Based on Japanese-German Road Traffic Law Amendments

Deliberations with observers from the National Police Agency's planning team

International Symposium

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 \rightarrow UKLC Chief(drafter of the UK AV Act) (AV = automated vehicle) \rightarrow UK Barrister(insurance systems, etc.) \rightarrow Der deutsche Richter (international criminal law)

- Understanding and review of the 2022 amended Road Traffic Act (enforced in 2023)







Activity Review of the 3-Year Project

2023: Accelerated Research = Specific Studies in Areas Expected to Utilize AVs

Medical:

Discussions and reviews on the potential use of AVs in emergency medical care at Nippon Medical University (Chiba Hokusoh Hospital)

Tourism:

Exchanges of opinions with officials from the Hokkaido Prefectural Government (ongoing)

UK survey: Hearing future issues from UKLC(drafter of UK AV ACT), and observing the operational status of autonomous driving buses Discussions on the coexistence of autonomous vehicles with bicycles and other traffic participants. (Supported by London Uni. Associate Professor Fujiyama)



Dilemma Issues:

Full-scale exchanges of opinions with legal philosophers. Deepened discussions based on insights from psychology, etc

Preparation of International symposium 2024



I Activity Review of the 3-Year Project

2024: Research Deepening and Compilation = With a View to International

Analysis of AV-related accidents

Eiheiji

 \rightarrow Contact accident with a bicycle \rightarrow Ambiguity in the authority and obligations of the Specified Autonomous Operation Manager (remote monitor)? \rightarrow AV boarding/alighting locations not recognized as ODD \rightarrow What is the significance of a Driverless car?

Confirmation of the need for

traffic recovery by AVs when

public transportation is

disrupted by natural

disasters

Agriculture and tourism sector

Visit to Yamagata, Professional University of Automotive Engineering

International Symposium

Meta-analysis of desirable rule(making) from the perspective of legal philosophy (Professor Emeritus Hasegawa, Hokkaido University)

Analysis based on German, British, and American crim law and legal philosophy (ProfDrWeigend, University

Cologne)

The nature of criminal liability in the event of an accident

Understanding of negligence (continued discussions with authorities, confirming viewpoints amid many off-point views)

Guideline creation

Created in English and Japanese, based on discussions at the international symposium

Dilemma issues (proposals from one-sided ethics and philosophy are worse than useless)

Compilation of 3 years of re

Evnansion							
★ Keihan Bus (Otsu) →Is it a problem unique to AVs? Are there particular problems that also occur with regular TV?	ssenger (P) side \swarrow Tokyo Para \rightarrow Is the accident investigation and reporting the second s	rt appropriate? Consi					
Agriculture sector	Relationship between other traffic participants and autonomous vehicles						
Initiatives by the Ministry of Agriculture, Forestry and Fisheries Division of duties (valuable practical example) with a view to liability sharing in the event of an accident	bicycles, etc abou	Imabari Internationa Symposium → Raising is about dilemmas → Discus in workshops (with engine researchers, etc)					
	ed on Swiss and EU criminal law and aw (ProfDr Gless, University of Basel)	nal Discourse (Rela [.]					
Sided y are (selection and analysis of parameters as a prerequisite for discussing criminal liability, especially negligence)	Problems with Level 3 (insufficient (should D	common to Levels be recognized outs ven though there is i inside?)					
pilation of 3 years of research \rightarrow Deployment within Japan (regions undergoing Level 4 demonstration experiments)							
Relationship with agriculture and tourism Candidate sites → Hokkaido, Osaka (Expo)	Medical sector \rightarrow AV utilization in the form of assisting doctor cars \rightarrow For patrol use to assist emergency vehicles						







2-1 What Areas are Appropriate for Level 4 = Driverless Cars?



In October 2023, near the "Eiheiji Sanro-do" promenade in Eiheiji Town, an AV traveling at Level 4 came into contact with an unattended bicycle parked on the roadside Four passengers were uninjured

AV traveling at level 4, made contact with a parked bicycle, and stopped No injuries were reported

 \rightarrow If a remote monitor (RS Specified Autonomous Operation Manager, etc) recognizes a bicycle in the path, must the vehicle be stopped?

RS is obligated to monitor the operating status of the remote monitoring device itself and to perform post-accident processing based on remote monitoring (Road Traffic Act, Article 75-21, Paragraph 1)

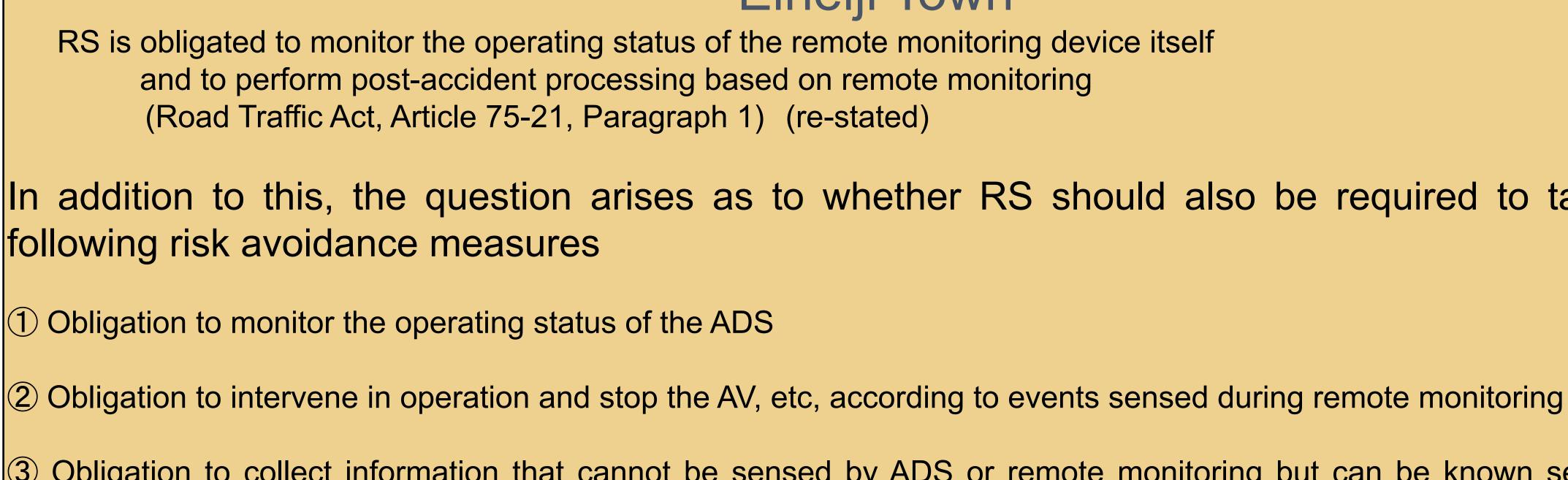
Eiheiji Town







2-1 What Areas are Appropriate for Level 4 = Driverless Cars?



Obligation to collect information that cannot be sensed by ADS or remote monitoring but can be known separately $(\mathbf{3})$ (such as the risk of a tsunami due to a distant earthquake) and stop the AV operation, etc, based on this

This is an issue that was **not discussed at the international symposium and requires further consideration**

Eiheiji Town

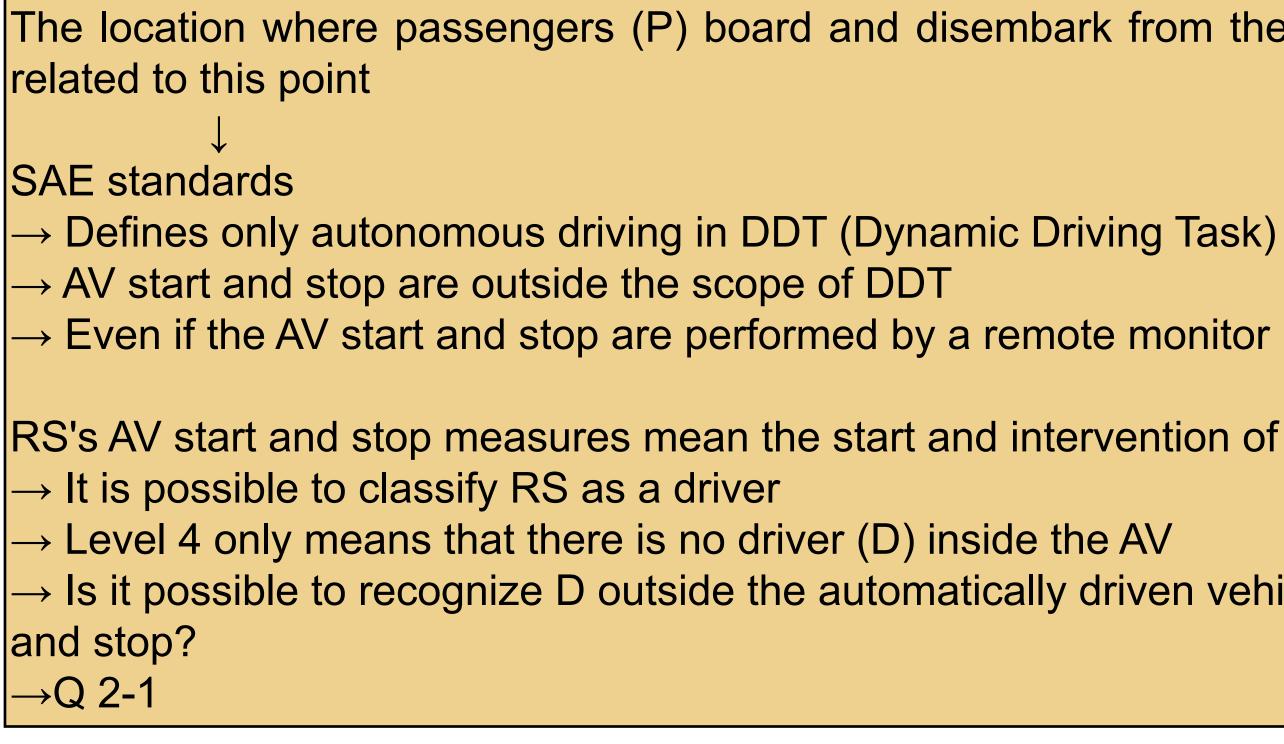
In addition to this, the question arises as to whether RS should also be required to take the







2-1 What Areas are Appropriate for Level 4 = Driverless Cars?



The location where passengers (P) board and disembark from the AV was also certified as ODD Awareness of issues

 \rightarrow Even if the AV start and stop are performed by a remote monitor (natural person RS), it is classified as Level 4

RS's AV start and stop measures mean the start and intervention of DDT and are directly related to AV behavior control

 \rightarrow Is it possible to recognize D outside the automatically driven vehicle and hold them responsible for the vehicle's start









Keihan Bus Case

Shiga Prefecture, a passenger in her 70s fell inside the vehicle and suffered minor injuries

parked in front automatically accelerated suffered minor injuries

2-2 Should AV Occupants (P) Be Protected More Than Other Traffic Participants?

- On January 11, 2023, during a demonstration experiment of an autonomous driving bus in Otsu City,
- Near a bus stop at the top of a slope, the autonomous driving bus driver manually steered to avoid a truck
- After that, the autonomous driving system determined that the obstacle in front had disappeared and
- At that time, a seated passenger fell from her waist to the floor due to the impact of the acceleration and









2-2 Should AV Occupants (P) Be Protected More Than Other Traffic Participants?

It is possible that the same type of accident could occur with traditional vehicles (TV, such as buses controlled by human drivers)

Is it reasonable to understand that "passengers (P) on autonomous driving buses naturally deserve greater safety assurance than passengers on traditional buses"?

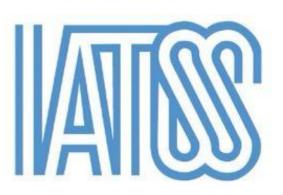
Is it not sufficient if the former can <u>ensure safety equivalent to the latter</u>?

To that extent, was it <u>not unnecessary to suspend the autonomous bus driving experiment</u>?

Protection of AV passengers (P) > Protection of TV passengers, pedestrians (PD), and those who entered the ODD? \rightarrow Q 2-2







2-2 Should AV Occupants (P) Be Protected More Than Other Traffic Participants?

states,

but there are no provisions to prioritize the protection of occupants This point must be taken into consideration.

In the above autonomous bus, passengers were not required to wear seat belts, and there were no seat belts in the first place This point also needs to be considered.

Article 2, Item 2 of the Passenger Vehicle Transportation Business Transportation Regulations

"Passenger vehicle transportation operators shall treat passengers or the public fairly and courteously"



2-3 Is the Risk-Taking of Traffic Participants (SH) and Their Involvement in Accidents Considered in **Accident Cause Analysis?**

Tokyo Olympic/Paralympic Incident

August 26, 2021, at the athletes' village in Harumi, Tokyo An autonomous vehicle "e-Palette" (Level 2) provided by Toyota was traveling at low speed (approx 5-6 km/h) within the village when it came into contact with a visually impaired judo athlete (Paralympic athlete) At that time, the vehicle was running in AUTO mode (the system controlled vertical and horizontal movements, but as it was Level 2, operation by a driver with "GO" or "SLOW DOWN" was assumed) An operator (guide) tried to stop the victim's approach to the crosswalk but was unsuccessful The athlete fell and suffered minor injuries

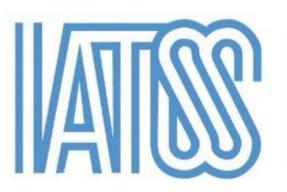
Points not analyzed in the accident investigation report

(i) To what extent did the driver and guide recognize that it was possible for the victim (visually impaired) person) to cross the crosswalk, and what preparations were made for that event? (ii) Did the guide try to stop the victim's approach to the crosswalk in an appropriate manner? (iii) Did the victim try to cross the crosswalk with awareness of the guide's attempt to stop them?



12





2-3 Is the Risk-Taking of Traffic Participants (SH) and Their Involvement in Accidents Considered in Accident Cause Analysis?

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(i)and(ii)
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→ The driver trusted the guide's arrangements and could be said to have no negligence, but this point was also not considered.

(iii)

→ Circumstances that affect the specific protection value of the victim's legal interest (physical safety)

(ii)

Guide \rightarrow Person who should perform traffic control and ensure the safe driving of AV \rightarrow The manner of fulfilling obligations arising from that role should be more carefully analyzed and confirmed.

Shouldn't the degree of danger recognition and response of each person, the driver, the guide, and the victim, be specifically examined? \rightarrow Q 2-3







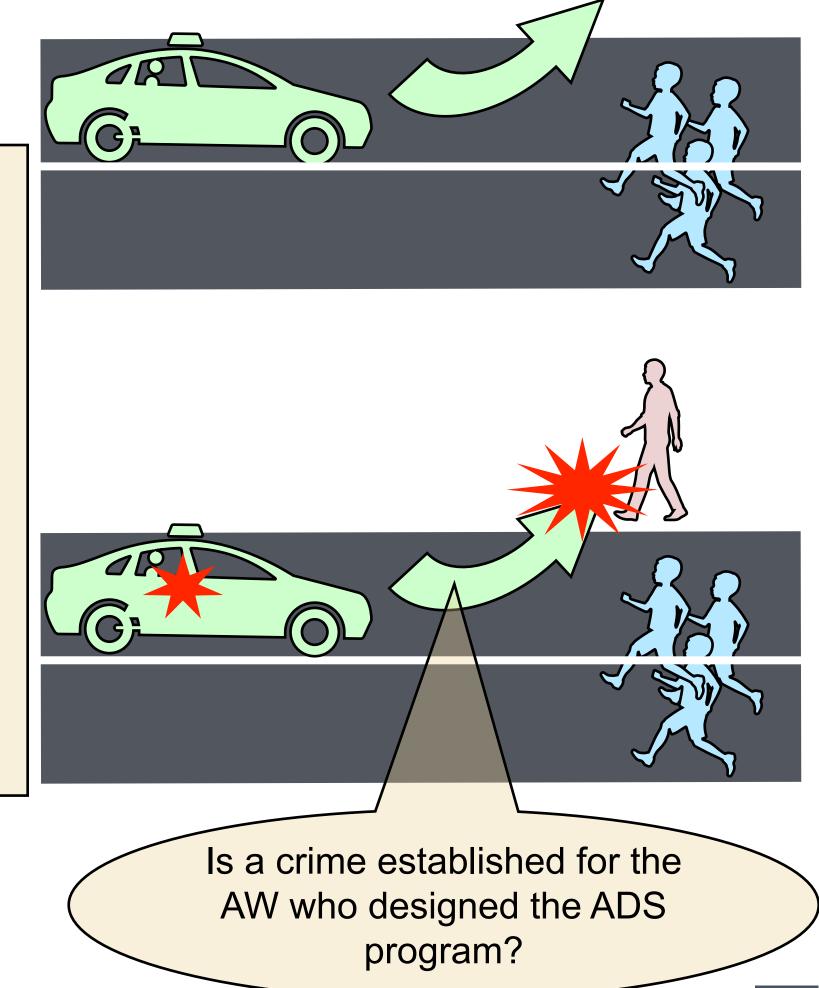


2-4 Dilemma Issues (Trolley Problem, etc)

Ex1. Autonomous Vehicle AV (traveling at Level 4 or higher)

1 Suddenly, three people, A, B, and C, ran into the public road (within the ODD) in the direction of travel Even if the brakes are applied, a collision with the three people cannot be avoided. Therefore, the autonomous driving system (ADS) changed the AV's direction of travel to the left, avoiding a collision with the three people

2 However, the AV mounted the sidewalk at the changed course, collided with a walking pedestrian PD, and killed PD. Also, the AV's occupant P suffered minor injuries from the collision between the AV and PD ③ Is a crime established for the AW who designed the ADS program (algorithm)?







2-4 Dilemma Issues (Trolley Problem, etc)

Opinion 1 AW is guilty of murder, or at least professional negligence resulting in death

(Reason)

- a "tool" and violates "individual dignity"
- established) that someone equivalent to PD would die when creating the program. obligation.
- AW must not create a program that changes direction to the left AW (and AV occupant P) can only leave the AV's travel result to chance

• AW caused the death of PD by the action of creating a program that changed the AV's direction of travel to the left Protecting the lives of A, B, and C by the death of PD is nothing more than using PD's life as

• AW knew (murder established) or should have known (professional negligence resulting in death Although the act of causing the death of a person called PD should not occur, AW violated this







2-4 Dilemma Issues (Trolley Problem, etc)

Criticism 1 Opinion 1 only stops at one interpretation from Kant's deontology

symposium \rightarrow Q 2-4

This understanding leads to consequentialism, with act utilitarianism as an example

This idea is a powerful argument even in Germany, where there are many believers in deontology \rightarrow Confirmed at the international symposium

• Even from Kant's deontology, it is possible to adopt an interpretation that taking measures to rescue more lives complies with the obligation of individual dignity \rightarrow Confirmed this understanding at the international







2-4 Dilemma Issues (Trolley Problem, etc)

Opinion 2 consequentialism in the form of rule utilitarianism (the claim of the author of the paper published in IATSS Review Vol. 48.No.2 p.61)

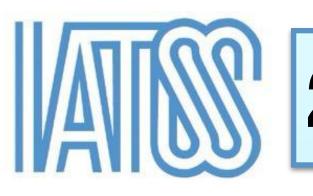
protected is lower than PD on the sidewalk

the international symposium \rightarrow Q 2-4

- An opinion that confirms the viewpoint of Criticism 1 and attempts to adjust deontology and
 - Originally, rule utilitarianism is a form of deontology and is incompatible with act utilitarianism
- From the viewpoint of emphasizing individual dignity, considering the degree of individual risk-taking, the degree to which those who have taken more risks (each person A, B, C who entered the ODD) should be
- There is room to modify the understanding that allows AW's actions based on A, B, C > PD (simple comparison of the number of lives) (so-called simple act utilitarianism) \rightarrow Confirmed this understanding at







2-4 Dilemma Issues (Trolley Problem, etc)

Ex 2 Change part 2 of Ex 1 as follows (2)-2 However, the AV mounted the sidewalk at the changed course, collided with a walking pedestrian PD, and PD suffered severe injuries AV occupant P also suffered severe injuries equivalent to PD from the collision between the AV and PD \rightarrow The conclusion is the same as Ex 1 As a premise, the protection value of PD and P is the same On the other hand, regarding the protection value of the interests of life and body, there is also an argument that P > A, B, C, PD, and that illegal nature is precluded even if other people's interests are violated to protect P Is there any basis for preferentially protecting P's interests? → Confirmed this understanding at the international symposium \rightarrow Q 2-5









Q2-1 to Q2-5 were discussed with internationally renowned legal scholars and philosophers of law. Reporting of the conclusions was confirmed

Invited Speakers

Prof.Dr.Weigend (University of Cologne) Prof.Dr.Gless (University of Basel) Prof.Dr.Hasegawa (Hokkaido University)

3 International Symposium Discussion Results Reflected in Guidelines







3 International Symposium Discussion Results Reflected in Guidelines

- Q Answers to the questions
- 2-1 It is possible to recognize D outside the AV Issues for futu

Prioritized protection of AV passengers (P) cannot be exp

- 2-2 for preferential protection of P in the German Ethics Com motives?
- 2-3 In situations where damage is expected, it is necessary to of each traffic participant

Individual dignity \rightarrow Should choose a means to rescue m be made taking into account that the degree to which indiwith risk taking (jumping into the readway, etc)

²⁻⁴ with risk-taking (jumping into the roadway, etc)
 In Ex1 of 2-4, the idea of not controlling the AV traveling t
 travel as it is, leaving the result to chance, violates individ criticism of this idea even in Germany

2-5 Same as A2-2 There are also criticisms that this is a clain

	Guideline
ure study	Additional Future Targe
plained legally or normatively Is the claim nmittee's rules, etc, due to profit-seeking	Introduction point 3, embodiment point 8
to measure the specific protection value	Introduction points 5 ar embodiment points 8 to
nore lives However, comparisons must dividual lives are protected decreases towards three people and allowing it to dual dignity. There is a fundamental	Introduction points 1, 2, 9, embodiment points 1, 2, 10
m to improve AV sales	Introduction point 3, embodiment point 8









Perspective

>Premised on the existence of diverse values regarding ethics, morality, and the use of autonomous vehicles, we aim to achieve a better transportation society by attempting to balance and coordinate them, thereby increasing the social acceptance of autonomous vehicles

>Even private guidelines, if considered by diverse stakeholders and if the content is appropriate, have binding force similar to legal norms

>Given the high interest in the legal responsibility, especially the criminal responsibility, of traffic participants when an accident involving AVs occurs, and the current situation where responsibility analysis is ambiguous, normative, and interpretations are mere imitations of foreign law, we present objective and scientific indicators of responsibility sharing

4 Outline of Guidelines







Extraction of Specific Proposals

(Introduction points 5, 6) Utility by AV use > Loss by AV use

Consider maximizing utility with a risk-based approach

At that time, what factors (parameters) to consider is an important issue

the characteristics of the area where the user resides, etc

- After creating a general utility function, specify the function based on the necessity of AV use,









Extraction of Specific Proposals

(2) (Embodiment point 2)

Lives to be rescued (TPL) > Lives that had to be violated (TVL) (TPL: to be protected life, TVL: to be violated life)

is precluded)

cases in the future

- Emergency evacuation (rescue of larger interests > loss of smaller interests \rightarrow illegality of acts
- Japan has few reference judicial precedents \rightarrow It is necessary to analyze similar overseas







Extraction of Specific Proposals

(3) (Embodiment points 1, 2, 5)

such that

Lives to be rescued (TPL) < Lives that had to be violated (TVL) program In other words, AW's actions are illegal.

whether intent or negligence can be recognized, is a separate issue.

view that has not undergone sufficient philosophical consideration

- If, when encountering a dilemma problem represented by the trolley problem, the AV operates
- Emergency evacuation does not apply to AW or manufacturer's personnel who created such a
- However, whether to recognize criminal responsibility for AW and other related parties, or
- Furthermore, the understanding that "it is the correct attitude derived from deontology and individual dignity that the parties concerned do not respond to this situation, expecting it is a







Extraction of Specific Proposals

(Embodiment point 6)

The recognition of intent and negligence ultimately depends on the evidentiary relationship of individual cases, but the following viewpoints are important

(5) (Embodiment point 6)

There are many processes in the manufacture and sale of AVs, and in each stage, the "on-site" person in charge manages the manufacturing results

(Example) AW creates a program \rightarrow ADS including the program is manufactured and the sales company installs it on the vehicle \rightarrow AV productization \rightarrow Sold at individual retail stores \rightarrow After-sale warranty \rightarrow Response at the time of an accident

In each process, it is necessary to make full use of the abilities and experience of the person in charge (ultimately the business operator) and to take all possible measures to prevent the occurrence of accidents involving Avs. The Ministry of Agriculture, Forestry and Fisheries requests user education from manufacturers when using automated agricultural machinery and confirms the content It is thought that administrative bodies, manufacturers, and users can work together to understand the characteristics of automated vehicles (agricultural machinery) and use them, which will increase the probability of accident prevention This initiative should be referred to greatly when using other automated vehicles



25



Contact with a third party who has entered the field



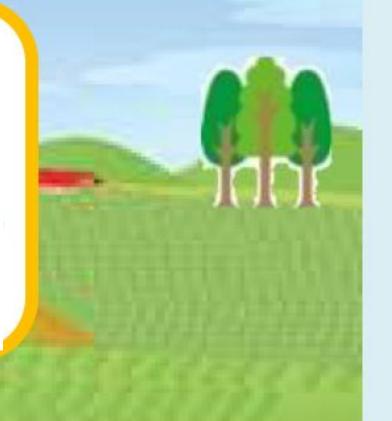
entered the field

Field and surrounding sightseeing checks



Contact with a third party who has Contact with a third party due to deviation from the field

- ✓ Is there a low possibility of third-party intrusion?
 - Are there any obstacles in the field? Is monitoring possible?
- \checkmark Are the field conditions suitable for safe driving?





26



Extraction of Specific Proposals

(6) (Supplement to Embodiment point 6)

must also use them to invest resources to reduce the probability of accidents negligence is (theoretically) denied

- At that time, ISO may be referred to, but exemption is not granted for complying with ISO. If a business operator has abilities and experience that exceed those assumed by ISO, they In the event of an accident with a product (AV) that has been marketed with such care,
- ISO is not the primary standard for determining the duty of care for AV manufacturing of the defendant (business operator) in a criminal trial (it is only an indirect indicator)









Extraction of Specific Proposals

(7) (Embodiment point 6)

- The concept of CCD (Competent and careful driver) can only be an indirect indicator
- 8 (Embodiment point 9 The embodiment is described later in 5) AVs will likely have high adaptability to agriculture At that time, we would like to pay attention again to the fact that for (so-called robot) agricultural machinery, administrative bodies, manufacturers, and users are taking steps to understand the characteristics of each model and use them

The procedure for ensuring the safe use of robot agricultural machinery is roads) and for these guidelines

- a useful reference for ensuring the safety of autonomous vehicles (scheduled to run on public







Extraction of Specific Proposals

(9) (Embodiment points 10 and below The comparison table is described later in 5) AV = Can only run in accordance with rules created by humans (at present). TV = Human drivers may drive on a risk basis

This difference \rightarrow It is expected that seeing AVs driving in compliance with traffic laws will enhance the compliance awareness of TV Ds (drivers). In automated driving of robot taxis, etc, it is desirable to use this "external economy,"

But it cannot be denied that sudden circumstances will arise in which danger cannot be avoided by complying with traffic law

the trolley problem is required

- There, an emergency evacuation response is required, and as a premise, a thorough study of









5-1 Domestic Deployment of Guidelines

Revision of guidelines based on consultations with local governments conducting pilot projects and feedback from participants

- Future site visits (potential local governments): > Osaka (Expo)
- > Tottori (Governor's leadership)
- > Sapporo (Vice Governor's leadership)

5 Outlook







5-2 International Deployment of Guidelines

Switzerland

fundamental issues (such as whether RS is D)

accidents with lawyers from the UK and US

6 Outlook

> Continued exchange of opinions with researchers in Germany and

- > Discuss current issues with UK planners and discuss unresolved
- > Study insurance systems suitable for compensating damage caused by





6 Outlook

5-3 Adding and Modifying Guidelines at Any Time

> Aim to resolve unresolved issues

→ Is RS of AV traveling at Level 4 a driver? What is the concept of a driver? → Emergency evacuation The only practical examples suitable for detailed analysis of the trolley problem are overseas judicial precedents Analyze these and specify guidelines for cases expected in Japan







5-3 Adding and Modifying Guidelines at Any Time

> Aim to resolve unresolved issues

 \rightarrow If the AI that operates the AV's ADS comes to have a self-learning function, who is responsible for data collection and analysis that leads to accidents? The same problem exists for accidents when driving according to the views of Chat GPT

6 Outlook







5-3 Adding and Modifying Guidelines at Any Time

> At the end of 2024, the guidelines will be published domestically and internationally as guidelines issued by IATSS

After that, the guidelines will be added to and modified based on the knowledge gained from domestic and international demonstration experiments, and the revised guidelines will be published

6 Outlook



Thank you for your attention



International Association of Traffic and Safety Sciences

