Session : Impact assessment

SIP-adus Project : Development of traffic accident simulation to evaluate the benefits of safety systems for the reduction of traffic accidents

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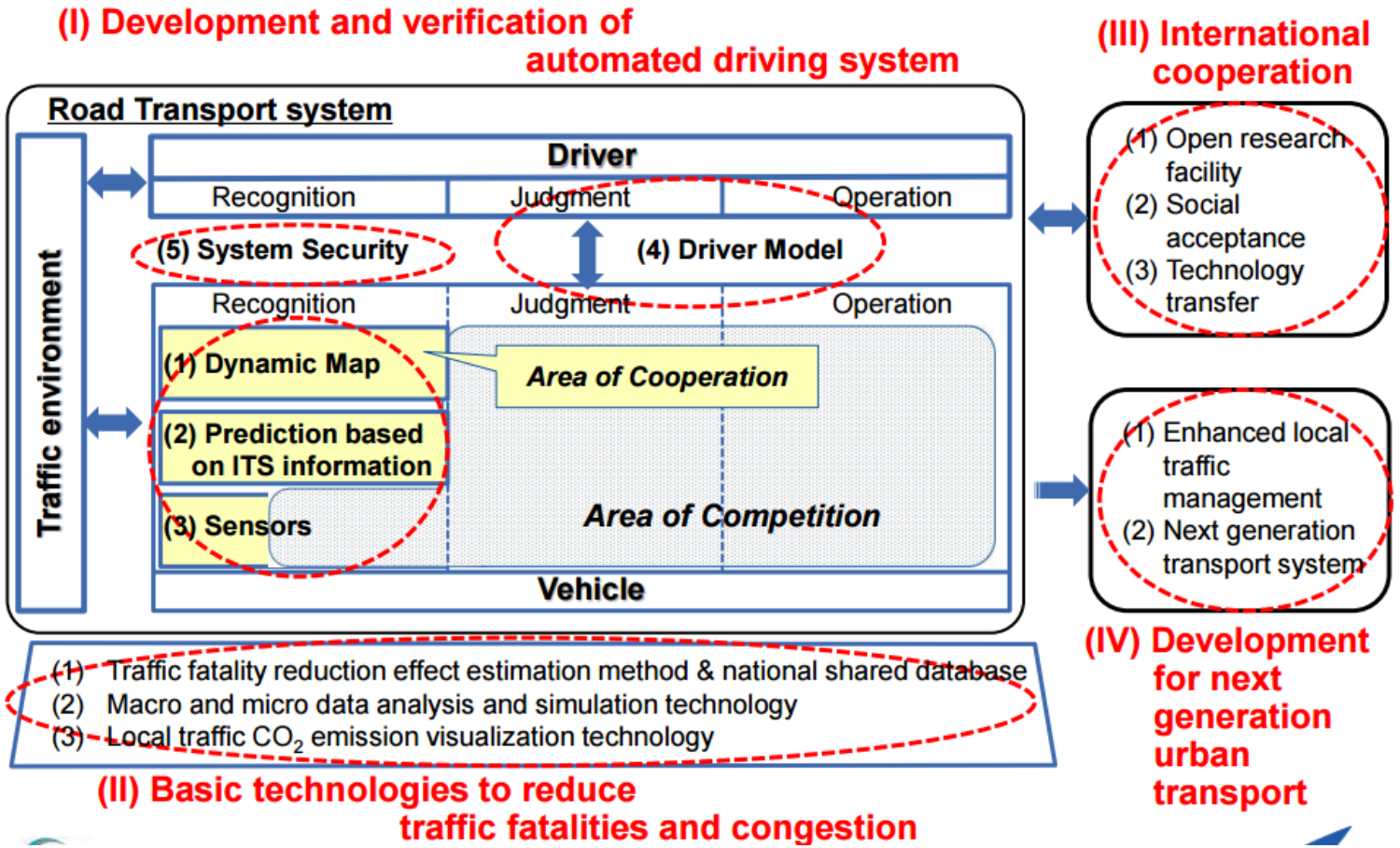
Scope of SIP-adus



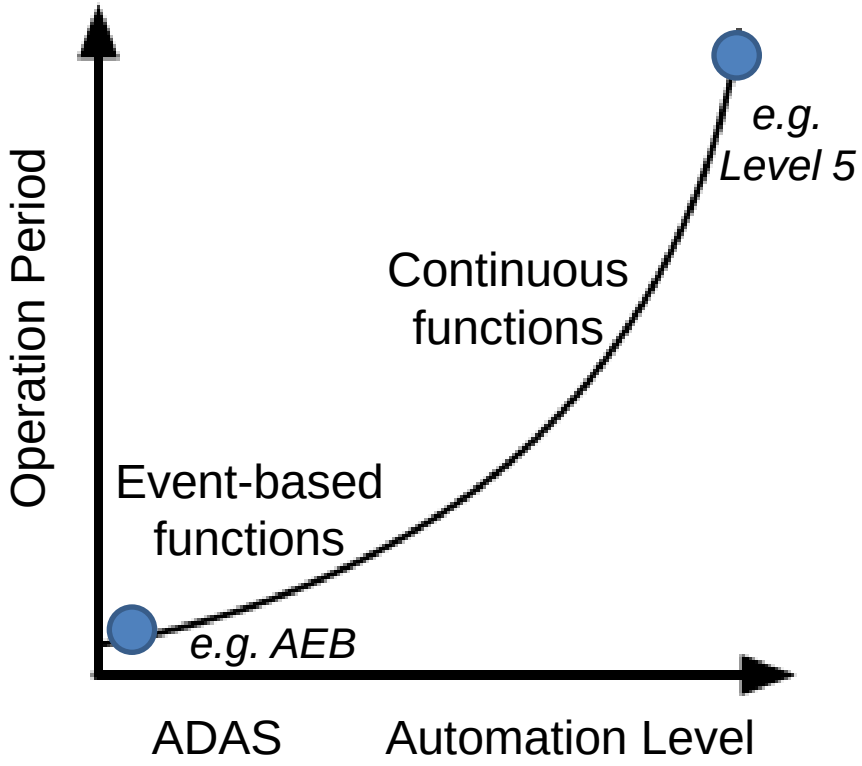
【Project Goal】

Developing simulation tool to evaluate traffic **safety impact** when ADAS/Automated Driving systems are deployed.

Safety Impact Assessment

Type of functions in ADAS/Automated driving systems

"Event-based functions" and "Continuous functions" (AdaptiVe)



Impact Assessment methodology

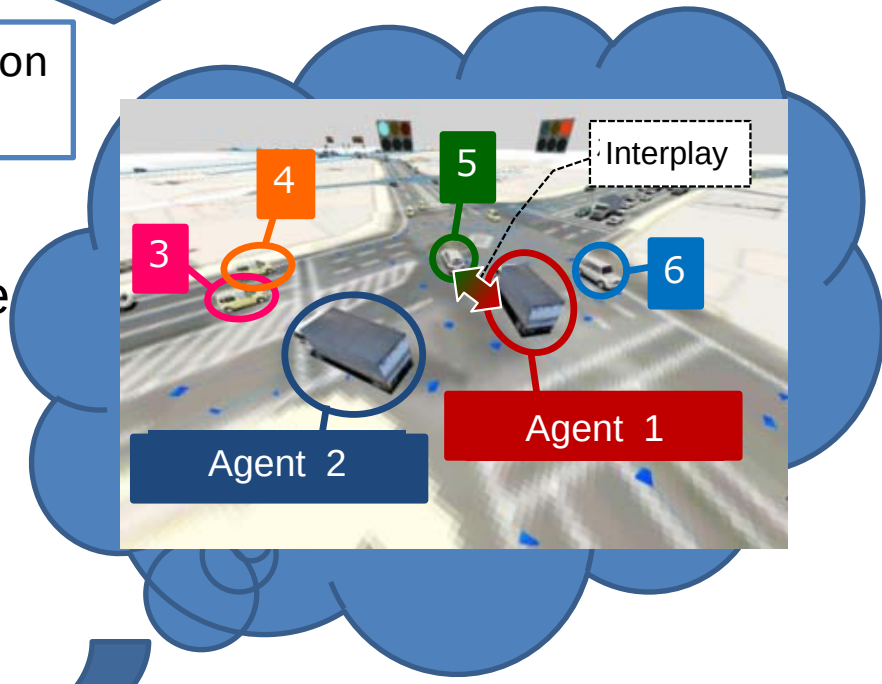
Assessment Method for "Continuous Functions"（Long Operational Period）

Field Operational Test

Implementation challenges

Cost
Acceptance
.....
Data
(Accident)

Traffic Simulation



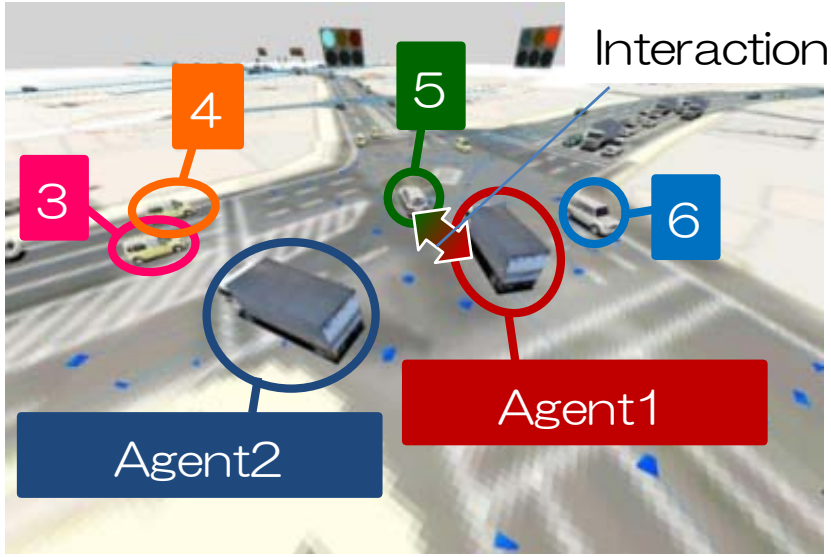
Real traffic flow

Virtual traffic flow

Characteristics of simulation

Keyword: Agent-based simulation

1. All traffic participants (driver, pedestrian, rider...) are modeled as agents.
2. Each agent has Perception・Recognition・Decision making・Action process.
3. Agents' actions are interactively affected.
4. We aim to reproduce not only emergent situation but potential danger situation.

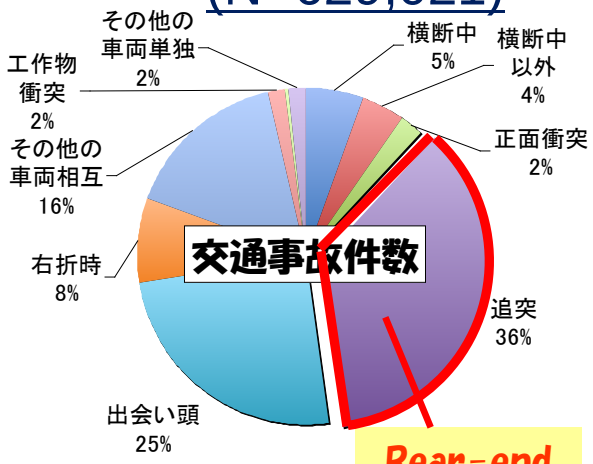


Target Crash Types

From traffic accident statistics in Japan, we will focus on at least three accident patterns.

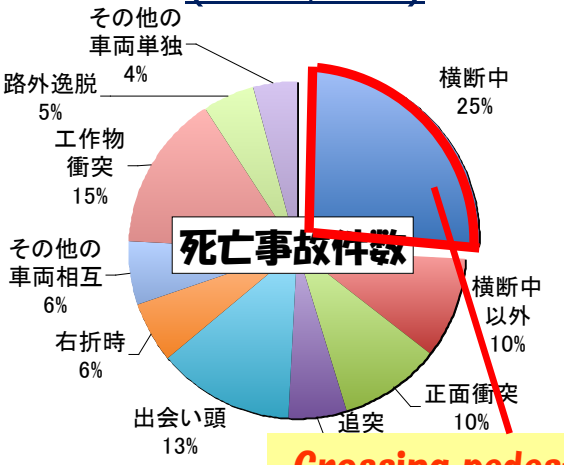
1. "Rear-end accident"
2. "Crossing pedestrian-car accident"
3. "accident causing lane departure"

Traffic accidents in Japan (N=629,021)



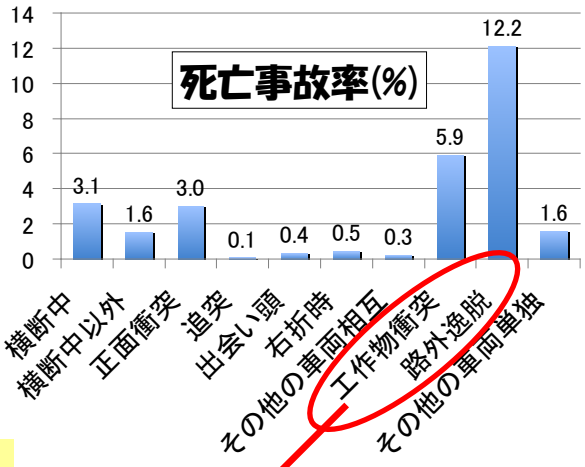
Rear-end accident 36%

Traffic fatalities (N=4,278)



Crossing pedestrian - car accident 25%

Traffic fatality rate (%)

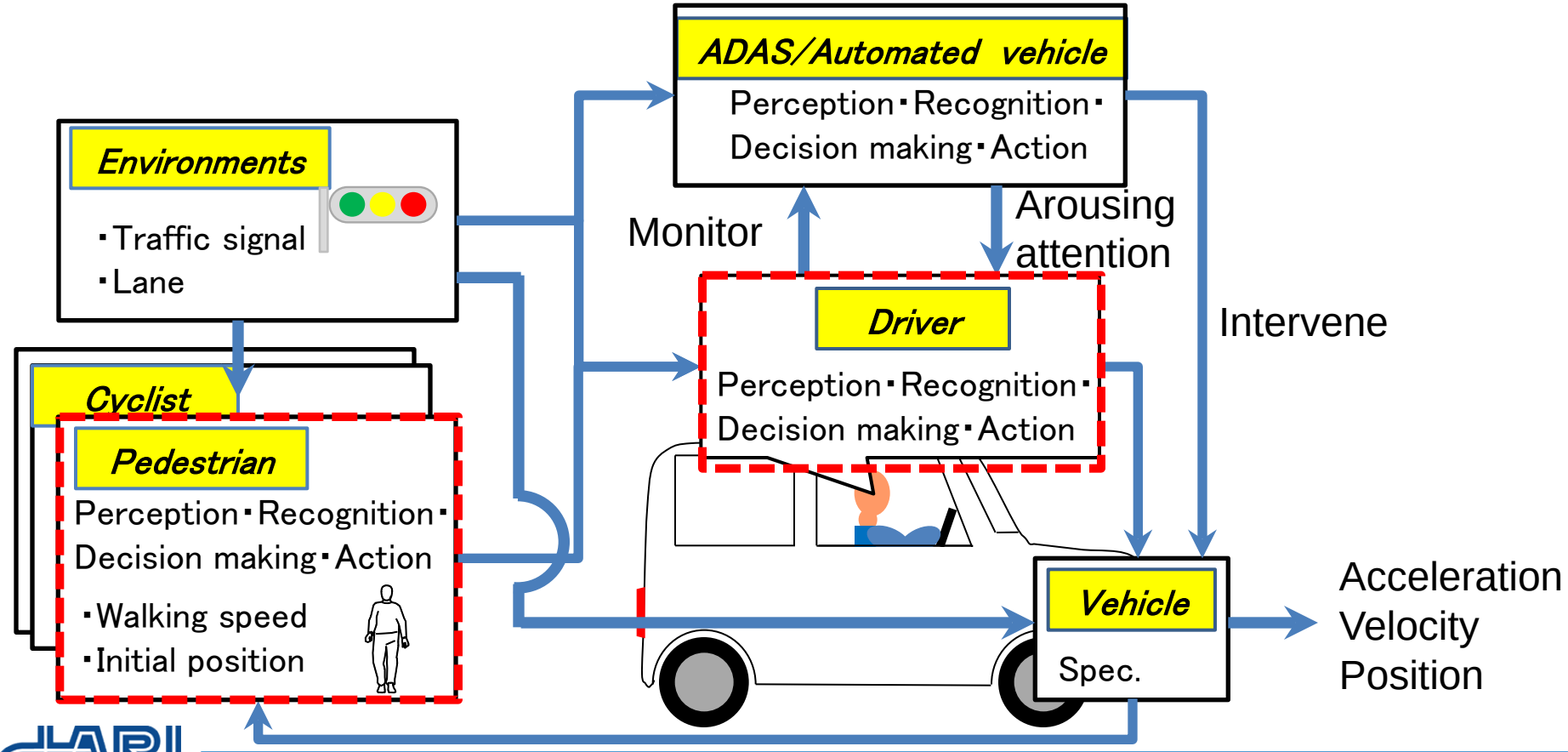


Accident causing lane departure

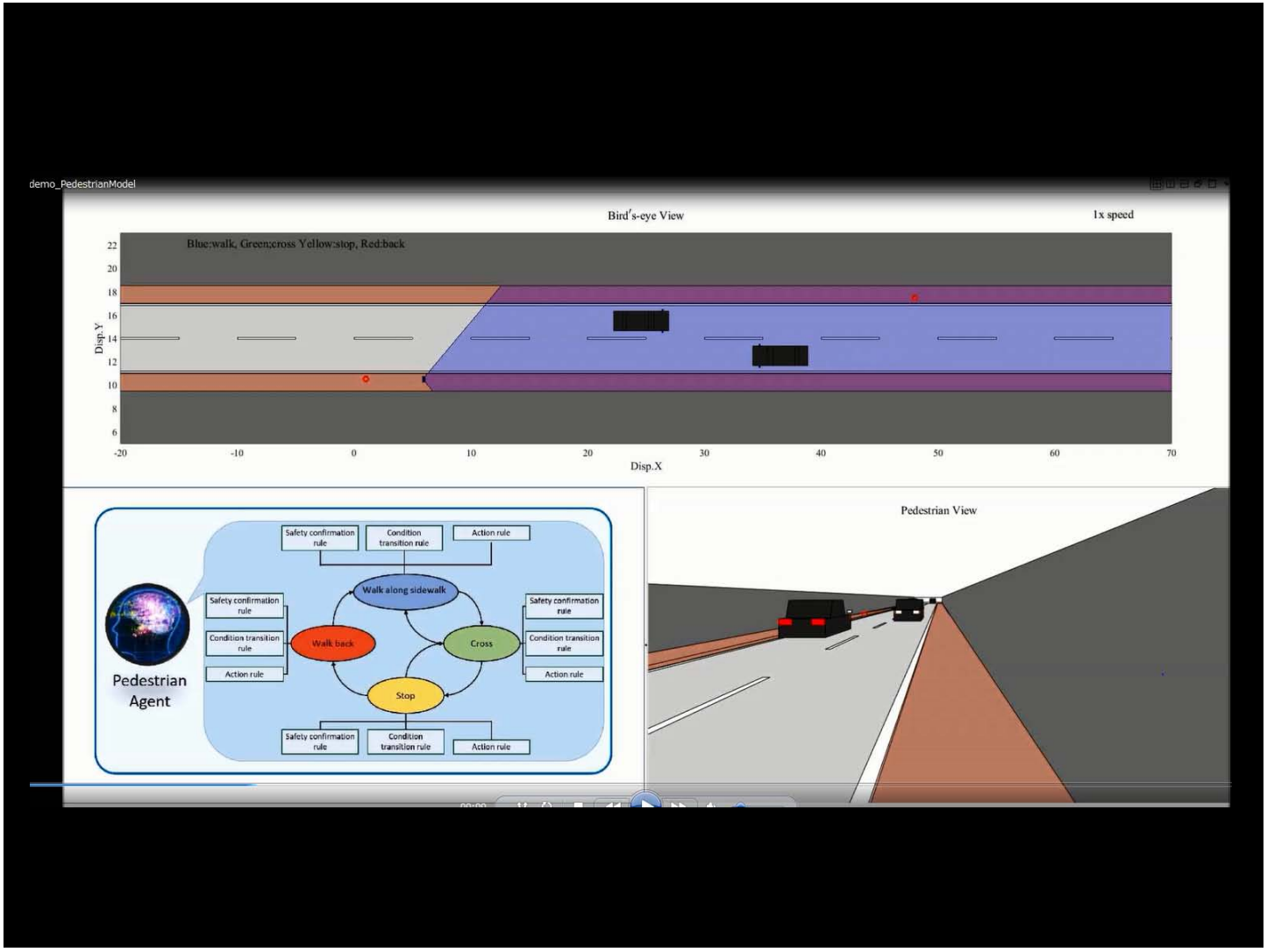
Composition of Models

In order to evaluate ADAS/Automated vehicles, it is necessary to have at least 5 components.

Relationship between each comports



Pedestrian agent (Pedestrian model)



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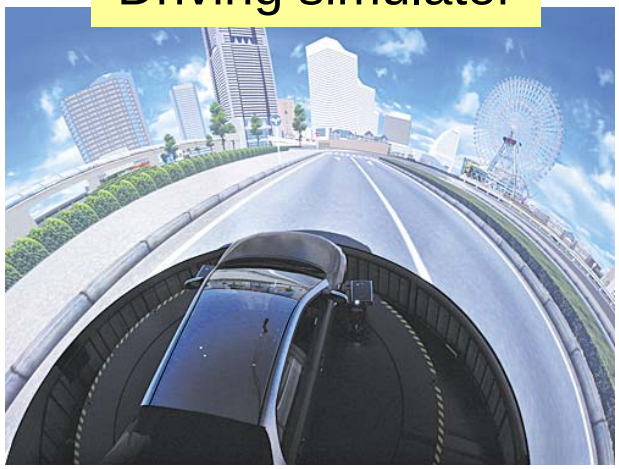
Development of driver model

- In order to develop accurate simulation, appropriate driver model parameters are necessary(e.g. driver reaction time, brake operation etc...).
- It is essential to acquire actual driver behavior data based on experiments.

Driving simulator



Vehicle simulator on test course

Driver behavior

(reaction time, brake operation...)

Driver behavior in critical scene

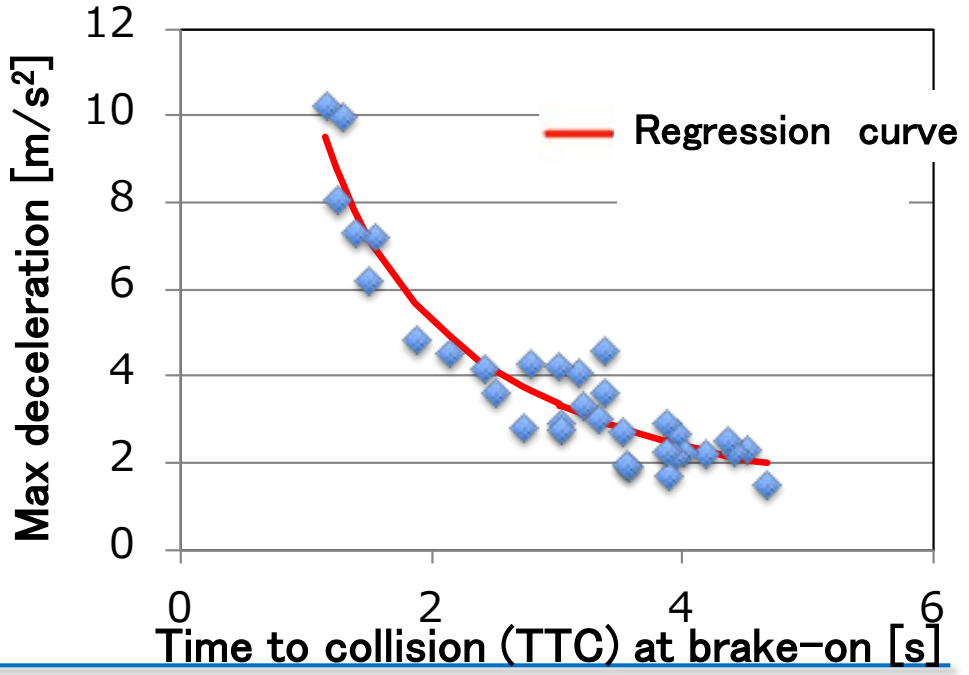
Acquisition of driver behavior data

Example: Crossing pedestrian-car accident

- The relationship between TTC and Maximum decelerations were formulated by regression analysis.

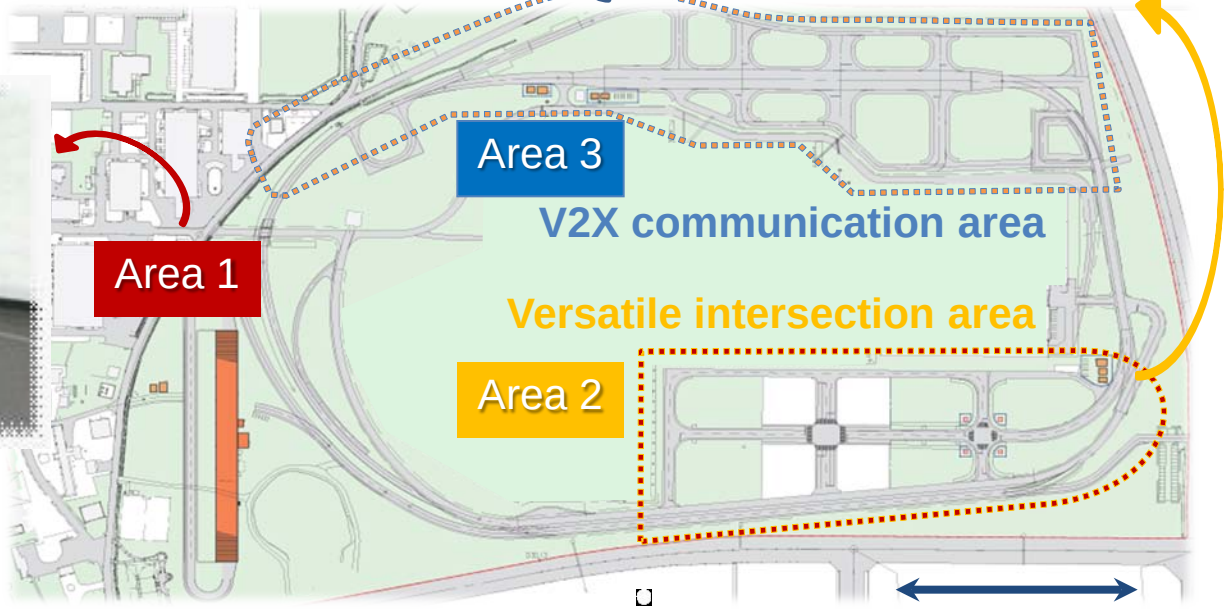
Experiment

Distribution of Max. deceleration, TTC



New Automated Driving Test Center

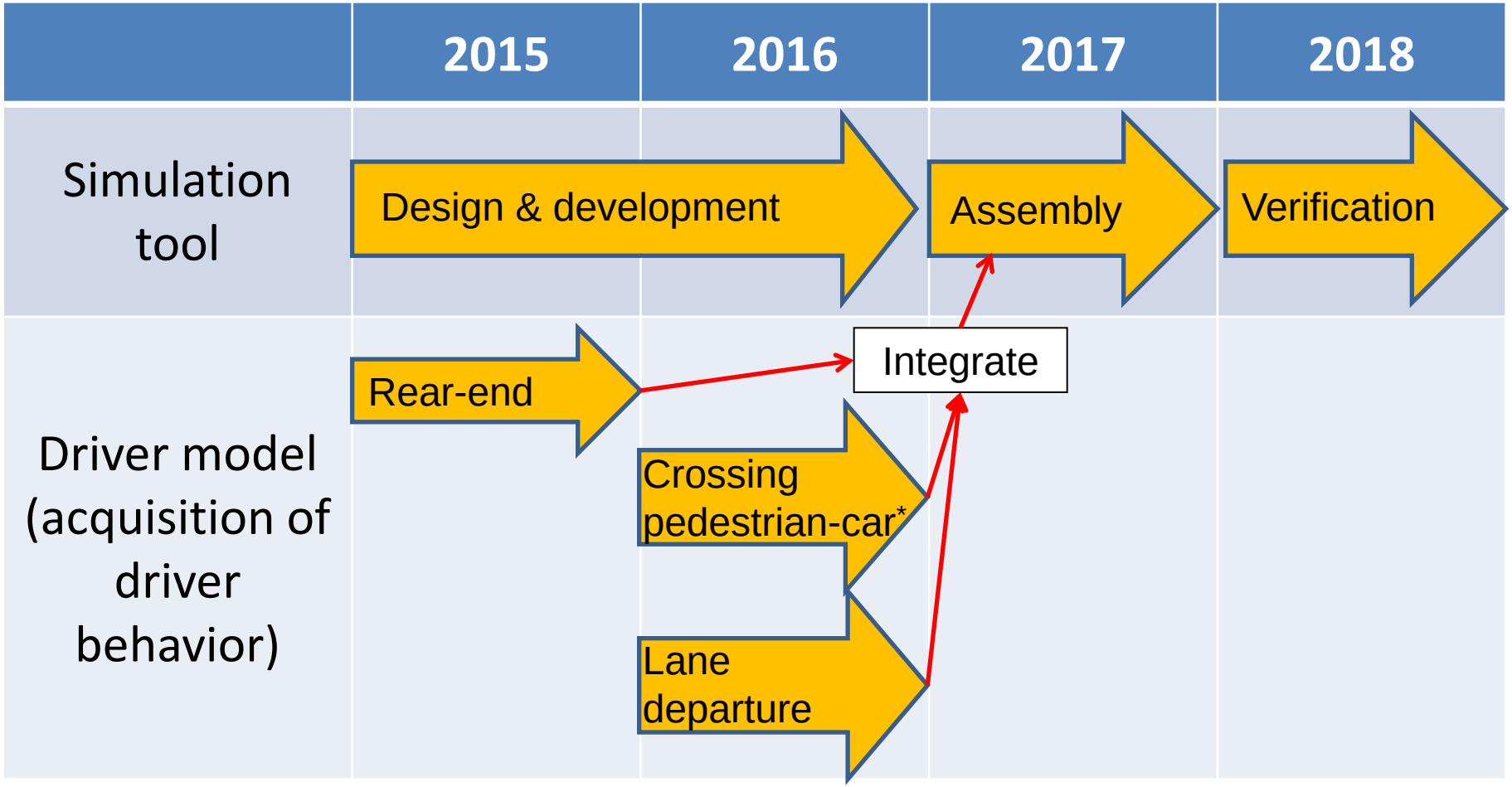
Poor visibility environment



200m corridor

- **Heavy rain (max 80mm/h)**
- **Dense fog**
- **Simulated direct sunlight**

Development Schedule (Outline)



* Development of pedestrian model is also included

Summary

- **We aim at developing a simulation which can contribute to accurate impact assessment when automated vehicle / ADAS is deployed.**

- **Agent based simulation is necessary to reproduce realistic traffic environments.**

- **Making driver models based on experimental data is necessary for accurate impact assessment of automated vehicle / ADAS.**

Thank you for your attention