Session : Impact assessment

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

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Project Goal

【National Goal】

- Reducing the number of casualty in the traffic accidents.*

【Project Goal】

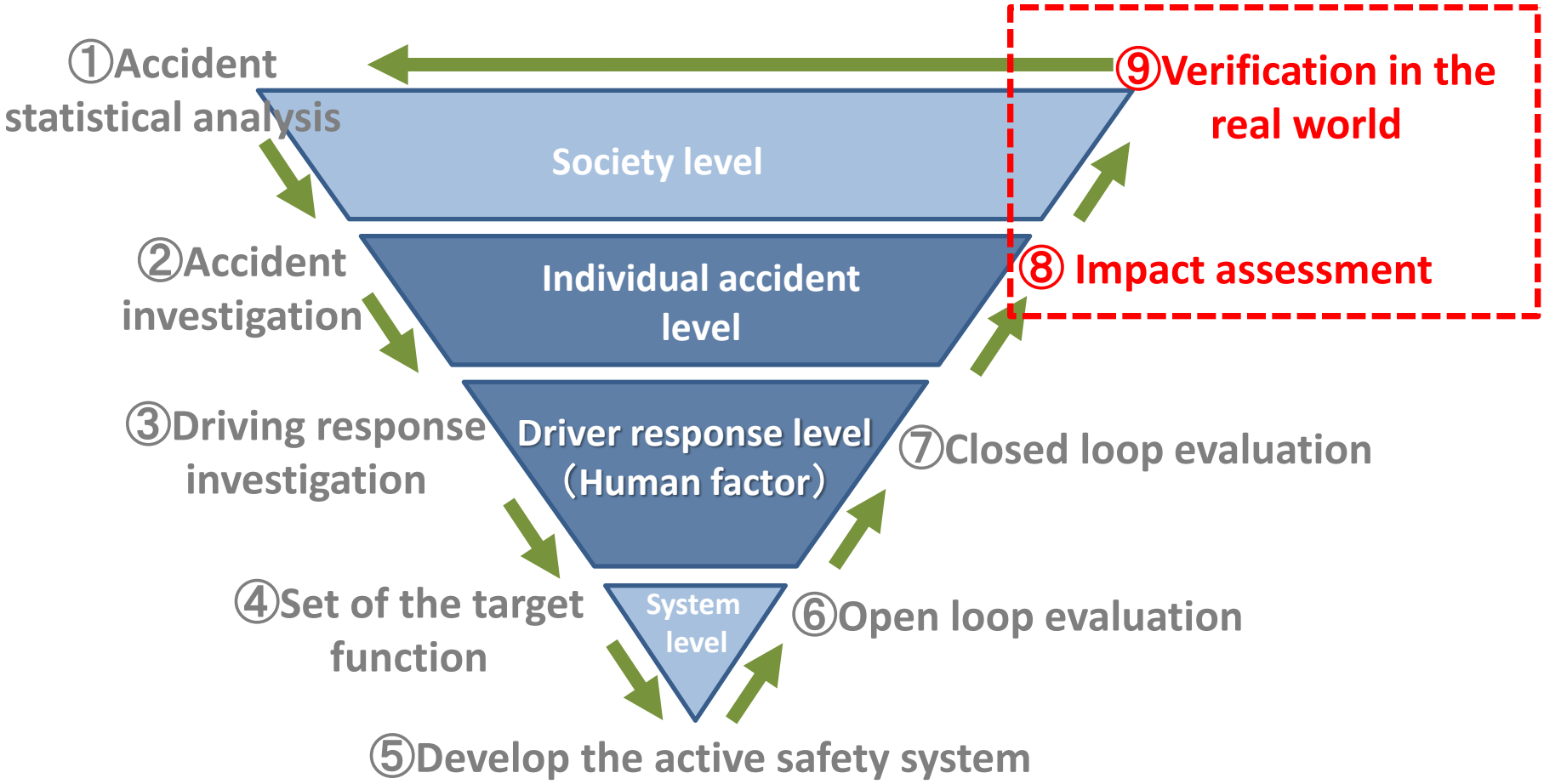
- Developing simulation tool to evaluate traffic safety impact when automated driving / ADAS are deployed.

ADAS:Advanced Driver Assistant System

*:Source= Japanese Cabinet SIP-adus

Utilization of Simulation

Basic development cycle of active safety systems

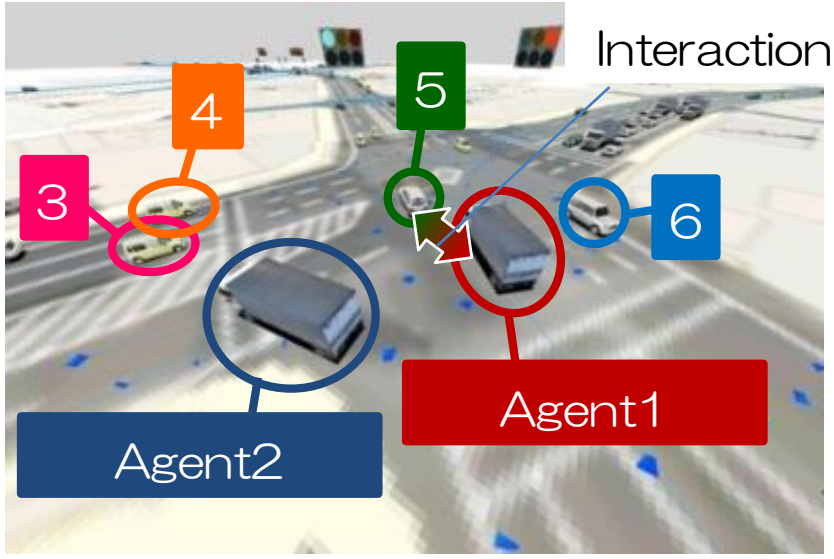


Harmonization of evaluation methodology between regions

Characteristics of simulation

Keyword: Agent-based simulation

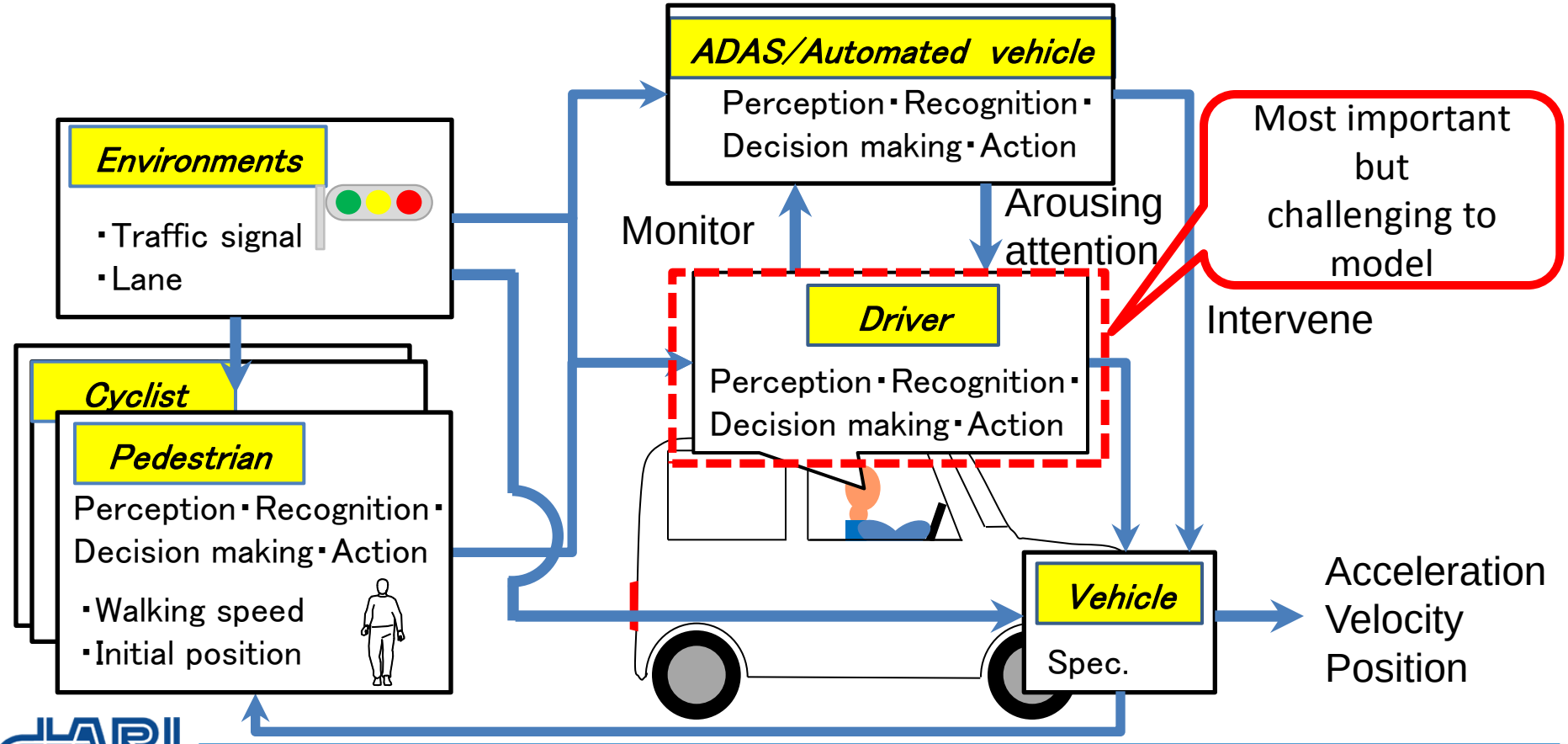
1. All traffic participants (driver, pedestrian, rider...) are modeled as agents.
2. Each agent has Perception・Recognition・Decision making・Action process.
3. Agents' actions are interactively affected.
4. We aim to reproduce not only emergent situation but potential danger situation.



Composition of Models

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

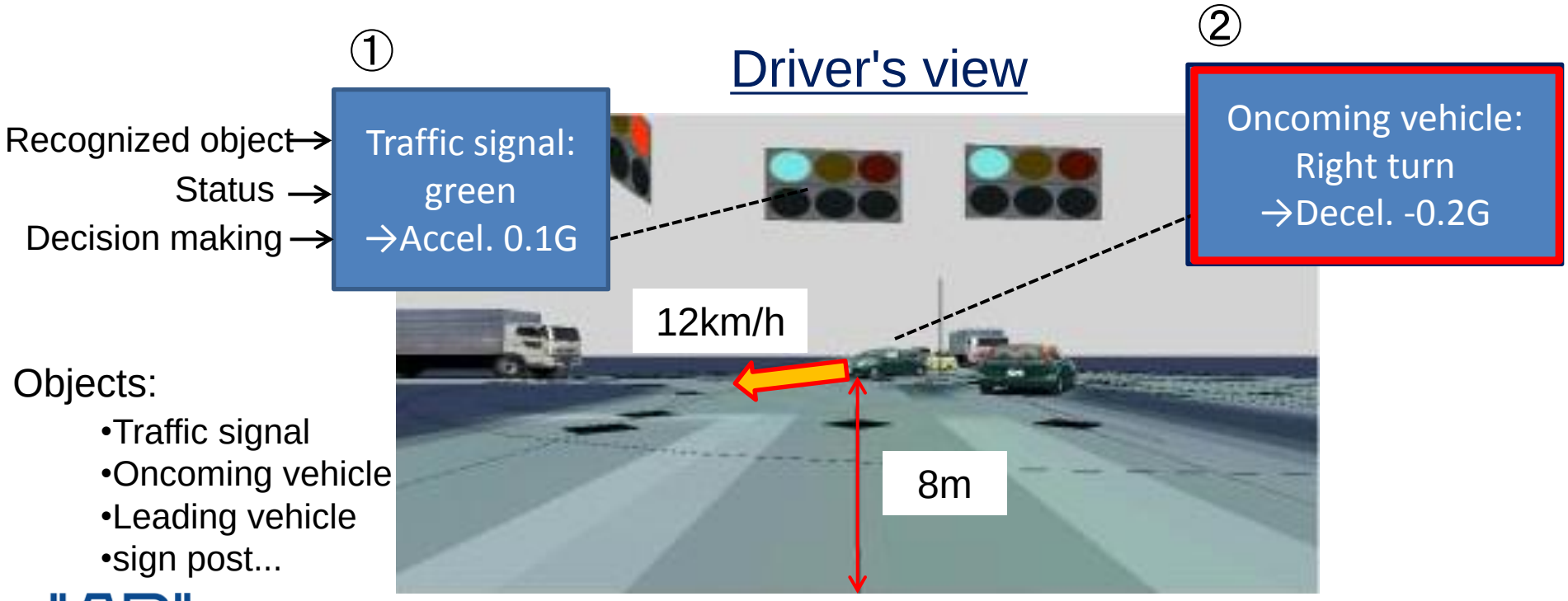
Relationship between each componts



Driver agent model (Driver model)

Exa.: Decision making process while approaching an intersection

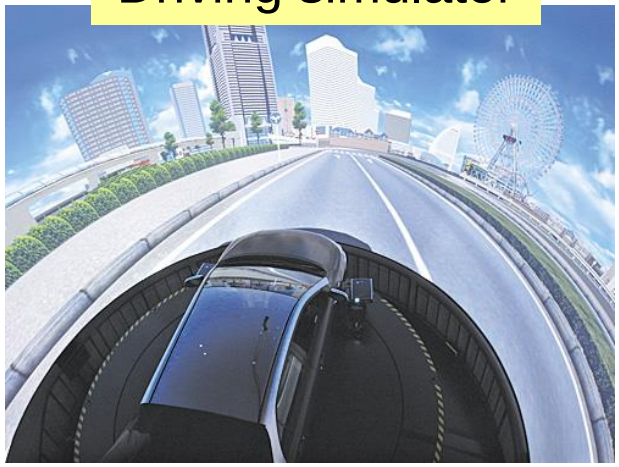
- For each recognized object, the driver (agent) decides his/her action according to decision making rules.
- Then the driver chooses the appropriate maneuver (e.g. deceleration for avoiding collisions).



Methodology of making driver models

- 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

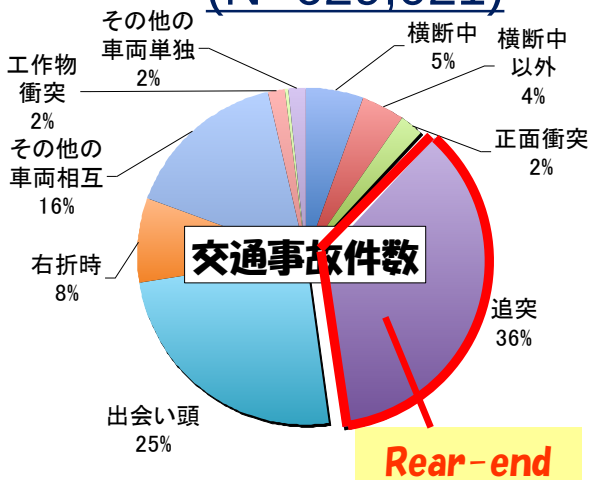
(reaction time, brake operation...)

Accident Types

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

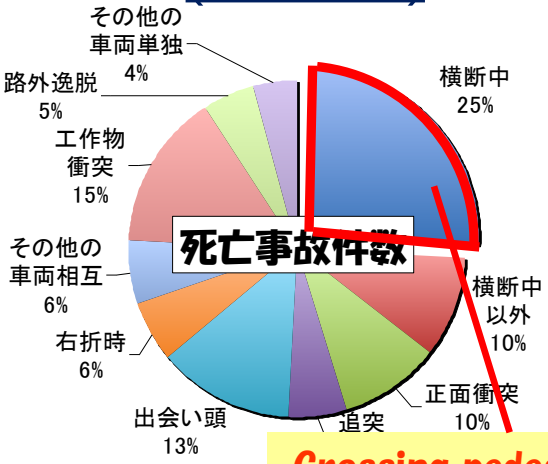
1. "Rear-end accident"
2. "Crossing pedestrian-car accident"
3. "accident causing lane departure"

Traffic accidents in Japan (N=629,021)



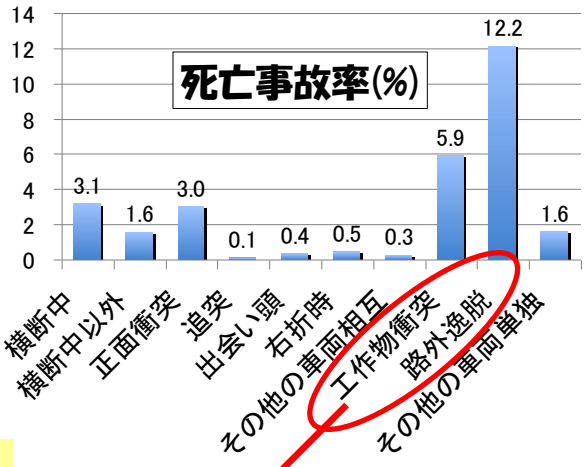
Rear-end accident 36%

Traffic fatalities (N=4,278)



Crossing pedestrian - car accident 25%

Traffic fatality rate (%)



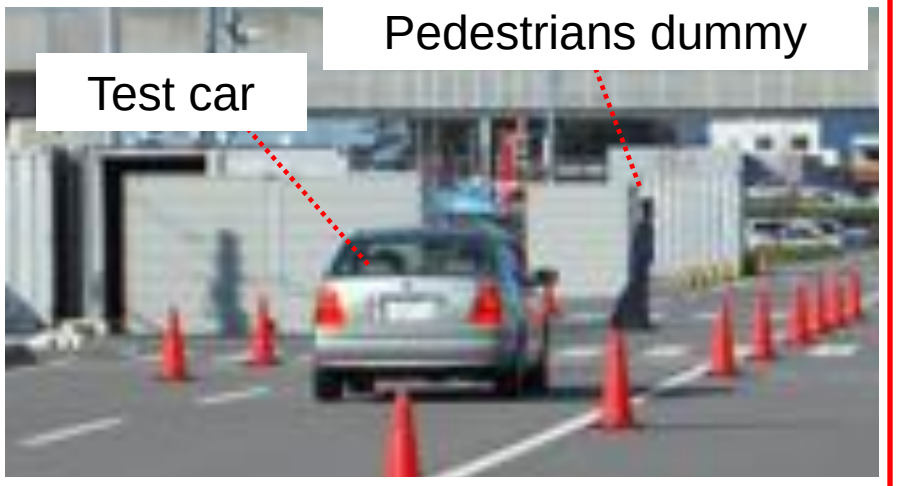
Accident causing lane departure

Acquisition of driver behavior data

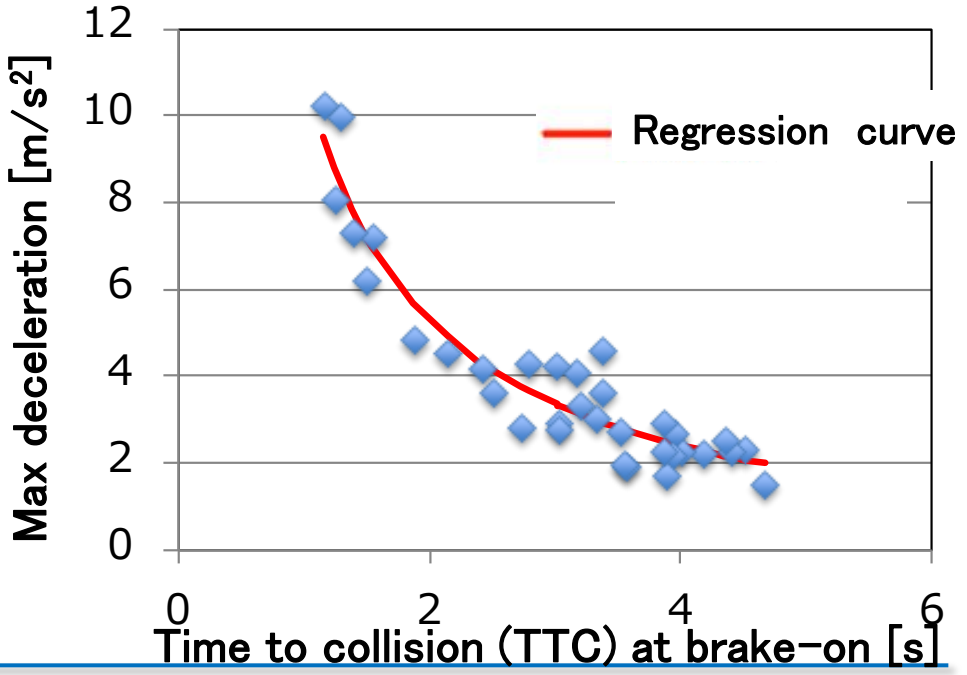
Example: Crossing pedestrian-car accident

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

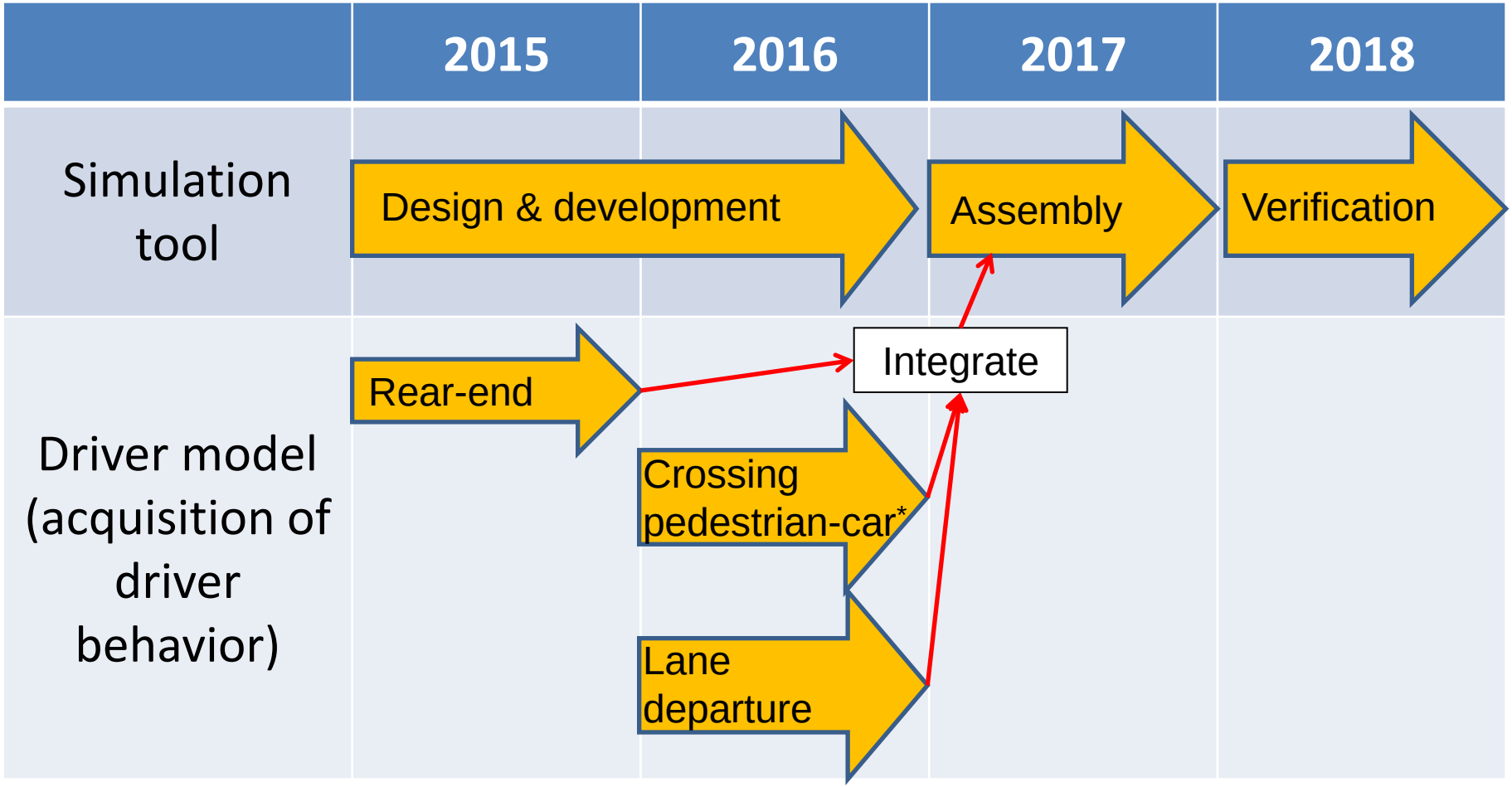
Experiment



Distribution of Max. deceleration, TTC



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