A multi-agent traffic simulation model to predict the impact of automated driving systems on safety

**Project aim**
Automated driving systems are being developed, promoted and implemented. These systems are expected to contribute to achieve the Japanese government target to become the safest automobile transportation society in the World. The aim of this project is to develop a multi-agent traffic simulation methodology applicable to predict the potential safety improvements of different automated driving systems.

**Development of a multi-agent traffic simulation methodology**

- **Methodology development plan**
  - 2015
  - 2016
  - 2017
  - 2018

- **Targeted accident types (Japan, 2013)**
  - Total: 6,213 (2013)
  - 35.4% traffic law
  - 28.3% head collision
  - 14.9% pedestrian

- **Decision making simulation logic**
  - Perception and Recognition
  - Driver’s visual field
  - Head shaking
  - Looking aside
  - Inattentive/drowsy driving
  - Judgement
  - Inadequate operation etc.

- **Decision making logic**
  - Preceding vehicle
  - Perception vehicle
  - Error
  - Warning
  - In case TTC ≤ 0.8 seconds, Force brake “Normal” with delay

**Safety impact assessment**

**Simulation to predict the impact of automated driving systems on safety**

- **Simulation setup**
  - Road network and static infrastructure
  - Multi-agent dynamic traffic flow

  - Emergency braking
  - Lane keep assist system
  - Automated driving

- **Simulation results**
  - Accident occurrence spots
  - Relative accident rates

  - Novel multi-agent traffic simulation software developed and applied to a 6 x 3 km area in Tsukuba city. Over a simulated period of time including more than 500 agents (vehicles, drivers and pedestrian), the software can simulate and identify at least five types of accidents.

  - Different automated driving technology penetration scenarios can be set to estimate the potential impact of different technologies on safety.