

Human Factors



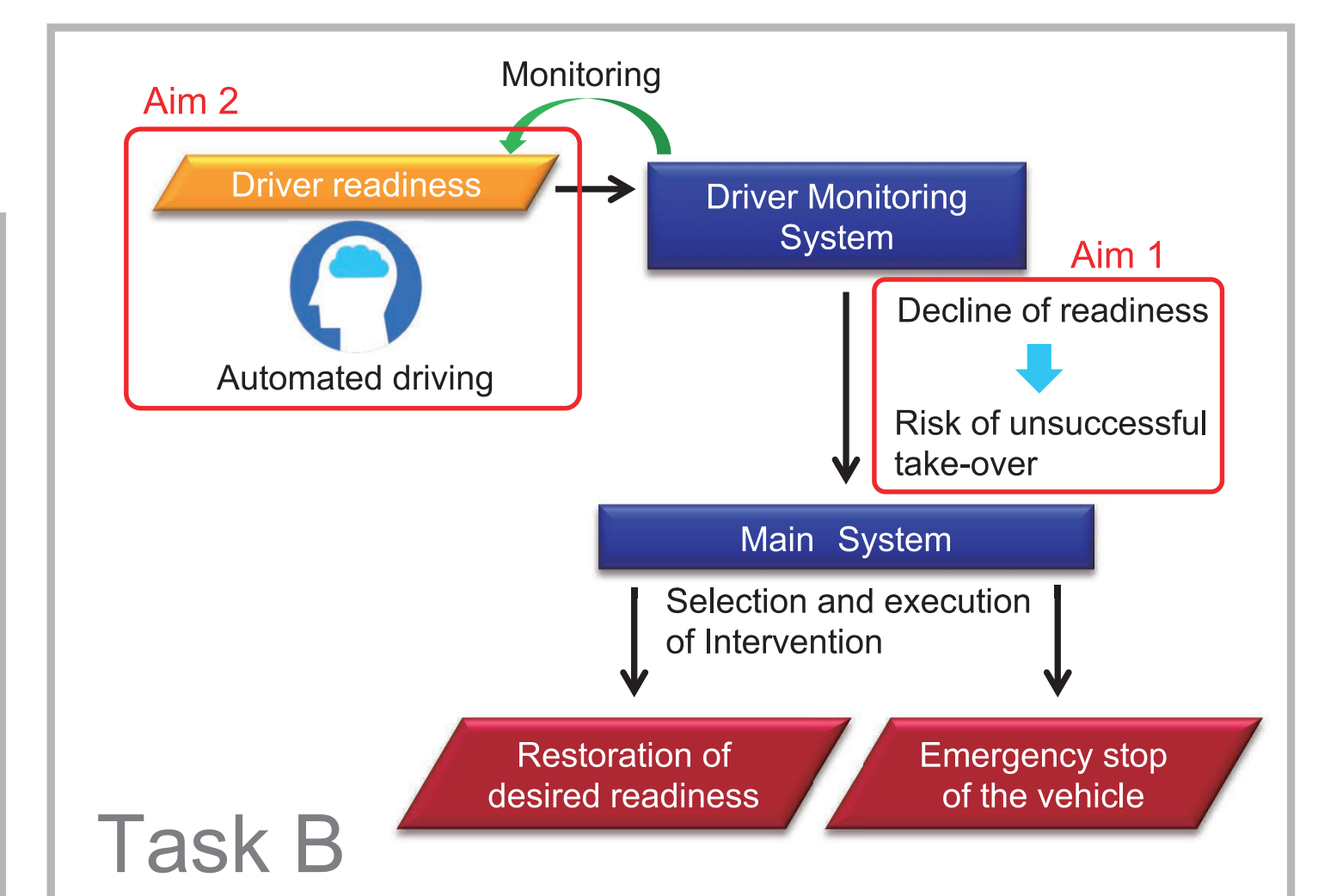
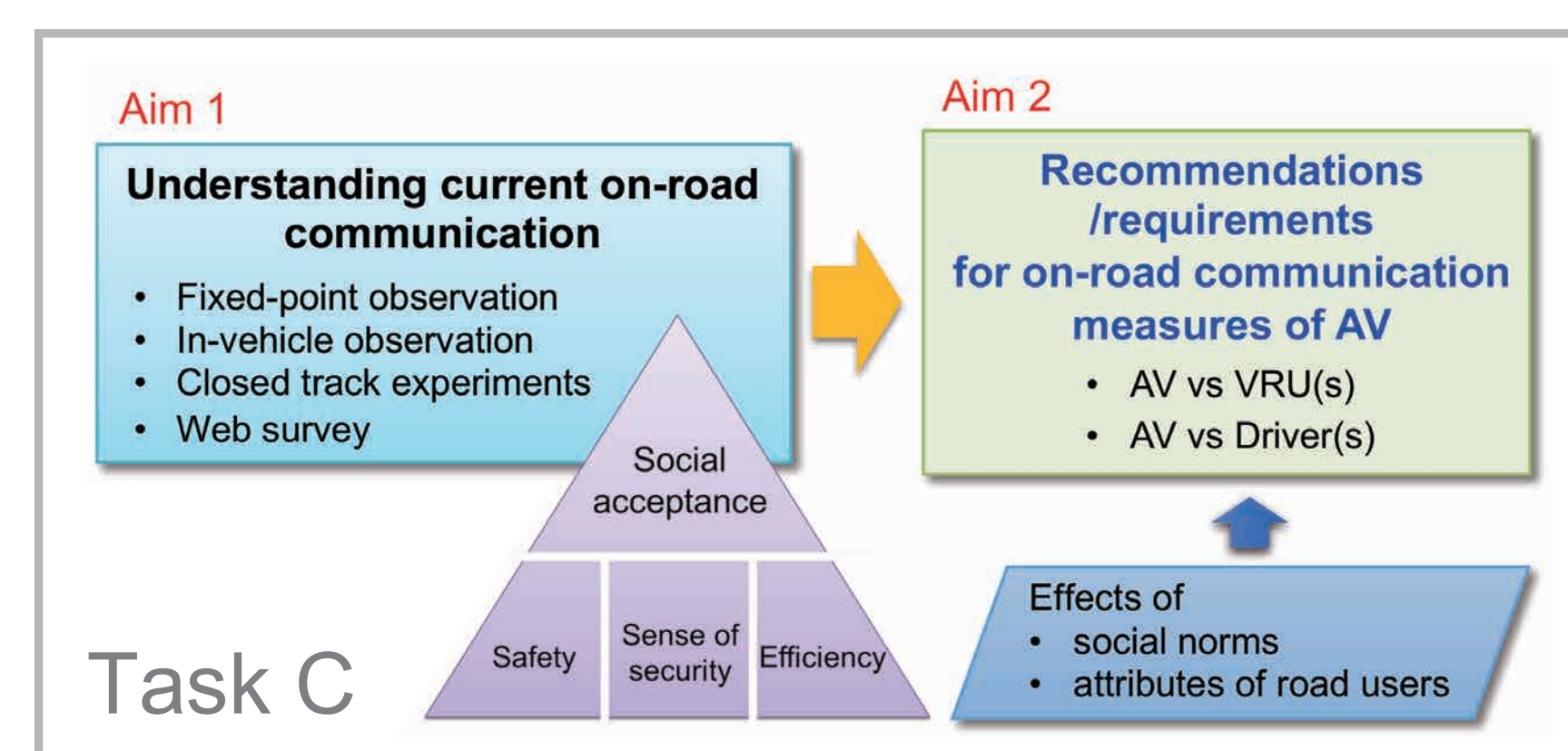
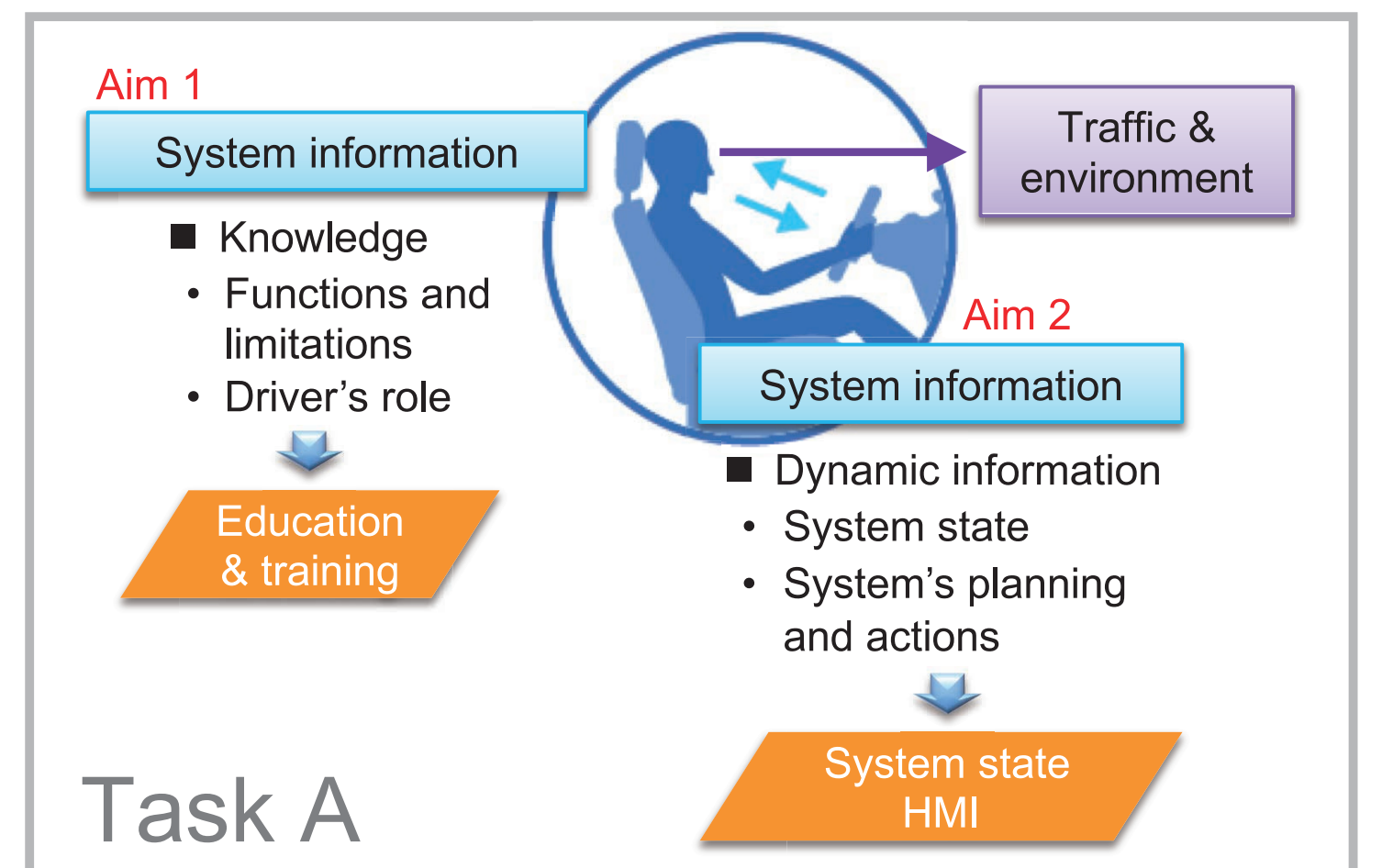
Overview of the project

- 3 year project: FY2016-FY2018
- Research consortium
 AIST, University of Tsukuba, Keio University, DENSO Co, and Tokyo Business Service Co.

Task A investigates effects of system information (knowledge and dynamic state) on drivers' take-over performance for Levels 2 & 3.

Task B investigates effects of driver state (readiness) on his/her take-over performance for Levels 2 & 3 and extracts metrics of readiness for driver monitoring

Task C investigates effective ways to functionalize AV to communicate with surrounding road users for Levels 2 & above.



Task A

Knowledge on system limitation (Level 2)

Purpose. Investigate whether or not drivers can generalize scenic knowledge and how to express the limitations, e.g. the system fails to detect an obstacle.



Fig. 1. Explained scene in which the system fails to detect traffic cones.

Method.

- ◆ 30 aged drivers
- ◆ 2 Explanations
 (A) Limitation + Scene
 (B) Limitation

Result.

Table 1. Number of collisions when the system fails to detect hazards

Event	Group A	Group B
Traffic cone (S2)	1/15	4/15
Cardboard (S5)	0/15	4/15
Vehicle stopping on the shoulder (S8)	0/15	0/15
Total	1/45	8/45

Conclusion. Explaining possible scenes is necessary for responding un-known scenes

HMI for system limitation (Level 2)

Purpose. Investigate the effect of presenting system intention in HMI when the system limitation occurs.



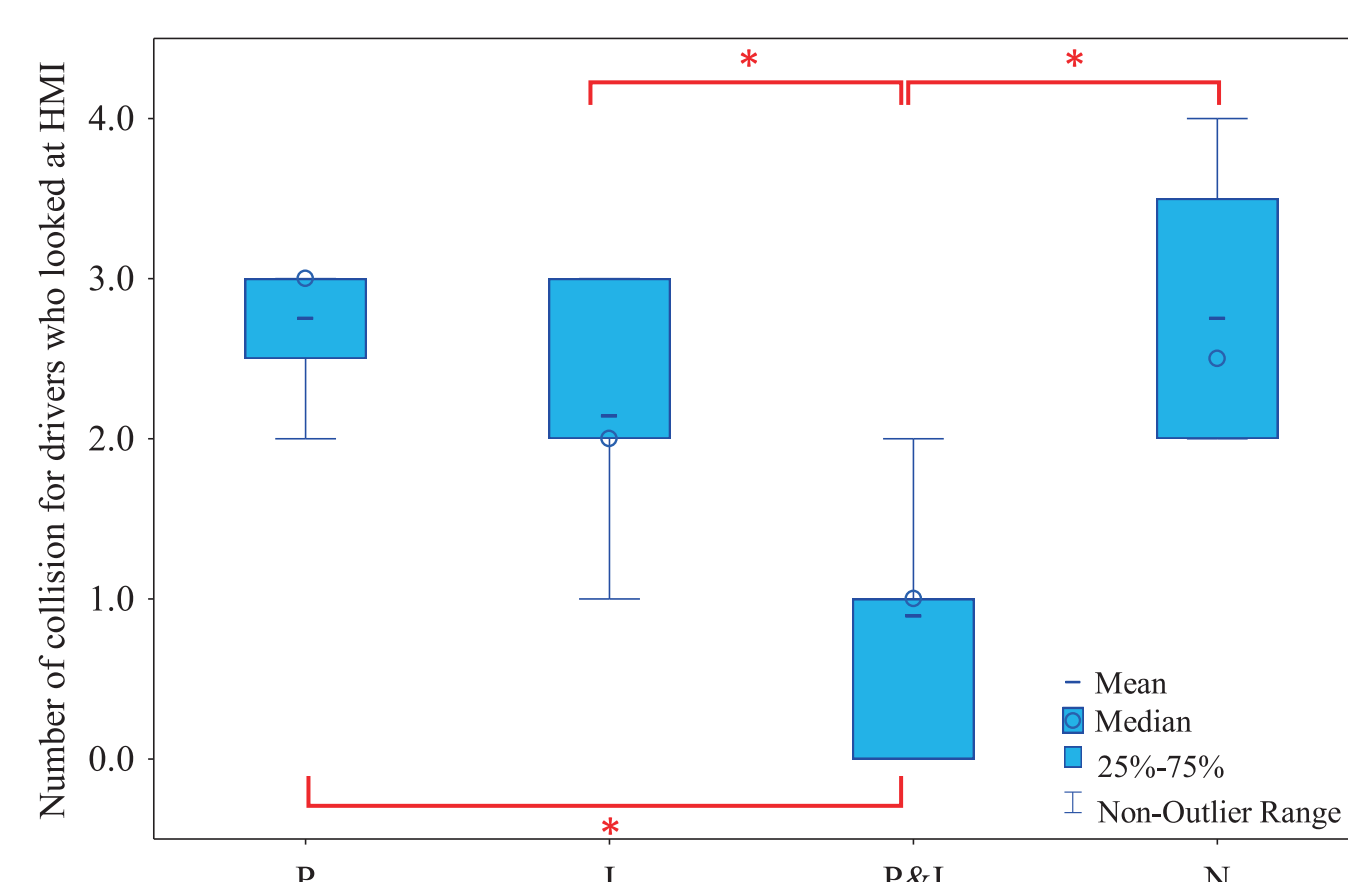
Fig. 2. the HMI that presents the system perception and intention.

Method.

- ◆ 60 aged drivers
- ◆ 4 HMIs
 (P) Perception
 (I) Intention
 (P&I) P + I
 (N) None

Result.

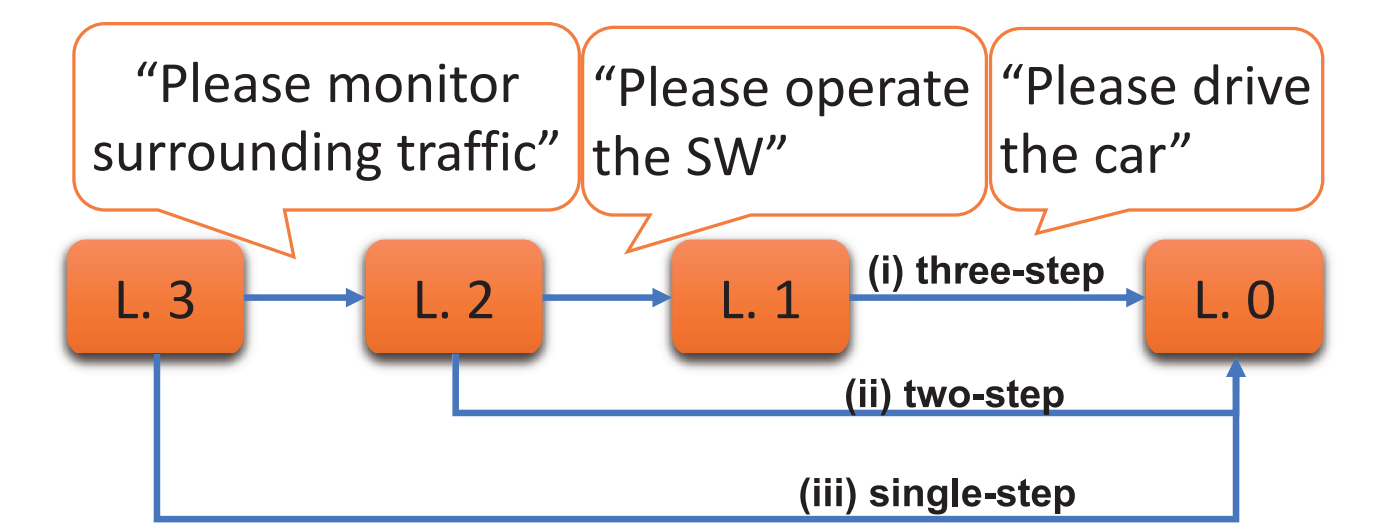
Fig. 3. Number of collisions when the system limitations occurred



Conclusion. Presenting system intention in HMI is effective to deal with system limitations.

HMI for Mode awareness (Levels 2&3)

Purpose. Investigate driver response in different mode transitions.

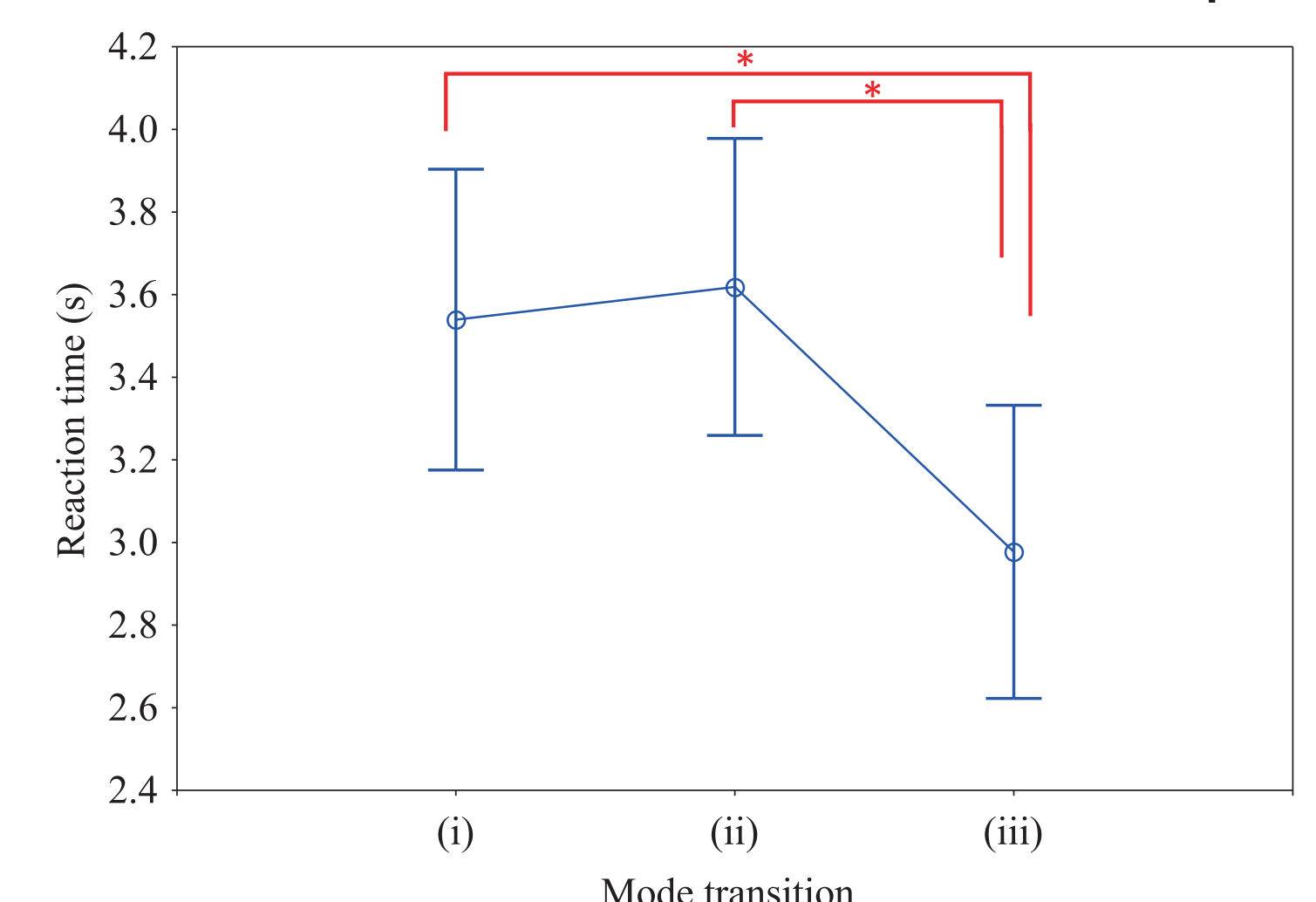


Method.

- ◆ 60 drivers
- ◆ 2 HMIs
 • Sound
 • Verbal
- 3 types of transitions: (i), (ii) & (iii)

Result.

Fig 5. Reaction time in scenes which drivers had to intervene into car control completely.



Conclusion. Under type (iii), driver's response was faster.