

# **Driver Assistance System (Lane Keep Assist System)**

**Presentation to WP-29 ITS Round Table  
18/02/2004 Geneva**

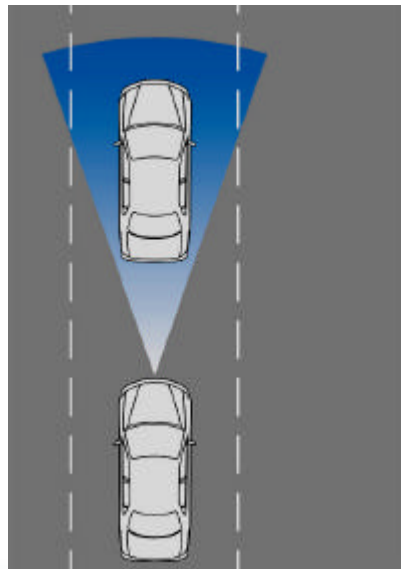
**Akira Iihoshi  
Vice-Chairman of JAMA  
ITS Technical Committee  
(Honda Motor Corporation)**

A decorative graphic of a mountain peak, likely Mount Fuji, is positioned in the bottom right corner of the slide. The mountain is rendered in a light brown color with a white peak, set against a blue gradient background that transitions from light blue at the top to a darker blue at the bottom.

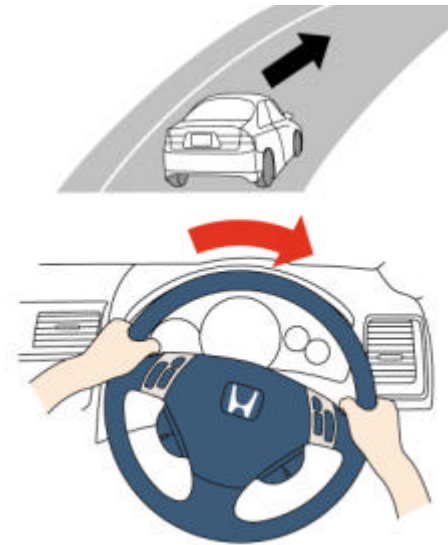
# Honda intelligent Driver Support System (HiDS)

## ■ Honda's proprietary Driver Assistance System

Adaptive Course Control system + Lane Keep Assist System

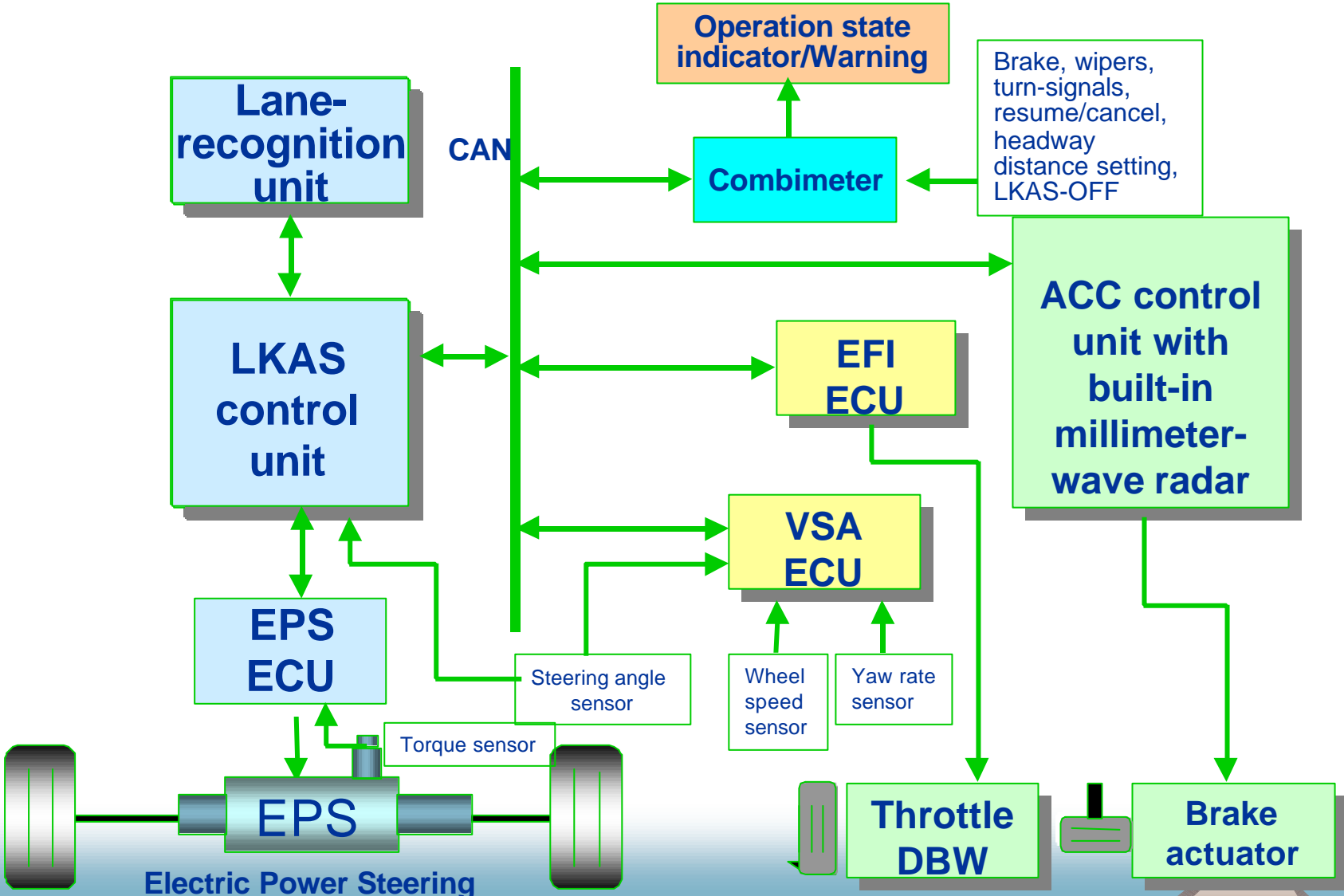


ACC



LKAS

# Block Diagram of HiDS



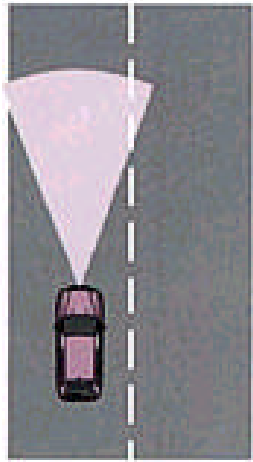
VSA:Vehicle Stability Assist / ECU:Electric Control Unit

# Functions of Adaptive Cruise Control (ACC)

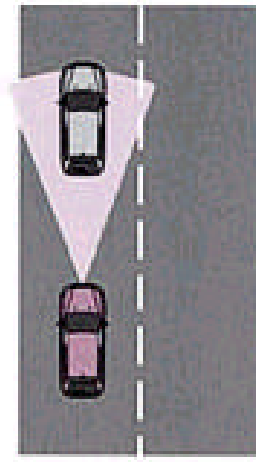
Controlling vehicle speed and headway distance to a preceding vehicle

Control Range : Forward Speed 45-100km/h  
(in Japan) Acceleration < 0.08G  
Deceleration < 0.2G

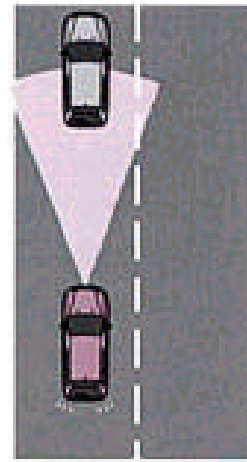
(1) Constant-speed drive



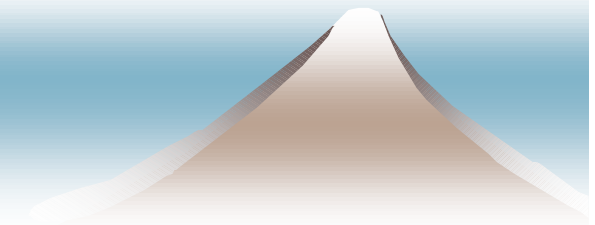
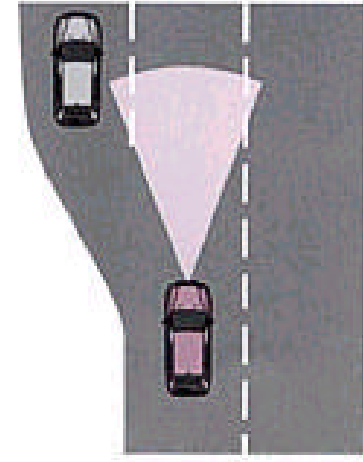
(2) Deceleration



(3) Vehicle following

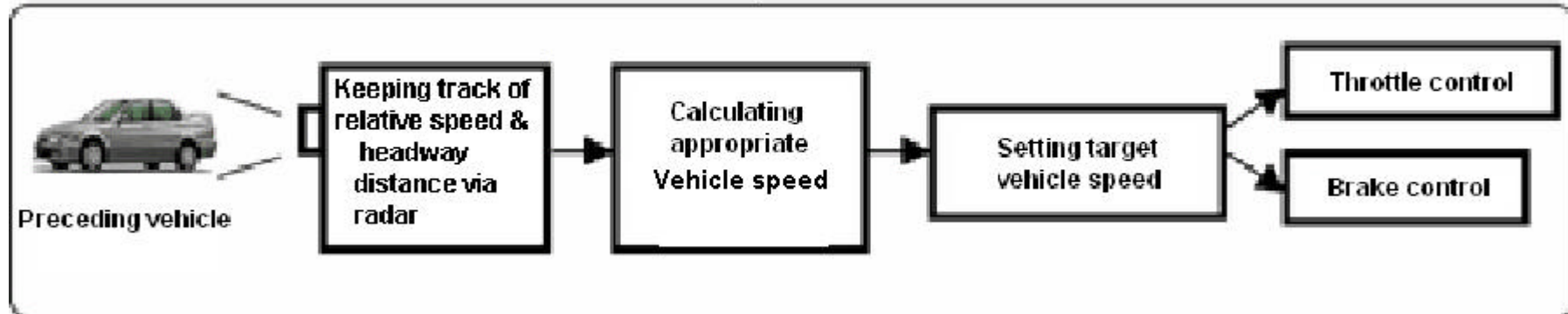


(4) Acceleration

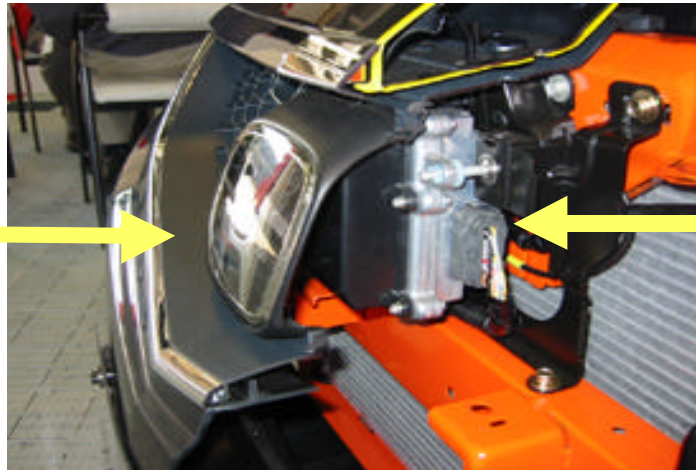


# Outline of Adaptive Cruise Control (ACC)

## Principle Functions



Radar covering



Millimeter-wave Radar



# Functions of Lane Keep Assist System (LKAS)

Assistance in providing optimum steering movement to keep the vehicle in the center of its lane.

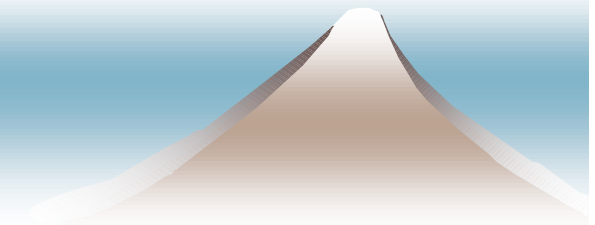
## Control Range (in Japan)

Forward Speed	65-100km/h
Lateral G	< 0.2G
Road Radius	> R230m

CAMERA



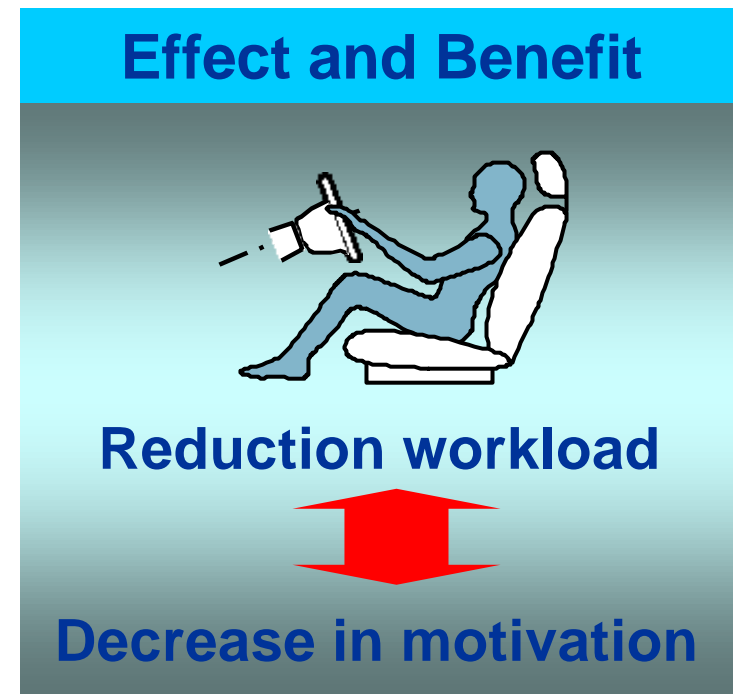
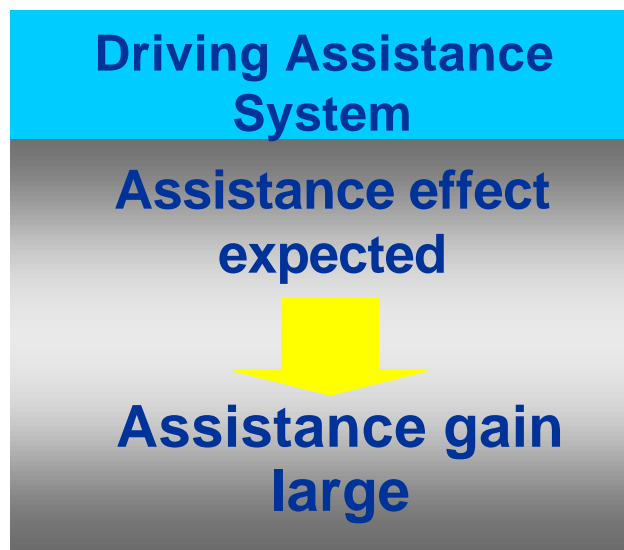
## Lane Departure Warning



# Honda Assistance System Philosophy

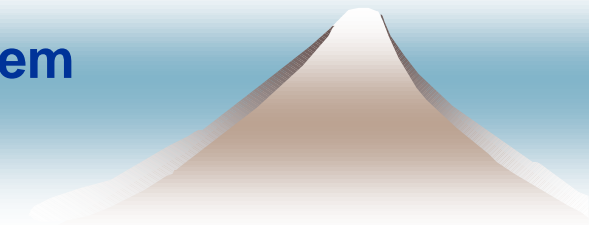
## ■ Background

The Driving Assistance System is under development to reduce the driver's work load.



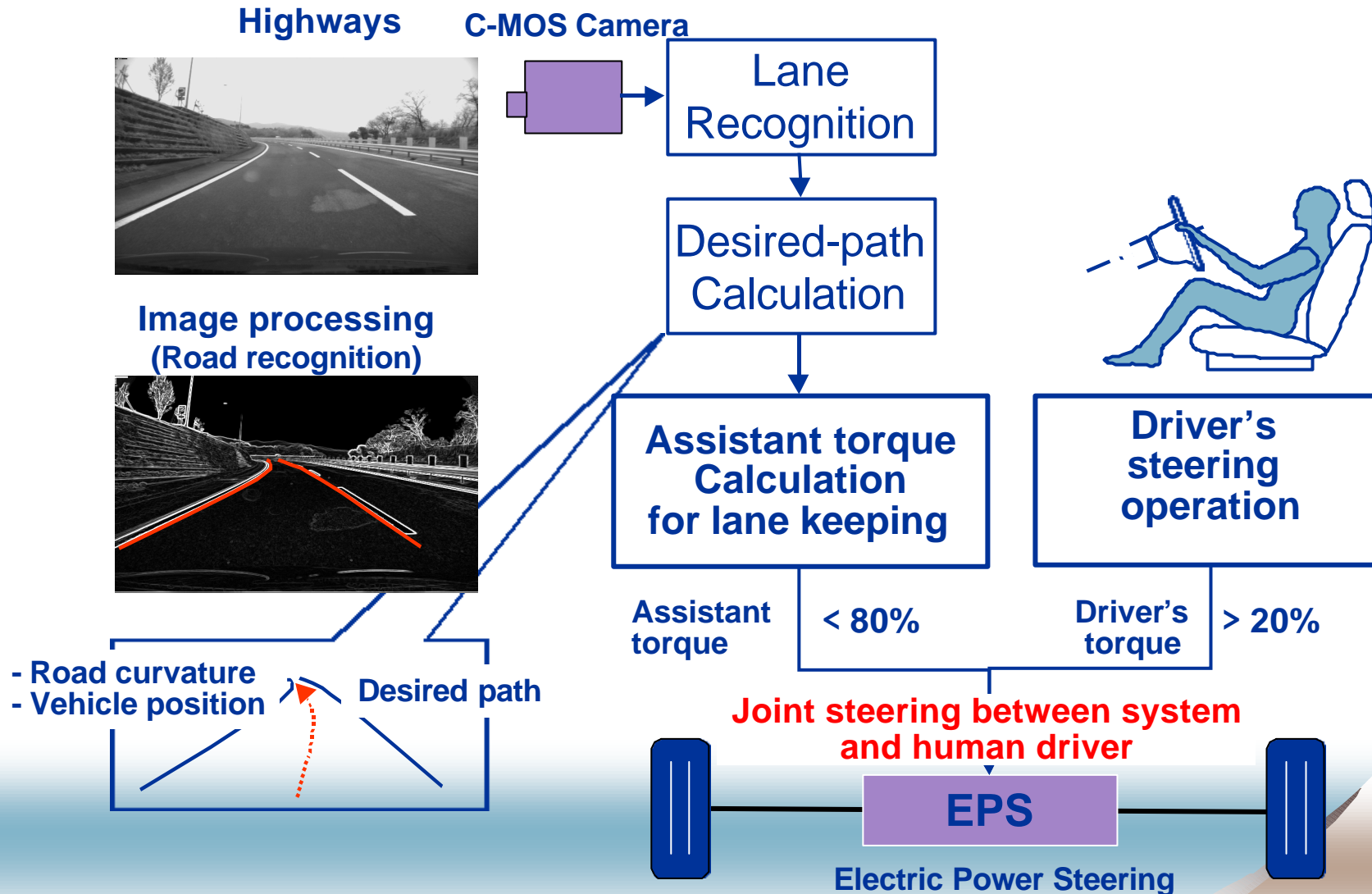
## ■ Purpose

- To avoid decrease in driver motivation
- To maximize the benefits of Assistance System



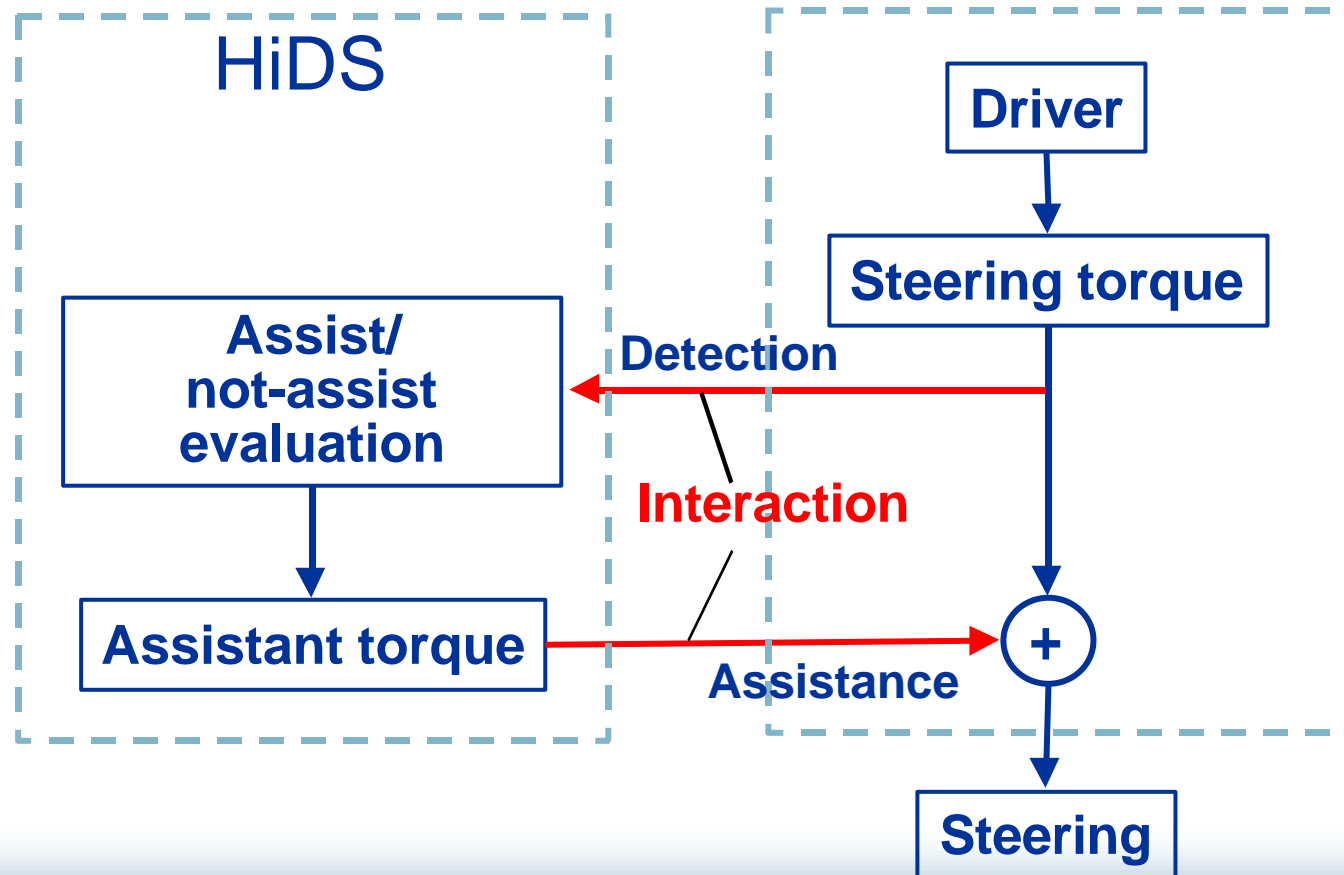
# Outline of Lane Keep Assist System (LKAS)

## Operational Principle



# Outline of Lane Keep Assist System (LKAS)

Interaction between Human and System  
Human Machine Interaction System

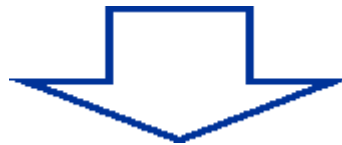


It regards the driver's operation as the driving intention when assisting steering operations.

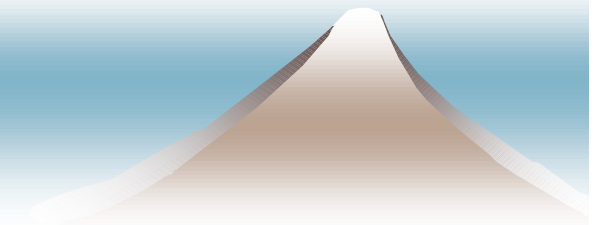
# HiDS Operations (video image)

# Evaluation of HiDS Effectiveness

- **Physical Evaluation (Steering Torque)**
- **Mental Evaluation (Mental Tension)**
- **Margin Evaluation (Eye Movement )**
- **Subjective Evaluation (Questionnaires)**

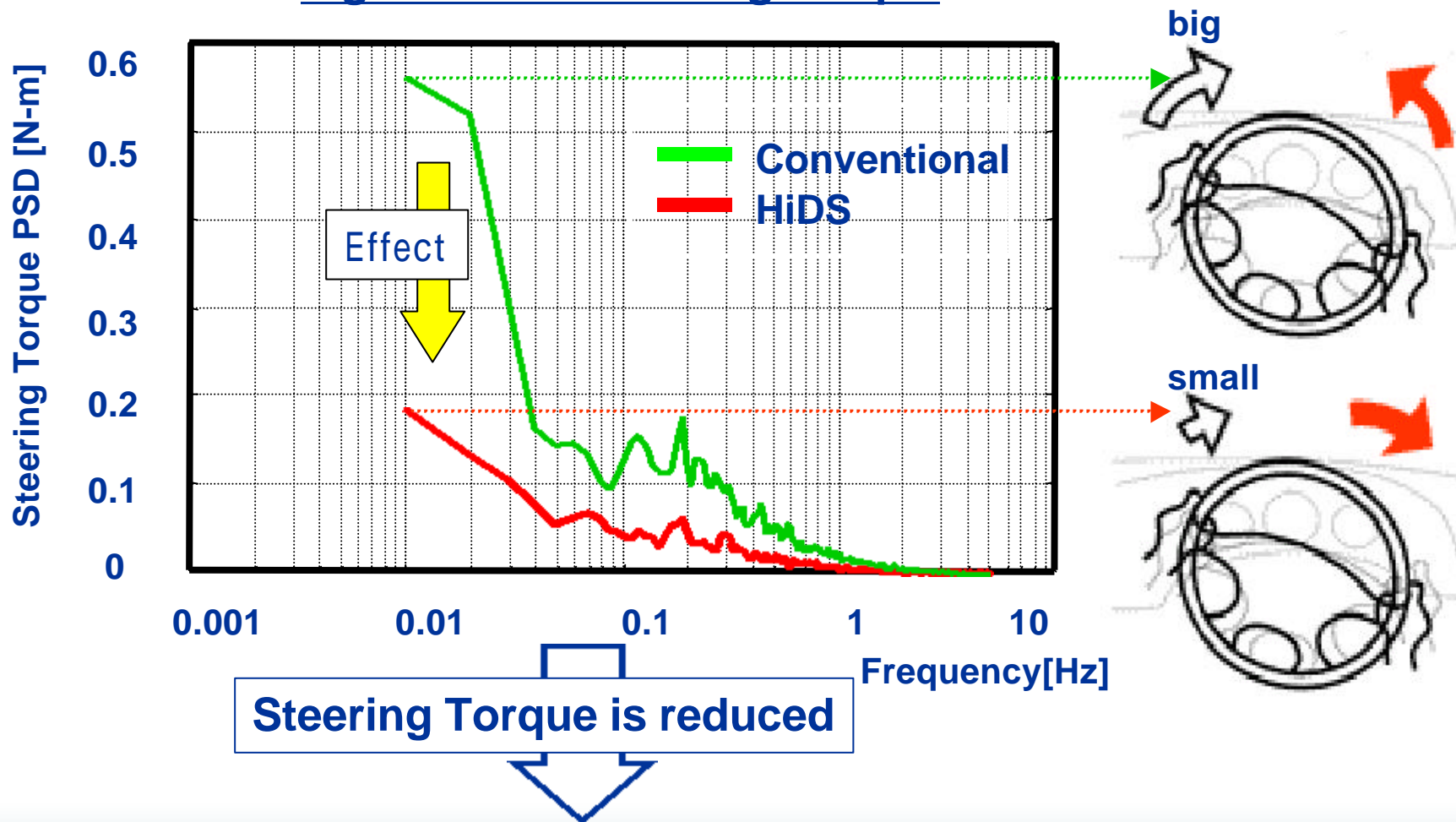


**Reduce both physical and mental workloads**



# Physical Evaluation Results

Fig-1 PSD of Steering Torque



Physical workload is reduced

# Mental Evaluation Results

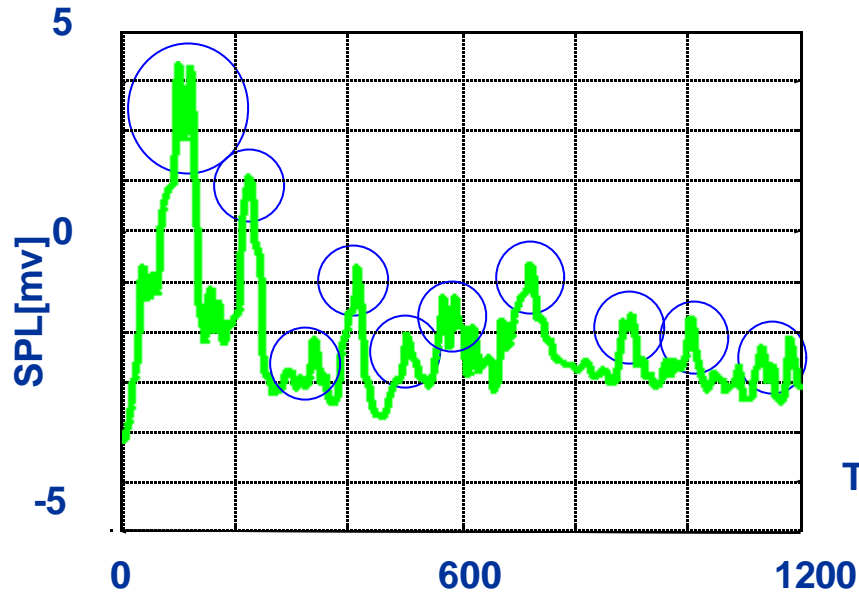


Fig.2-1 Driver's Mental Tension (Conventional)

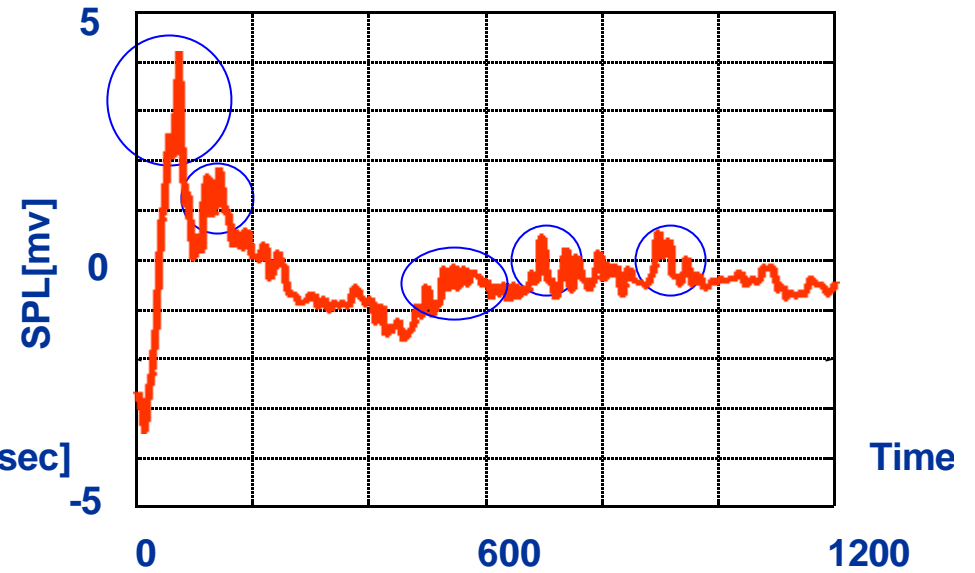
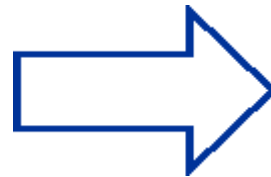


Fig.2-2 Driver's Mental Tension (Using HIDS)

Higher number of tension peaks



Mental tension is decreased



Mental workload is reduced

SPL: Skin (electric) Potential Level

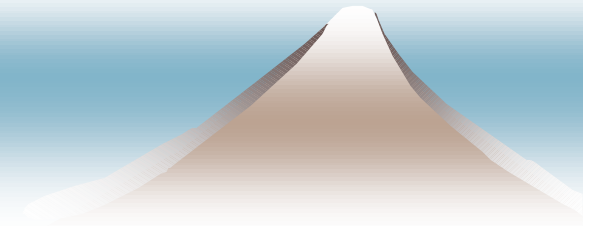
# Verification of Concerns with HiDS

There was a concern that such a near automatic system combining the ACC and the LKAS may adversely affect driving.

- Will HiDS contribute to a decrease in wakefulness?
- Will HiDS discourage drivers' motivation to drive?

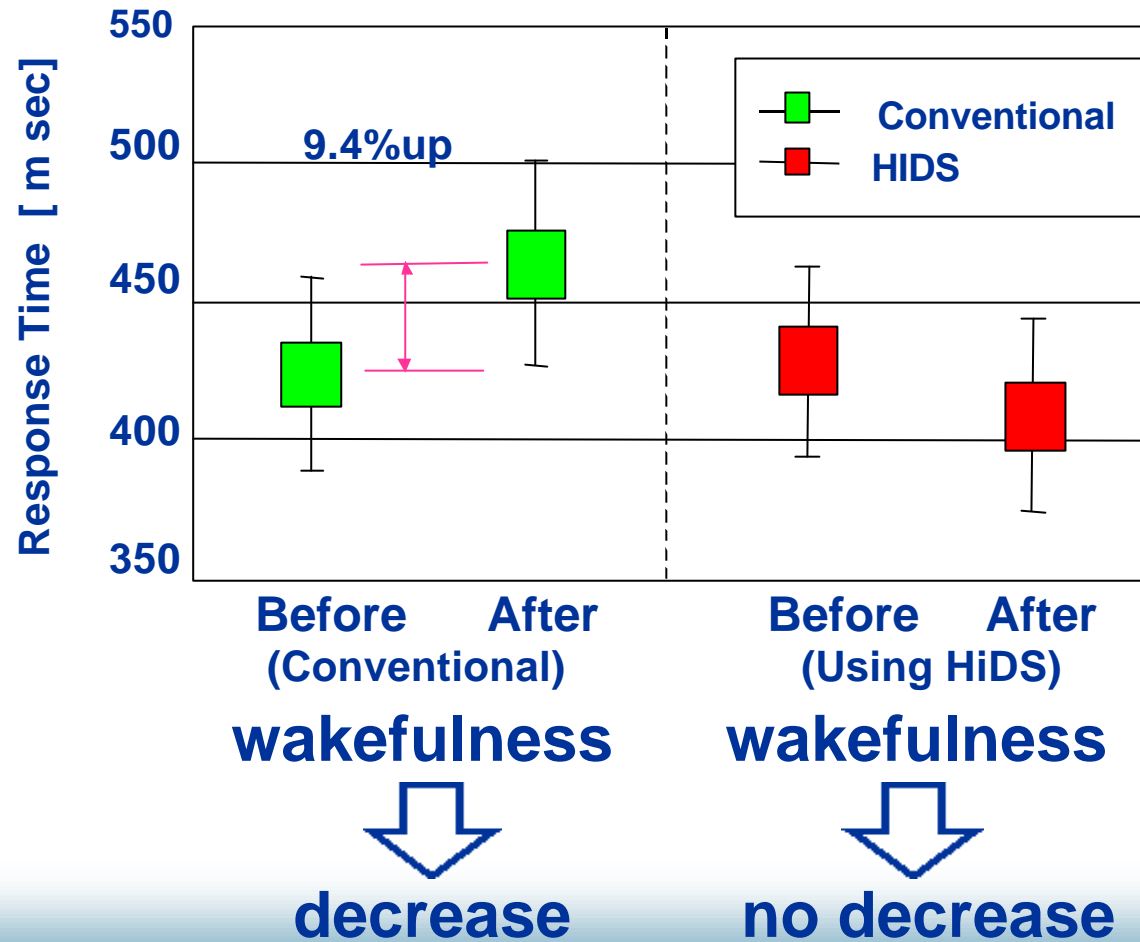


**Not at all**

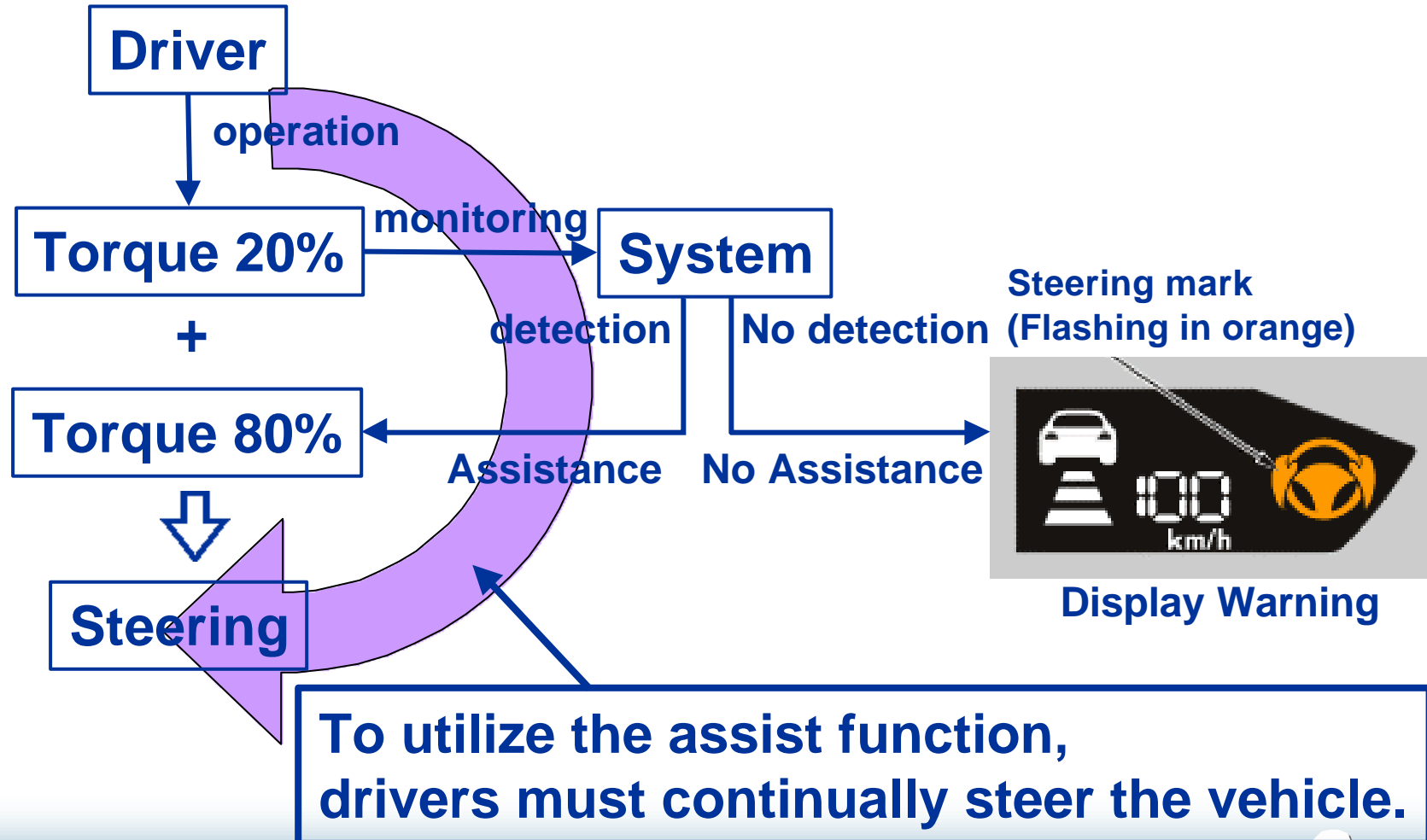


# ■ HiDS does not contribute to a decrease in wakefulness.

Fig.3 Visual Reaction Time



# ■ HiDS does not discourage drivers' motivation to drive.



# Conclusion

- HiDS is a human-centered, new-concept driving support system requiring a driver's operation as a prerequisite.

## New Concept

1. Human driver and the system must cooperatively drive together
2. Interaction between human and system

- HiDS lightens drivers' workload without reducing their wakefulness and motivation to drive.
- HiDS contributes to prevent "careless" or "absent-minded" accidents due to fatigue from long-time driving.