HONDA
The Power of Dreams

Consideration on Driver Interface for Future Active Safety Systems

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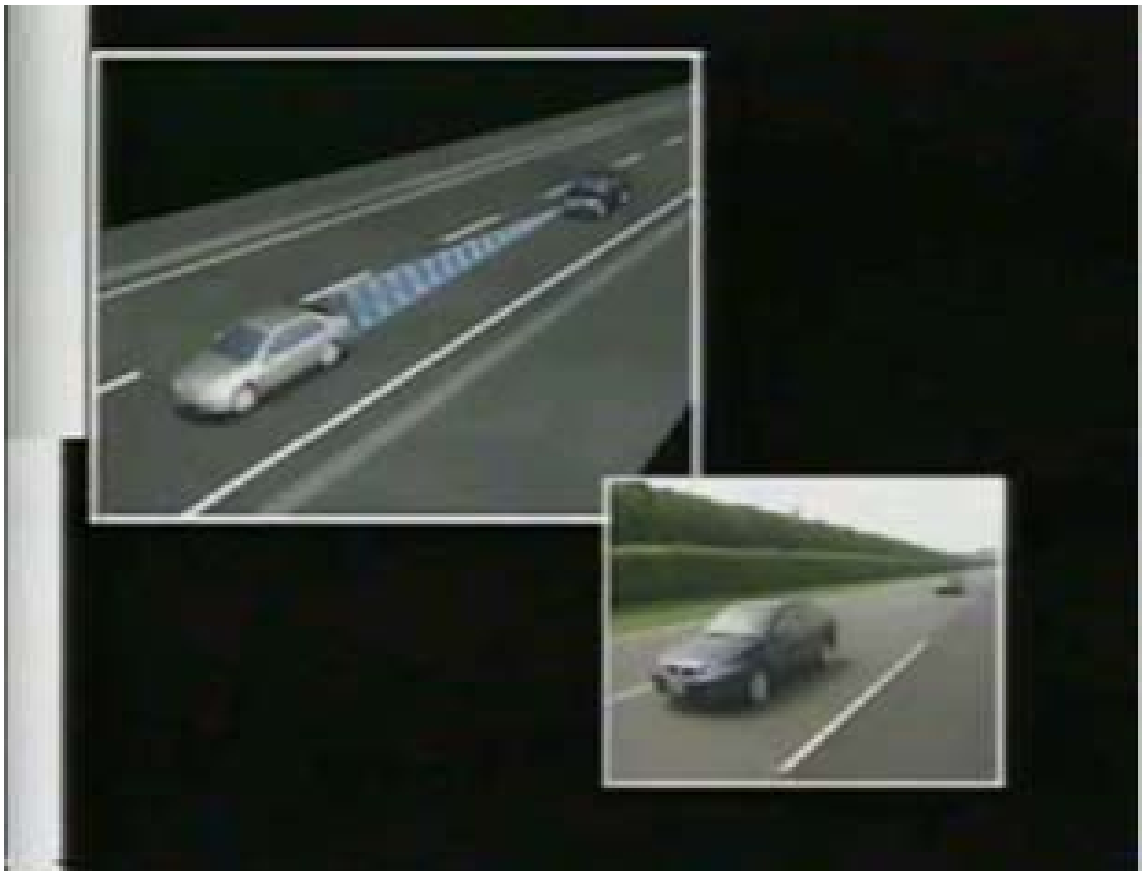
- Introduction
- Consideration
- HMI standardization
- Summary

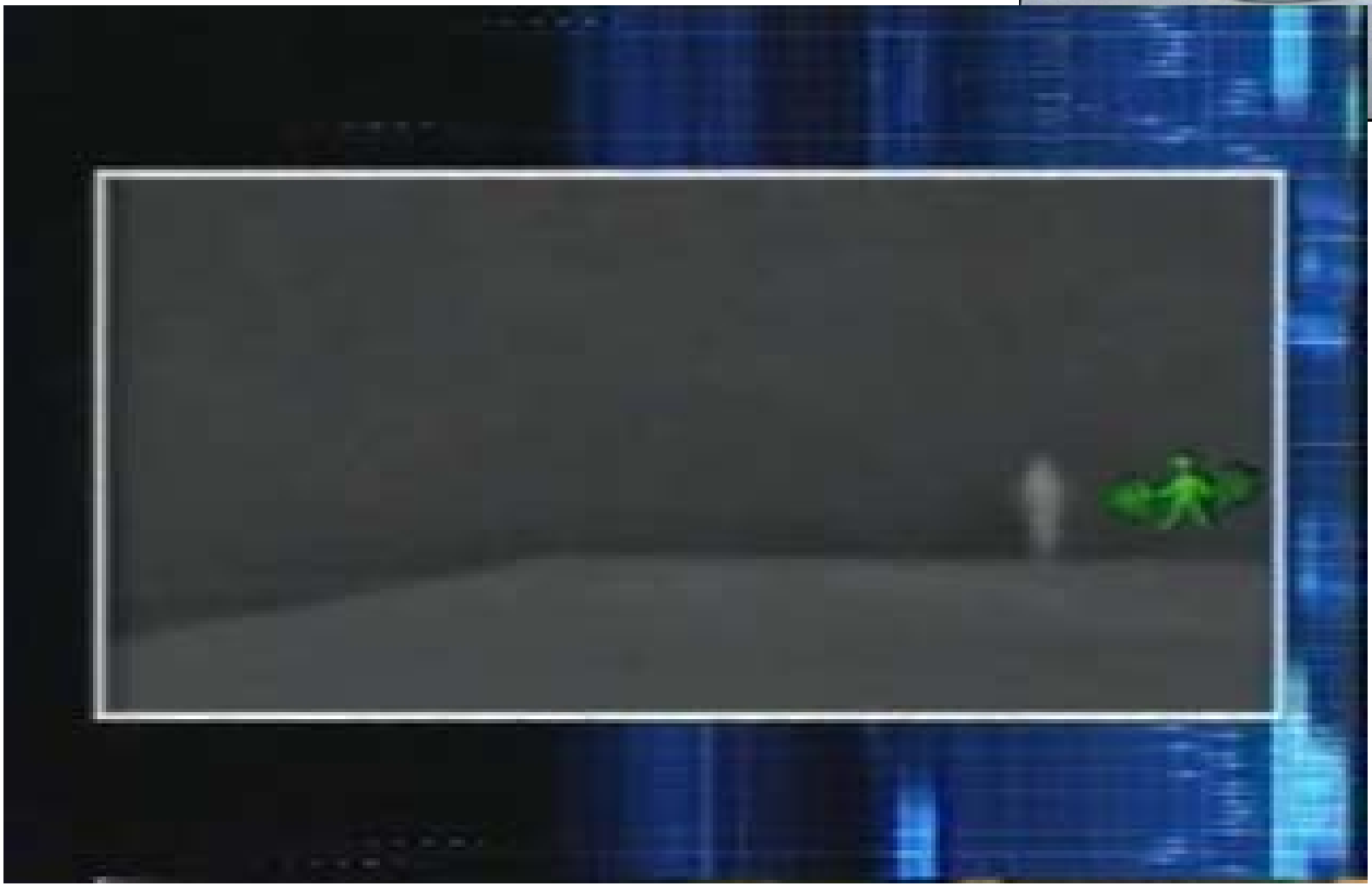
Current HMI for Active Safety System

- CMBS (Collision Mitigation Brake System)



Current HMI

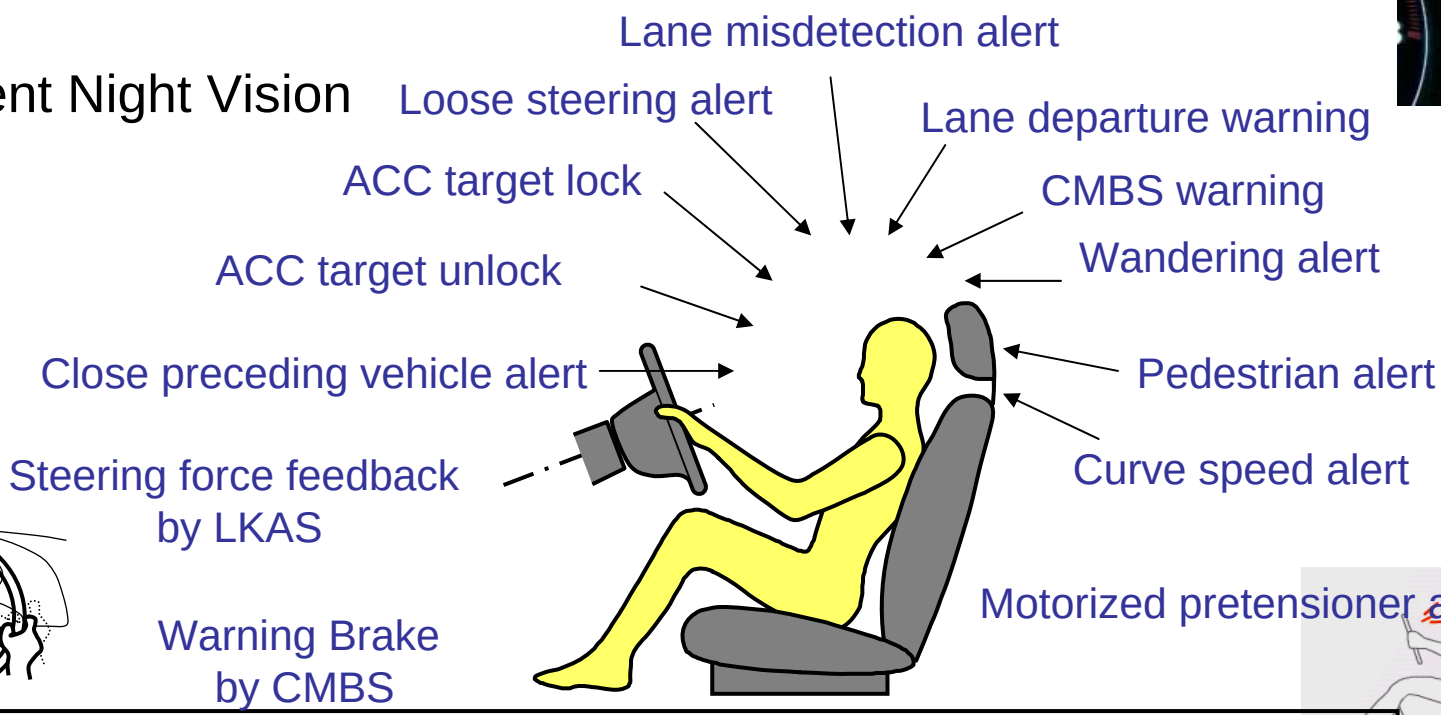
- Intelligent Night Vision system



Issue

Active Safety Systems (Legend in Japan)

- CMBS
- Intelligent Night Vision
- LKAS
- ACC
- etc.

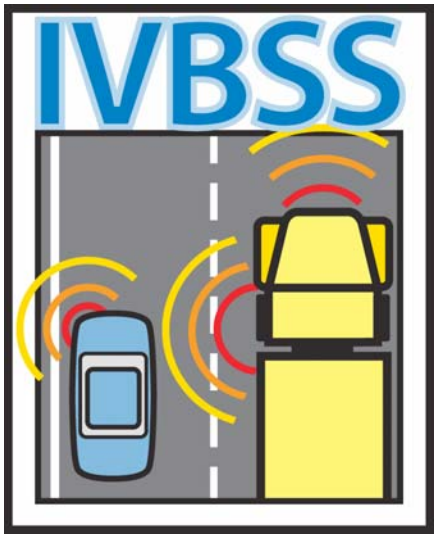


If additional alerts and/or warnings will be introduced without optimization

→Driver's frustration, annoyance and ability to react could be problematic.

IVBSS (Integrated Vehicle-Based Safety System)

- IVBSS is approaching integrated HMI



UMTRI

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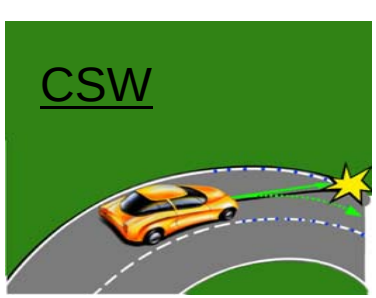

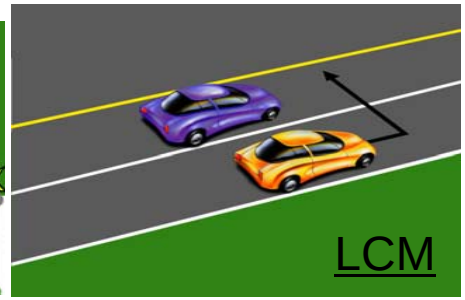

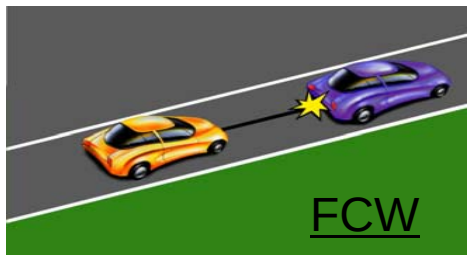

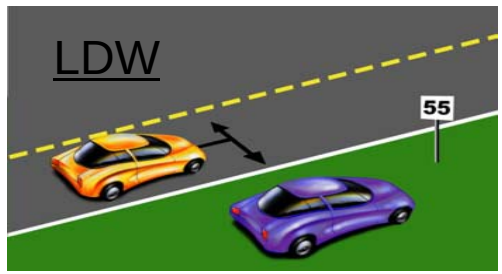

Honda is participating in IVBSS

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Issues

- Vehicle HMIs

  Classification of current alert / warning

Visual	CMBS warning Close preceding vehicle alert ACC target lock ACC target unlock Pedestrian alert Curve speed alert Wandering alert Lane misdetection alert Lane departure warning Loose steering alert
Auditory	CMBS warning Close preceding vehicle alert ACC target lock ACC target unlock Pedestrian alert Curve speed alert Wandering alert Lane misdetection alert Lane departure warning Loose steering alert
Tactile	Warning Brake by CMBS Steering force feedback by LKAS Motorized pretensioner alert

Issues

- Vehicle HMIs

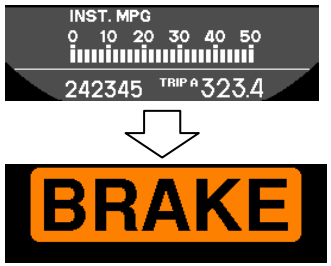
Red ones are just examples

Classification of current alert / warning

Visual	CMBS warning Close preceding vehicle alert Drowsy warning ACC target lock ACC target unlock Pedestrian alert Curve speed alert Wandering alert Lane misdetection alert Lane departure warning Loose steering alert Blind Spot Warning
Auditory	CMBS warning Close preceding vehicle alert Speed warning ACC target lock ACC target unlock Pedestrian alert Curve speed alert Wandering alert Lane misdetection alert Lane departure warning Loose steering alert Parking Aids
Tactile	Warning Brake by CMBS Stop sign misdetection alert Steering force feedback by LKAS Slippy road warning Motorized pretensioner alert Lane departure warning

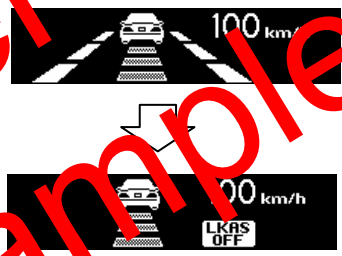
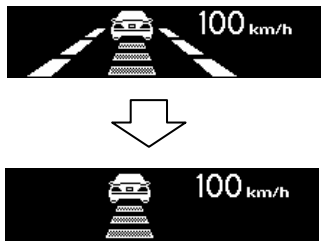
Current HMI

◆CMBS

Category	Status	Display	Auditory	Tactile
Operation Answer-back	CMBS OFF SW ON (System OFF)		Pi- 2KHz	
Vehicle Status	Dirty Radar surface		Pon 1.6KHz	
	System mulfunction		Pon 1.6KHz	
Radar info.	Forward collision warning		PiPiPiPiPi 2KHz	CMBS brake activated E-PT activated

Current HMI

◆LKAS

Category	Status	Display	Auditory	Vehicle
Operation Answer-back	LKAS SW OFF (System OFF)		No	
Vehicle Status	Lane Departure		Popopopo 1.6KHz	LKAS Operation Steering Torque
	System failure		Pon 1.6KHz	
Camera inf.	Lost lane marker		Pi 2KHz	LKAS activation

Other Examples

Issues

- Integrated concept for driver interface will be required
- Best usage of each advantage from each characteristics of visual / auditory / tactile HMI
- Decision on priority/urgency rating for many kinds of information
- Evaluation methodology and criteria are challenging

Comparison Between Different HMIs

- HMI warning types
  Visual / Auditory / Tactile

- Points of view

1. Quantity of information

   Good situation awareness
   Deep understanding of the meaning
   of the information

2. Intuitiveness

   Easy to understand what the driver should do immediately
   Correct response of the driver

3. Instantaneousness

   Quick response of the driver

Comparison Between Different HMIs

- Visual Information

Quantity	Large, especially if text or figures are used Maybe too much depending on the situation
Intuitiveness	Take some thinking task Difficult with light only
Instantaneousness	Slow, especially if text or figures are used Eye gaze may be distracted depending on the situation

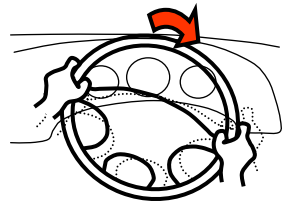
Comparison Between Different HMIs

- Auditory Information 

Quantity	Pretty much, especially if speech is used Small, if beep is used
Intuitiveness	Take some thinking task Difficult with beep only
Instantaneousness	A little slow, especially if speech is used Pretty fast, if beep is used

Comparison Between Different HMIs

- Tactile Information

Quantity	Small 
Intuitiveness	Good, if forces are feedback to steering wheel or pedals Depending on what sense will be touched
Instantaneousness	Fast 

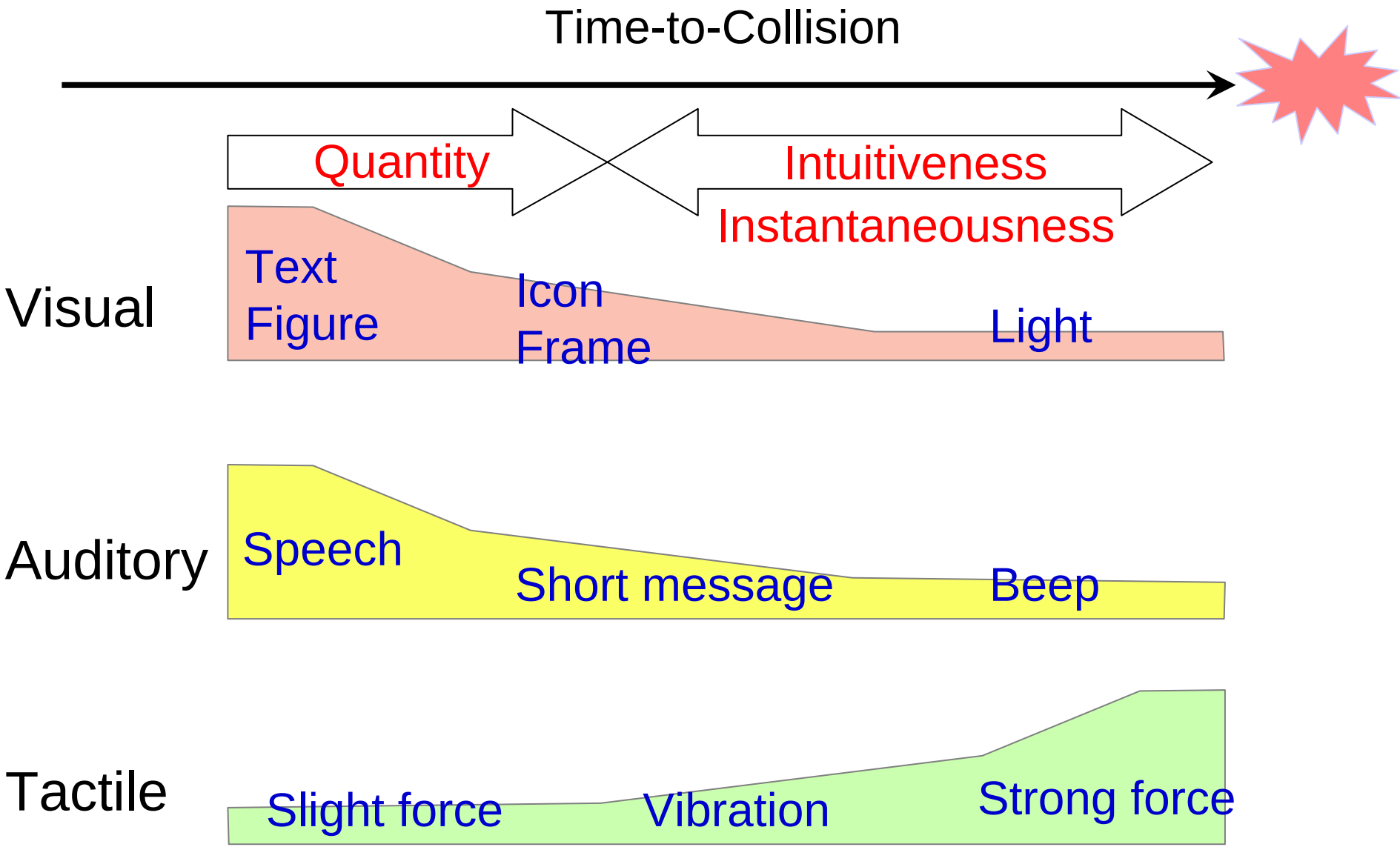
Consideration on Priority

Priority should be decided based on

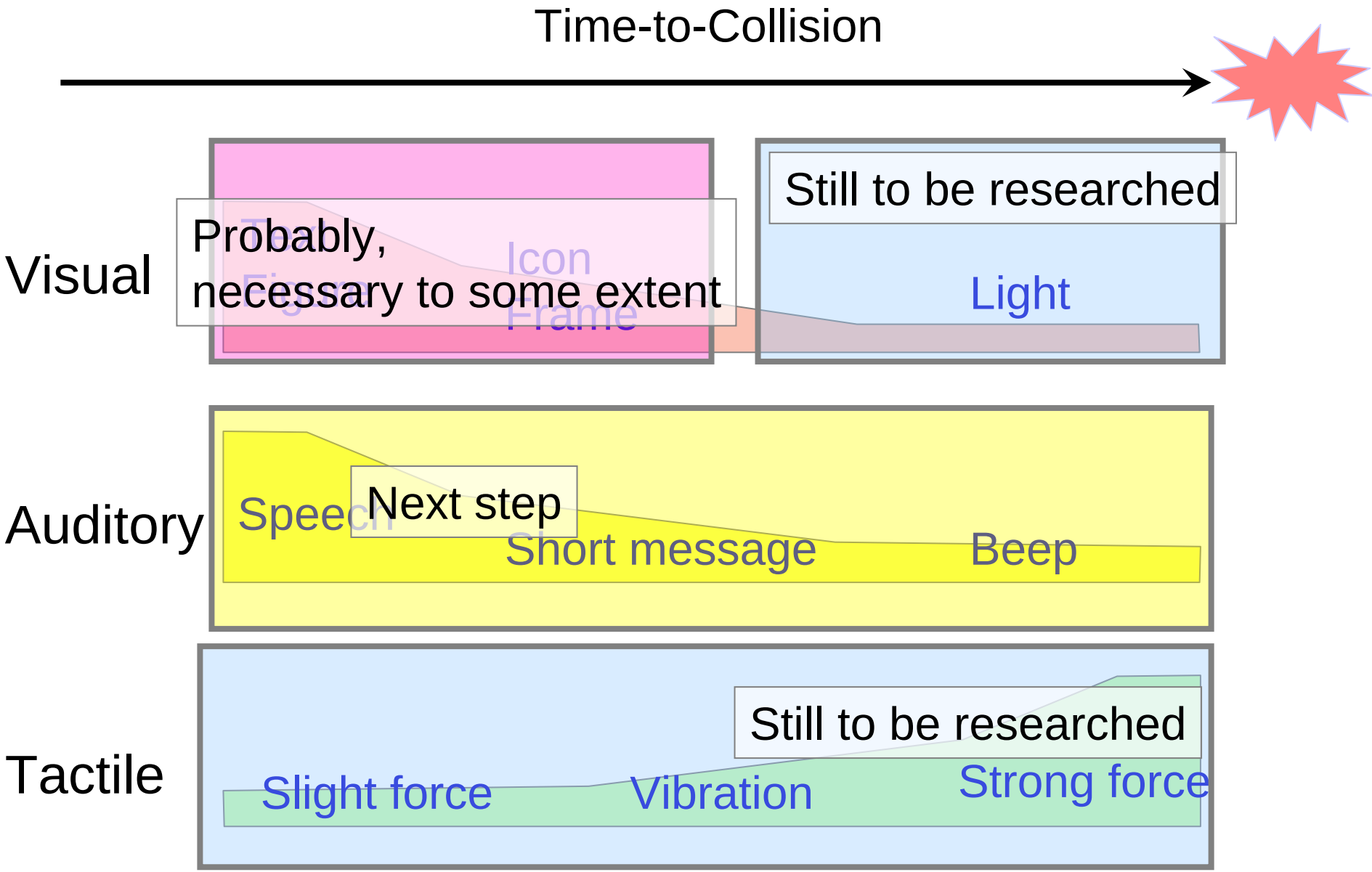
- Urgency
  Time to respond
  Time to Collision (TTC)
- Criticality
  Severity of predicted consequence

It is important to take advantage of
each HMI warning types' characteristics based on priority

Direction of Integration Concept



Is Standardization Necessary ?



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HMI standardization activities

ISO

- TS16951：Procedures for determining priority of on-board messages presented to drivers
- NP: Principles and guidelines for the integration of time-sensitive and safety-critical warning signals in road vehicles (Warning Integration)

IHRA

- ITS-WG: Start consideration of Warning Guidelines for WP.29 Informal group.

JAMA/JARI

- Study for HMI of driver assistant system (Safety information provided from infrastructures)

EC/PReVENT

- Code of Practice for the Design and Evaluation of ADAS (Ver3.0) released.

Harmonization is key!
We believe that NHTSA should participate in international standardization activities such as ISO and IHRA.

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Summary

- Needs for integrated interface of active safety system are increasing
- Deep consideration is required for selection on appropriate channels of senses and how to utilize them
- Better to consider standardization prudently, step by step and Harmonization is the key!

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THANK YOU !

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