Some Perspectives on the Standardization of Vehicular Multimedia

Masahito KAWAMORI,

Keio University, Japan

Focus Group on Vehicular Multimedia

- As ADAS (Advanced Driver Assistance System) and automatic driving technology is developing, the vehicle will become the third living and infotainment space besides home and office.

- A Focus Group on Vehicular Multimedia (FG-VM) has been established to identify the need for new vehicular multimedia standards based on <u>space and terrestrial networks integration</u>.

- The study will analyze and identify gaps in the vehicular multimedia standardization landscape and eventually draft technical reports and specifications covering, among others,
  - <u>vehicular multimedia use cases, requirements, applications, interfaces, protocols, architectures, and security</u>

Why is standardization important?

- Improved Interoperability
  - Products from different companies, countries can be used in the same way
  - Especially important in time of emergency

- Safer and more secure deployment
  - Intaroperability will enhance security
  - Compliance and certification will enhance safety

- Lowered cost of operation, purchase, etc.
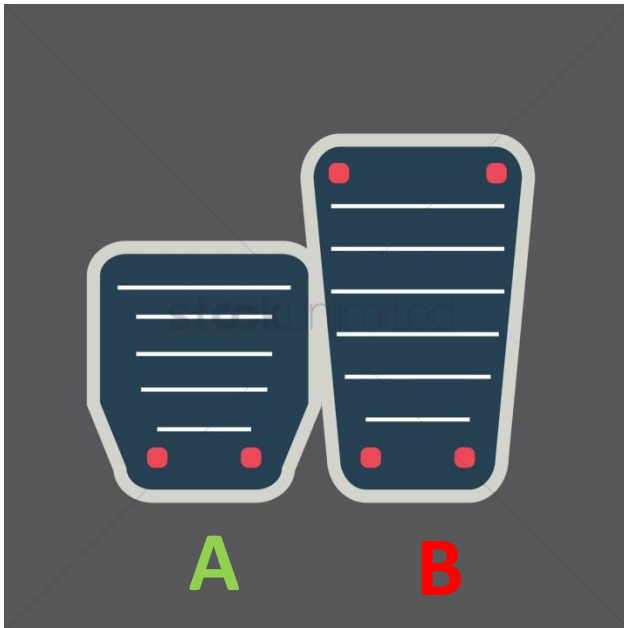 - More competition makes prices go down
  - More affordable to the user

- Lowered barrier to development and market entry
  - A wider market
  - More availability

Importance of Standards

- Imagine world where the positions for pedals in a car is not standardized – Is it safe?

ADAS
(Advanced driver-assistance systems)

- systems to help the driver in the driving process.

- automate, facilitate, and improve vehicular systems to assist drivers for a safe and better driving

- designed to improve driver, passenger and pedestrian safety by reducing both the severity and overall number of motor vehicle accidents.

- Can e.g., warn drivers of potential dangers, intervene to help the driver remain in control

- compensates for human errors

Typical ADAS

Lidar

GNSS antenna

Camera

INS solution

Steering actuator

Vehicle controller

77 GHz radar

Multi-layer laser scanner

Brake

APS signal

Gear shift

DMI

IMU

2D laser

Some of the Sensors on ADAS

- High Sensitivity Camera
- Ultrasonic Sensor System
- LiDAR
- RADAR
- IMU Inertial Measurement Unit (IMU)
- Inertial navigation system (INS)
- GNSS Global Navigation Satellite System,
- DMI (Distance-Measuring Instruments)

Typical Way Sensors work on ADAS

- Global Navigation – route
  - ADAS needs to keep track of overall progress along the route.
  - Typical sensor: GNSS
- Local Navigation – Context Marker detection
  - ADAS needs to be aware of a more local context including the things surrounding the vehicle
  - Typical sensor: cameras, LiDAR and ultrasonic systems.
- Vehicle Dynamics
  - Finally, the context of the vehicle and how it is moving through the immediate environment needs to be understood.
 - Typical sensor: IMU

# Scope of Vehicular Multimedia System

- Two primary multimedia systems on vehicle:
    - Interior Multimedia System
    - Exterior Multimedia System
- Interaction between these two systems
- Capturing, Presentation, delivery of the multimedia information within and between these systems
- E.g., *sensor data from GNSS and HD camera and a LiDAR is presented on Google map to further control the distance management system*

Interior Multimedia for Vehicle
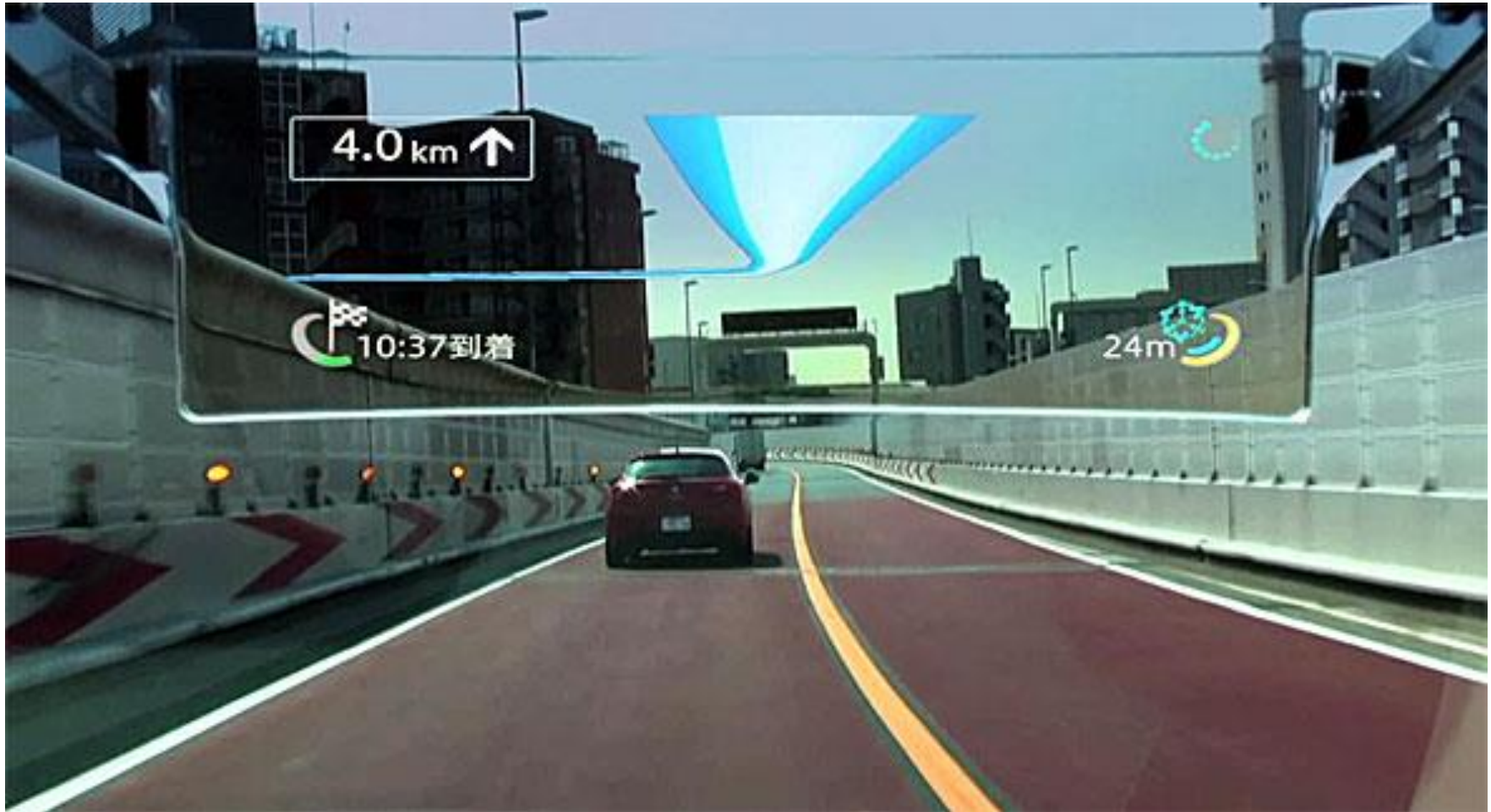
Interior Multimedia: BatMobile-like Entertainment System
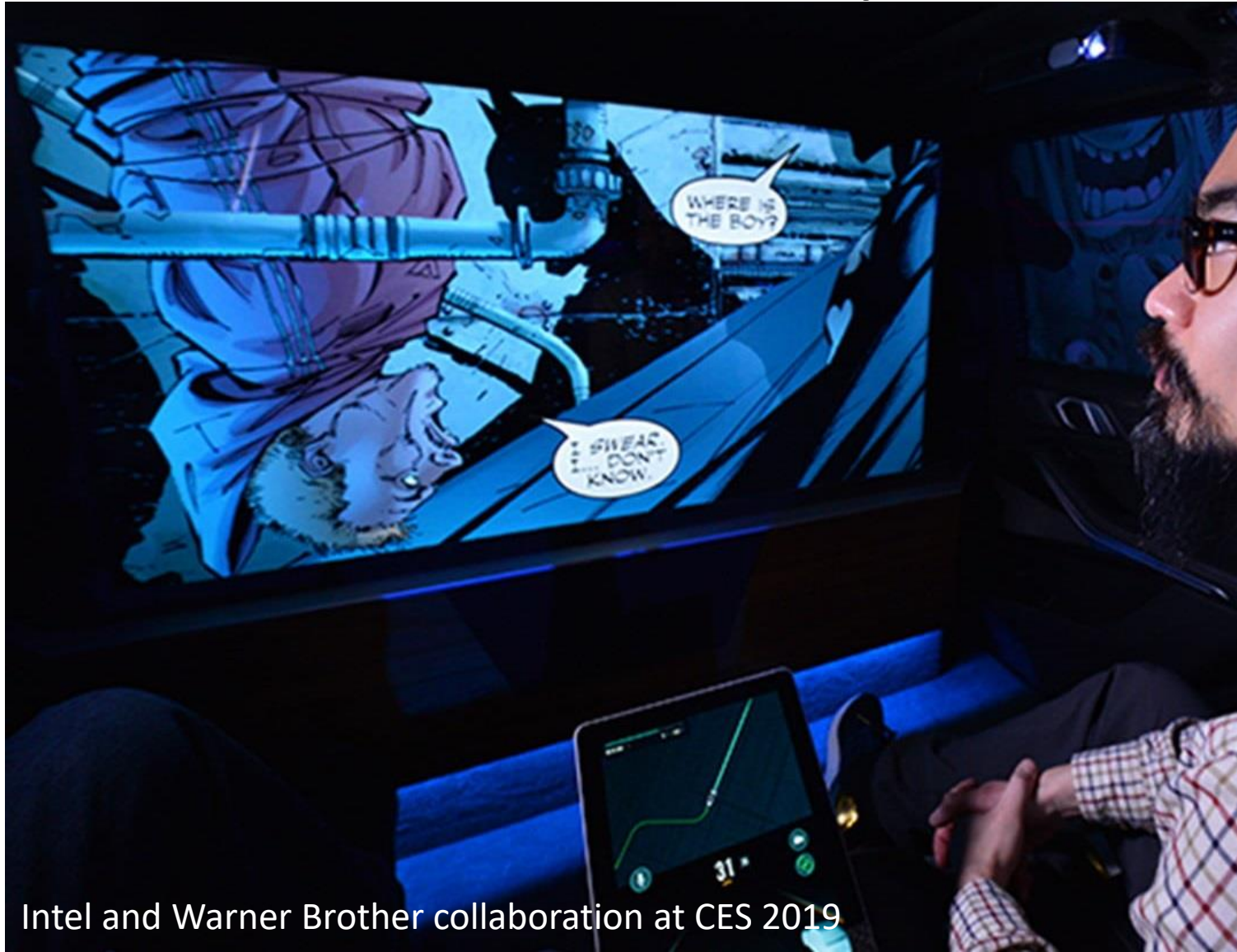
Intel and Warner Brother collaboration at CES 2019

Scope of multimedia

- From ADAS perspective, the most important features (requirements) on multimedia should come from Safety rather than entertainment.

- In this respect, "multimedia" can be considered as enhancement on human sensory capabilities

- ADAS compensates for our mistakes, be they inattentiveness, erroneous control inputs

Multimedia Sensors

- Multimedia for ADAS can be expanded beyond the usual Audio-visual
- Current sensors primarily used
  - Visual image: LiDAR, RADAR, HD camera, etc.,
  - Auditory – sound = ultrasonic, alarming system
- Other possible sensors
  - Haptic -Touch
  - Olfactory -Smell
- And more unknown areas and possibilities

Extension of sensors

Electrocardiogram-waveform transmitter

- Wearable sensor "shirt" used for monitoring driving
- Can be used with ADAS to monitor driver (e.g., long-distance passenger bus)'s health

ADAS and Human Errors

- Most road accidents occur due to *human errors.*

- ADAS, especially multimedia technology therein, is expected to compensate for human errors, enhancing or replacing human sensory capabilities

- Multimedia in ADAS will become "eyes" and "ears" (and "nose" and "finger") of the human driver

Human Error vs Disability

- Human error can be considered a temporary disability at the performance level
- temporarily disabled = unable to perform something that is normally a person is capable of
- E.g.,
  - *"I can run 100 meters in 11 sec, but I cannot run as fast today because I have a hangover."*
  - *"I can swim (I know how to swim) but I cannot today because I have a broken leg"*
- I.o.w., Assuming the driver is (temporarily) disabled will reduce human errors and enhance safety

Accessibility and Multimedia Design

- Accessibility can be defined as "designing products, devices, services, or environments for people with disabilities"

- Accessibility is strongly related to **universal design,** the process of creating products that are usable by people with the widest possible range of abilities, operating within the widest possible range of situations.

- It is also related to **Inclusive Design,** the design of an environment so that it can be accessed and used by as many people as possible, regardless of age, gender and disability.

Accessibility and Aging Society

Senior Citizen Drives Car Into Ice Cream Shop
The Inquisitr - Dec 29, 2018
More facts about **seniors** driving state that fatal **car crash** rates increase per mile beginning at age 75, rising sharply after the age of 80 due to ...

Driver crashes through Safeway store in Junction City
KPTV.com - Feb 18, 2018
A driver crashed through the front of a **Safeway** store in Junction City Sunday. ...
12:40 p.m. Junction City police said an **88-year-old** man drove through the windows ... Police said the **car** came to a stop in the produce section.

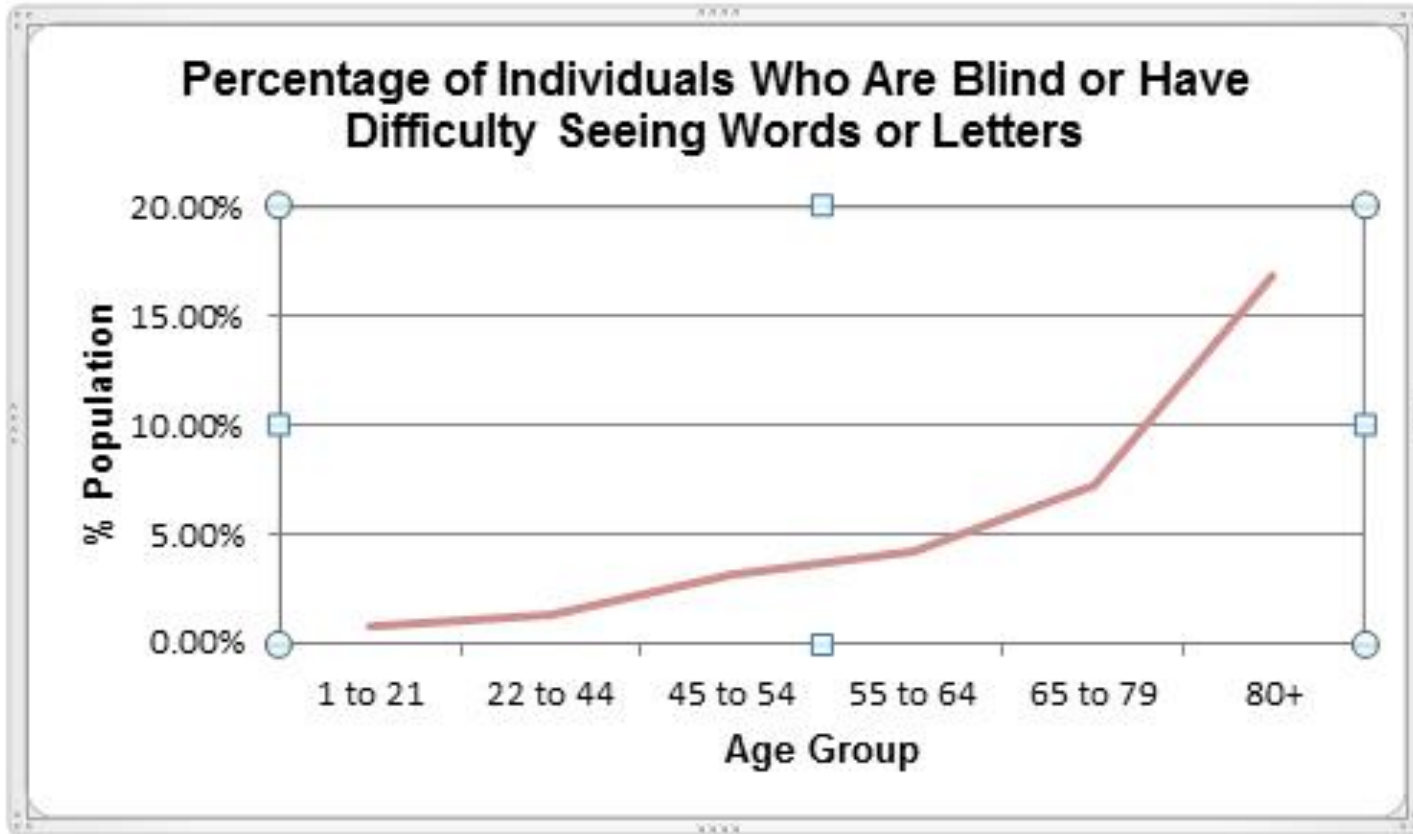No criminal charges filed after **88-year-old** crashes into Junction City ...

Older drivers: Is age a factor behind the wheel?
BBC News - Jan 18, 2019
AA president Edmund King said high profile **car crashes** involving **elderly** drivers often spark calls for bans or restrictions - but it is younger ...
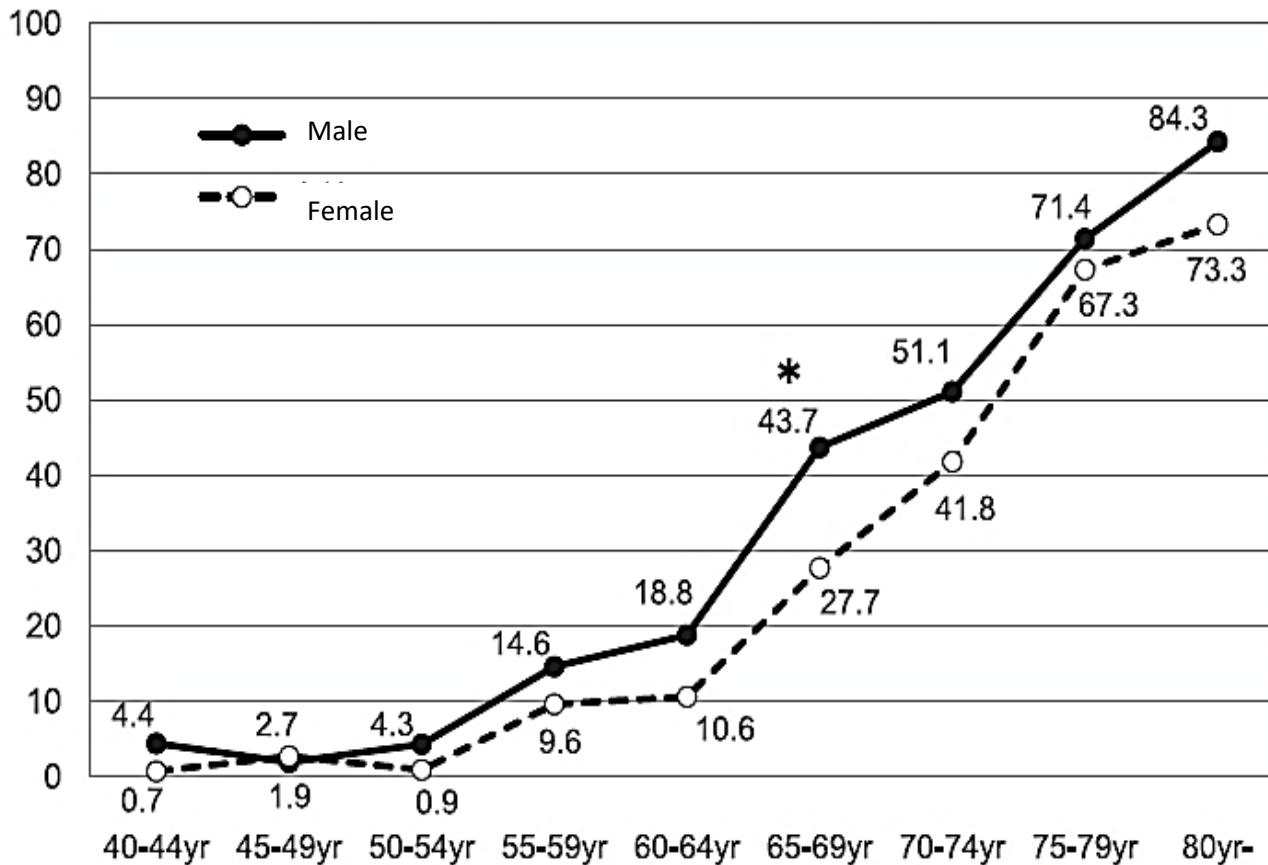
Vision loss and Aging

Percentage of Individuals Who Are Blind or Have Difficulty Seeing Words or Letters

- In the US, he onset of age-related vision loss can be seen to begin in people in their late 40s or early 50s.

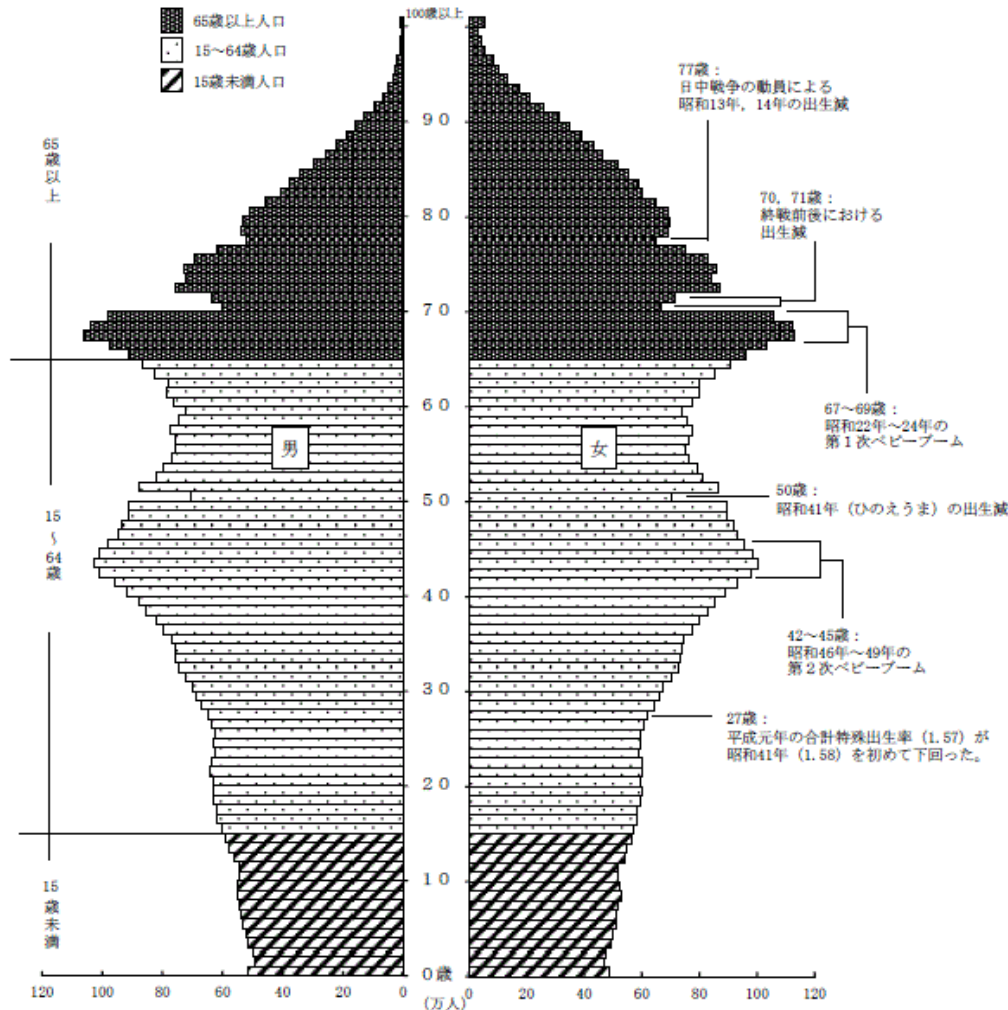http://www.afb.org/info/for-employers/visual-impairment-and-your-current-workforce/age-related-vision-loss/345

Hearing loss and Age

J. Japan Gerontology 49 : 222-227, 2012

- In Japan, after the age of 65, the number of hearing loss suddenly increases

- Over the age of 80, about 80% is hard of hearing

Aging Society

図2　我が国の人口ピラミッド（平成28年10月1日現在）

- The people over the age of 65 accounts for **27.3%** of the population of Japan

- This may imply that over 30% of the population probably have either vision (near-)loss or hearing problem

- Consumer Electronics Show (CES), world's biggest showcase of multimedia, promotes accessibility as a major issue

- *Stefan risked life and limb for freedom.*
- *Technology gave it back.*

- Olli, introduced in CES2017 by IBM as accessible vehicle, has become a mainstream EV in CES 2019.

Accessibility as a design principle of ADAS

- By designing ADAS with accessibility, it will be universally applicable

- Accessibility will raise the level of security and safety requirements

- If the car can be driven safely by a deaf-blind person, anybody can drive that car safely.

Conclusion

- Multimedia can be exterior as well as interior
- (Multimedia) sensors should be expanded beyond audio-visual
- Safety is the utmost importance of multimedia for vehicles, including ADAS
- Human error is a sort of (temporary) disability
- As the society ages, accessibility will become a more important design principle
- Accessibility should be part of the requirements on Vehicular Multimedia standards from the very beginning

- Thank you