

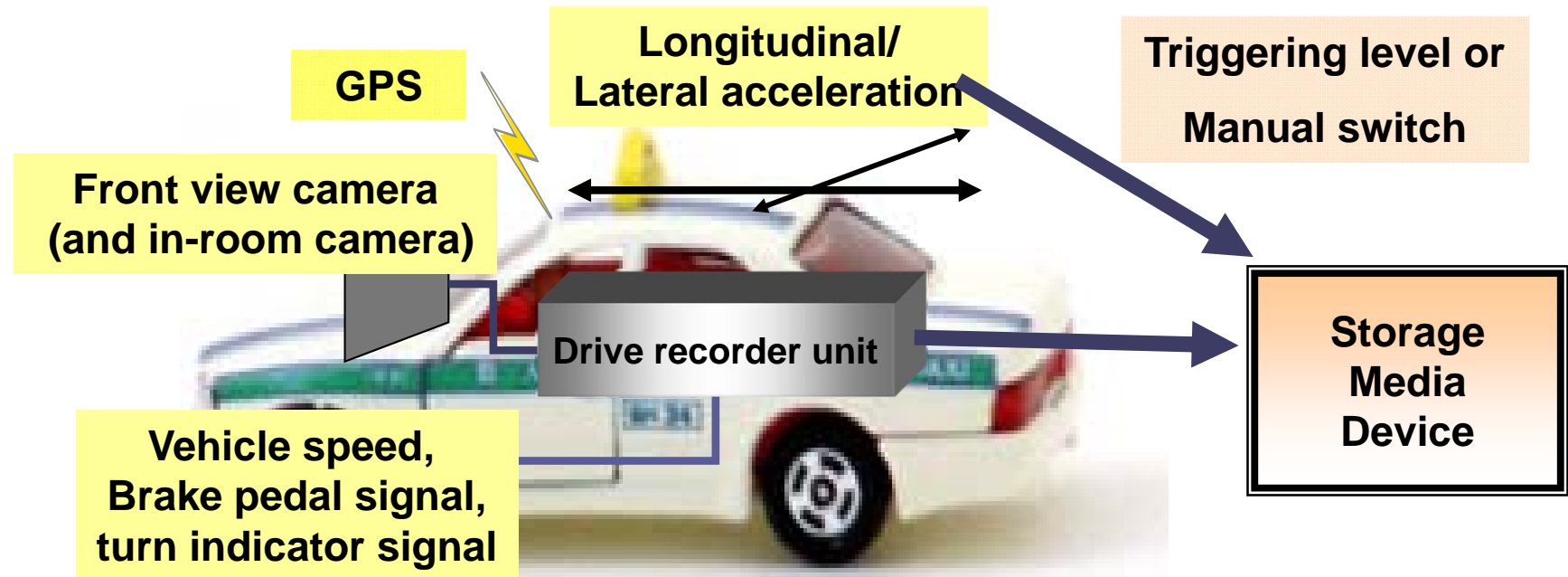
Drive Recorder Database for Accident/Incident Study and Its Potential for Active Safety Development

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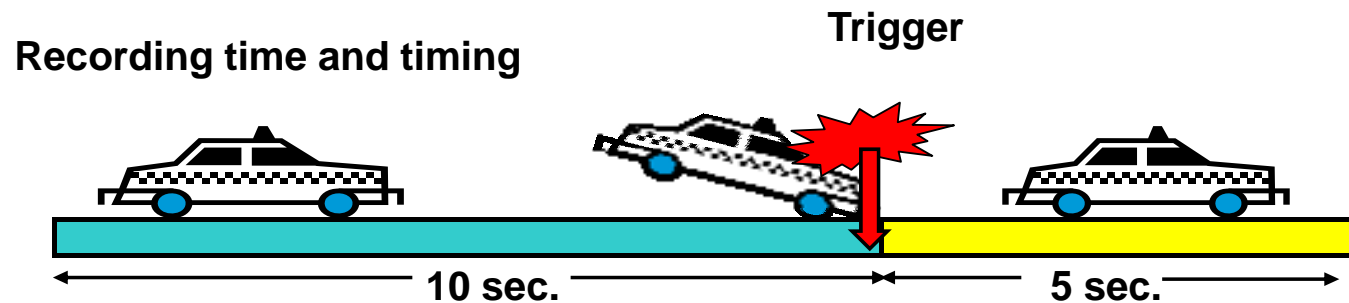


Recording device : Image-captured drive recorder



| | | | | |
|--|--|--|--|--|
| <p>HORIBA ITECH DR3031 (1-camera) DR6200 (2-camera)</p> | <p>△ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ×</p> | <p>Camera images X-Y-Z acc. Vehicle Speed Brake pedal signal Turn Indicator signal GPS (Map show) Manual SW for rec. Audio</p> | <p>○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○</p> | <p>HORIBA ITECH DR9100 (2-camera)</p> |
| | <p>Cameras and recording device are integrated in 1 unit.</p> | | <p>Cameras and recording device are separated.</p> | |

Trigger Level for Data Recording and Recording Time



Condition for the trigger

- Combined acceleration exceeds **0.45G** (or manual rec. SW).
- Recording time : 10 seconds before the trigger and 5 seconds after the trigger.
- Consequences of accident/incident can be observed by video together with the vehicle dynamics data.

Field Area for Data Collection

Hokkaido pref. Sapporo city
15 vehicles (2-camera)

Shizuoka pref.
Shizuoka city
20 vehicles
(1-camera)

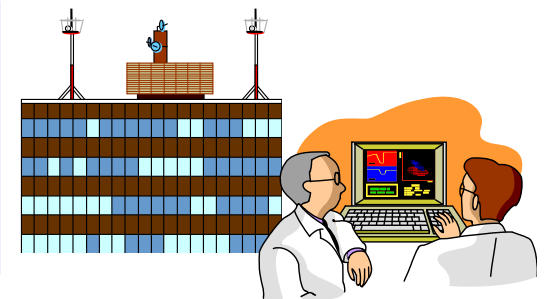
Akita pref., Yurihonjo city
23 vehicles (2-camera)

Data storage

Drive Recorder Data
Center in TUAT

Tokyo metropolitan area
125 vehicles
(10 vehicles with
2-camera type recorders)

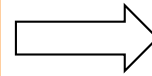
Fukuoka pref.
Fukuoka city
15 vehicles (2-camera)



Description of Driving Database System

Conventional approach of road accident analysis

National Police Agency
ITARDA * macro statistics and micro data



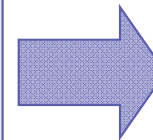
Data is recorded based on interview.
No precise information about crashes.

Drive recorder data analysis

Logged driving data (by direct measurement)

- Vehicle speed
 - Driving maneuvers (brake, turn indicator)
 - Location
 - Relative distances with surroundings
 - Surrounding environments
 - Headway distance
 - Driver behavior
 - Passenger behavior
- } **2-camera type**

Image analysis

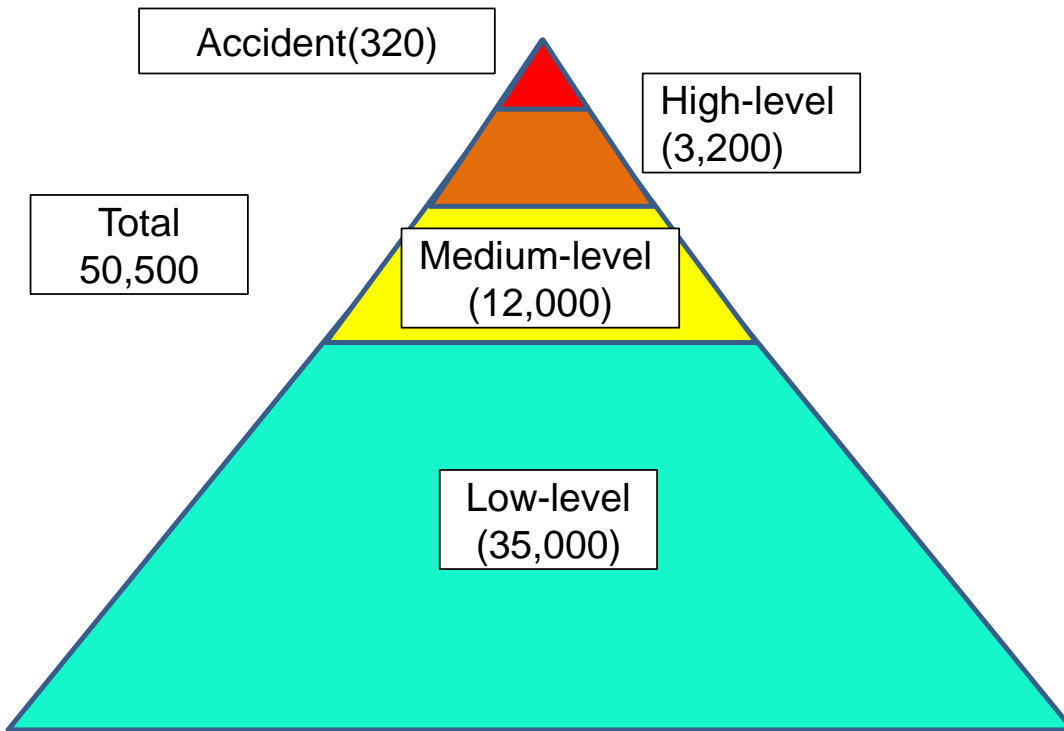


Database construction

- To obtain definite consequences of crash-relevant-events.
- Data can be retrieved from classification categories and statistical analysis can be done easily.

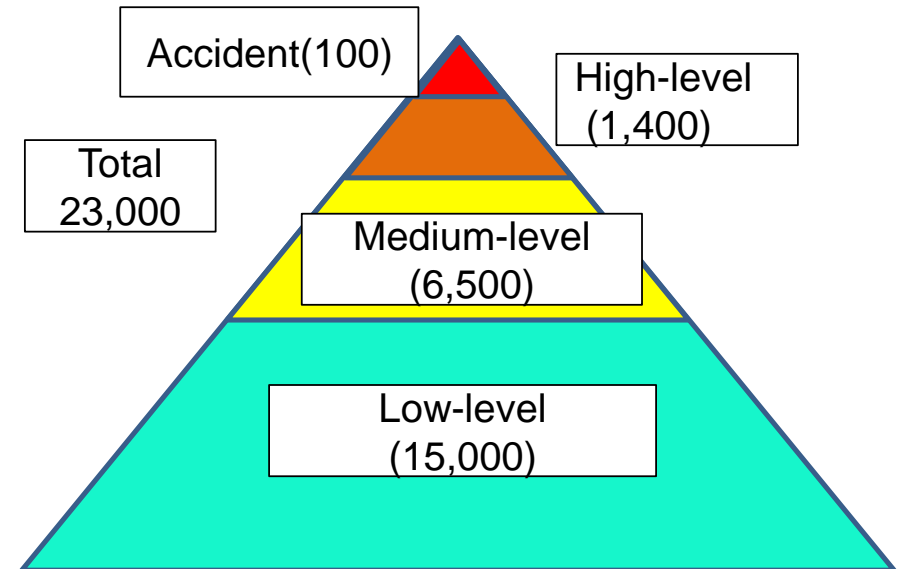
Breakdown of incident data classified by level of criticalness

1-camera database

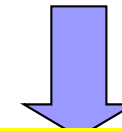


In-depth analysis can be done by using large amount of 1-camera near-miss incident data.

2-camera database



The cause factors of accidents can be observed from in-room camera images.



2-camera data collection and analysis will be extensively conducted.

Items for Classifications

The database is mainly based on ITARDA data classification method with combination of some items from National Police Agency.



Database for Traffic Incident

Incident or Waste

Basic Info.

Date
ID
Location
Speed
...etc
40 items

Object

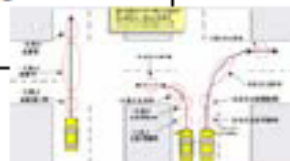
Who Is Object
Human
Bicycle
(Age, Sex)
Motorcycle
Vehicle
(Type)
Independent
...etc
25 items



My State

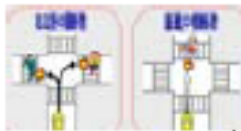
Progressing State
Starting
Accelerating
Decelerating
... etc
8 items

Motion
Going straight
Approaching to Intersection
Preparing turning right
Starting turning right
Turning right
... etc
87 items



Type

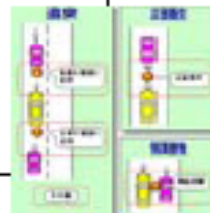
Typical Incident
(Human or Bicycle)
Dash out
Traverser while turning
...etc
6 items



Typical Incident
(Motorcycle or Vehicle)
Right and Straight
Rear-end
Interruption
... etc
11 items



Collision Type
(Motorcycle or Vehicle)
Frontal
Rear-end
... etc
9 items



Typical Incident
(Independent)
Oversight
Collision to parked car
...etc
9 items



Distance to Object



Object's State

Progressing State
(Human or Bicycle)
Facing direction
Same direction
Crossing
...etc
17 items



Progressing State
(Motorcycle or V)
Starting
Accelerating
Decelerating
... etc
8 items



Motion
Going straight
Approaching to Intersection
Preparing turning
Starting turning right
Turning right
... etc
87 items



Explanation

Surroundings

Surroundings
Shape
Priority road
Traffic light
Stop line
Number of lane
Brightness
Pedestrians
Traffic
Parked vehicles
... etc
41 items

Factor

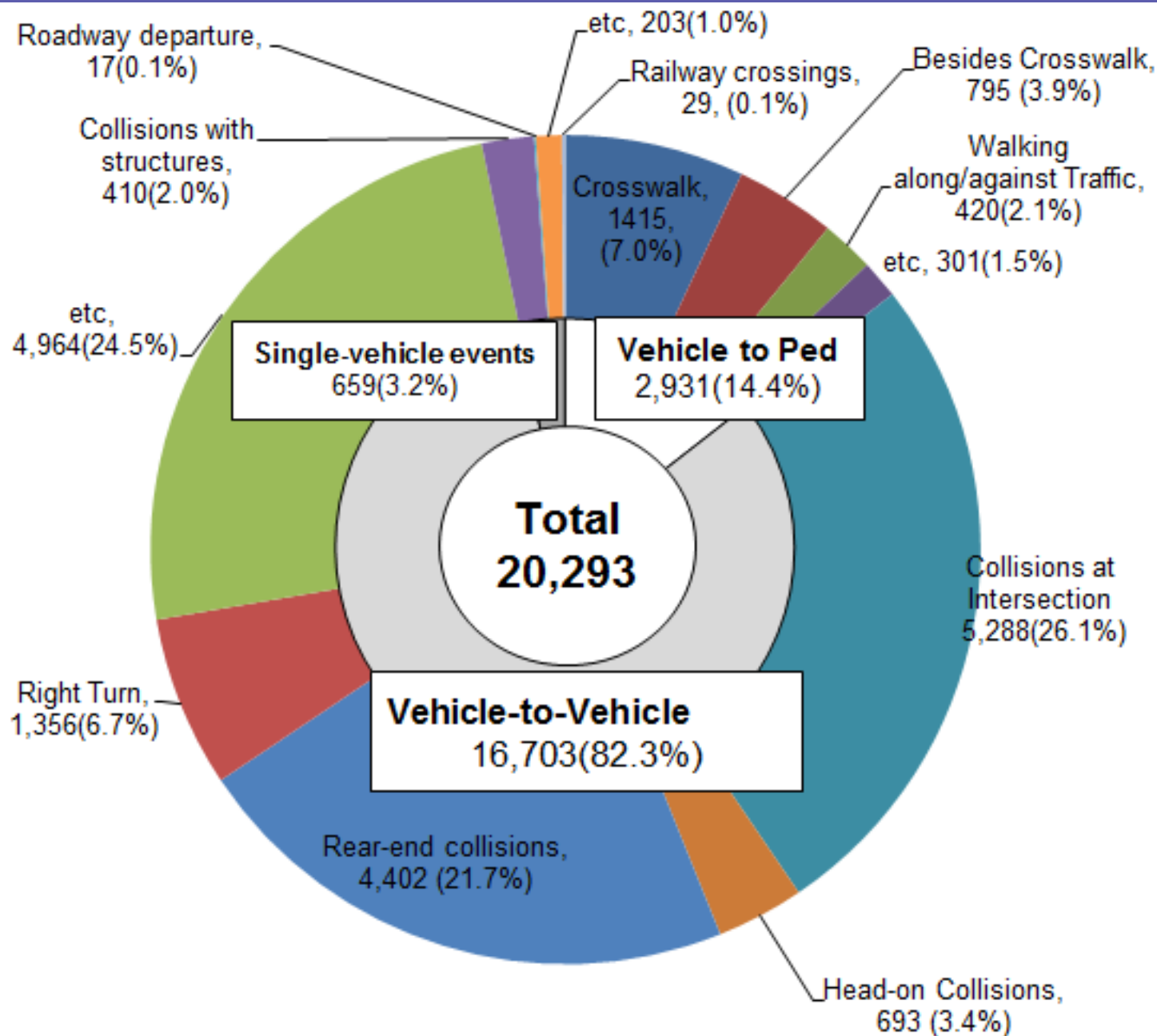
Factors
Confirmation
Velocity
Inattentive
Aimless
Obstruction
Ignoring light
No gaze
... etc
90 items

Graphic User Interface (GUI) for Database Handling

The screenshot displays a software interface titled "MovieWindow made by FSOFT". It features several key components:

- Header Information:** Editor Name (Mitsunobu Fujita), Case ID (146902), and buttons for "To Init." and "Exit".
- Case Details:** ID No. (272), Vehicle No. (早立500V-1571), and Date (07/10/20 07:47:12).
- Location Data:** Longitude/Latitude (35.651571667, 139.770831667, 321.38) and Location/address (東京都中央区).
- Map:** A street map showing the current location in Tokyo.
- Graphs:** A line graph showing "Acceleration[G]" vs "Time[sec]". It includes data for Speed (blue), Acceleration(Forth) (red), Acceleration(Side) (orange), and Brake (green). Below the graph are indicators for Brake, Winker L, and Winker R.
- Video Feeds:** Two camera views: "In-room camera" (showing a driver) and "Front-view camera" (showing a street scene). A speedometer overlay shows "32.1 km/h".
- Control Elements:** "Camera image switching" buttons (Fast, Norm, Slow), "Turn indicator" (Left Winker, Brake, Right Winker), and "Vehicle speed (numerical display)".
- Analysis Tools:** "Features" (Maximum Speed, Acceleration Difference, Maximum Jark), "Narrative comments" (with a text area), and "Data numbers" (289 / 289).
- Classification:** A "Detail of classification" section with checkboxes for "ヒヤリハット" (High/Low/Reaction level) and "事故" (Accident), and a "検索項目" (Search items) list including "対象: バイク" (Target: Motorcycle), "左折" (Left turn), and "追突" (Rear-end collision).

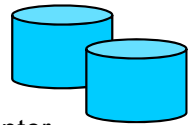
Breakdown of the accident/incident data (as of Sep.2013)



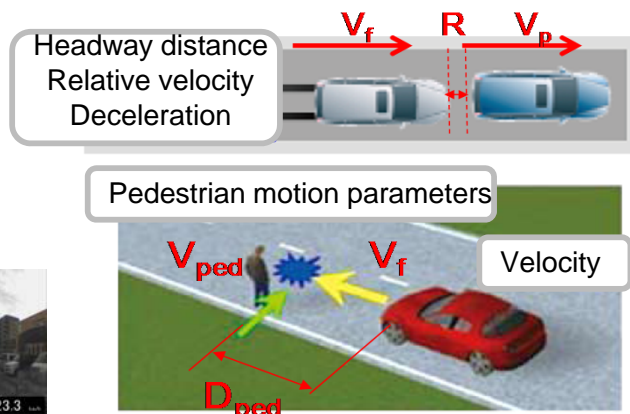
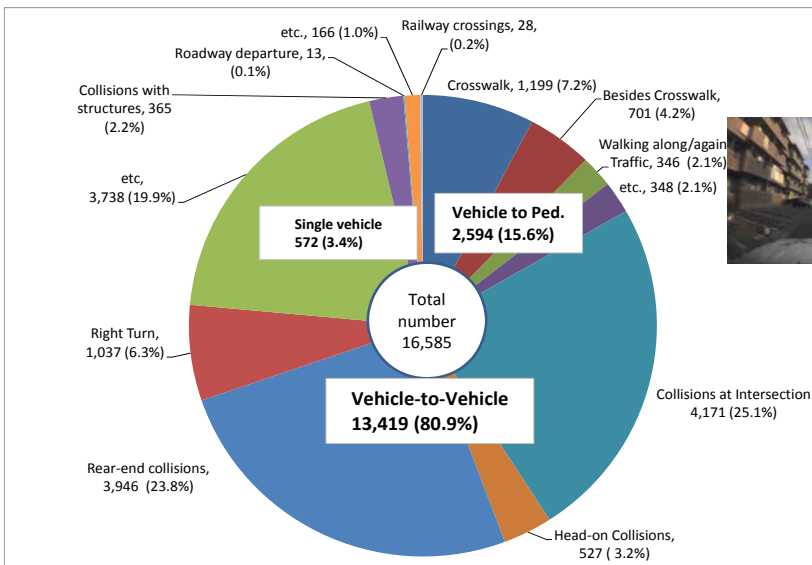
Near-miss incident DB for accident reconstruction modeling

- **Hazard anticipation driver modeling** based on real-world driving situations.
- **Systematic accident reconstruction model** by identifying the environment parameters from real world data.
- **Implementation and functional testing** of the autonomous driving intelligence systems on DS.
- HMI investigation for **seamless override**.

Near-miss Incident Database Macroscopic Analysis



Courtesy: TUAT Smart Mobility Research Center



Accident reconstruction modeling



Accident reconstruction modeling & Environment parameter identification

Driving Simulator for Effectiveness estimation in man-machine system

List of near-miss scenes

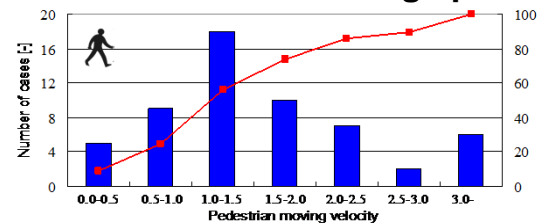
Scene A.



Scene B.



Pedestrian moving speed



Pedestrian appearance timing



Relevant Partners in Accident/Incident Data Analysis

① Accident/Incident Study:

Tokyo Univ. of Agri. & Tech., U. of Tokyo, Ibaraki Univ., Akita Pref.Univ., NTSEL, Jiken Center



② Active Safety Device Development and Assessment:

11 Automotive Manufacturers, and 7 Automotive Suppliers.

③ Road Infrastructure Improvement:

MLIT, CTIE, Metropolitan Expressway, etc.



④ Safety Education:

National Police Agency, JSAE, etc.



Data Sharing Activities in Japan

① 「2-Camera Drive Recorder Research Group」

- ◆ Promoting traffic safety research by making use of 2-camera drive recorder data
- ◆ Fulfillment of 2-camera drive recorder database content
- ◆ Sharing Information relevant to drive recorder and road-accident study
- ◆ July 2012 started. (2 universities and 7 automotive-related companies)
- ◆ Research group members pay for data maintenance and new data update.

② 「Drive Recorder Utilization Research Group」

- Current status of drive recorders and recent activities in data analysis, including information sharing about the perspectives of the vehicle safety technology and investigations on new approaches of active safety.
- Started in May 2011.
(5 universities, 9 government-related research institutes,
9 automotive-related companies, 2 insurance companies, 4 user groups)

Examples of information sharing by each research group

1. Automotive manufacturers

- **Honda, Nissan etc.:** Incident data classification by active safety countermeasures
- **Toyota CRDL:** Investigation of pedestrian motion modeling
- **Mitsubishi:** Effectiveness estimation of intersection collision prevention systems

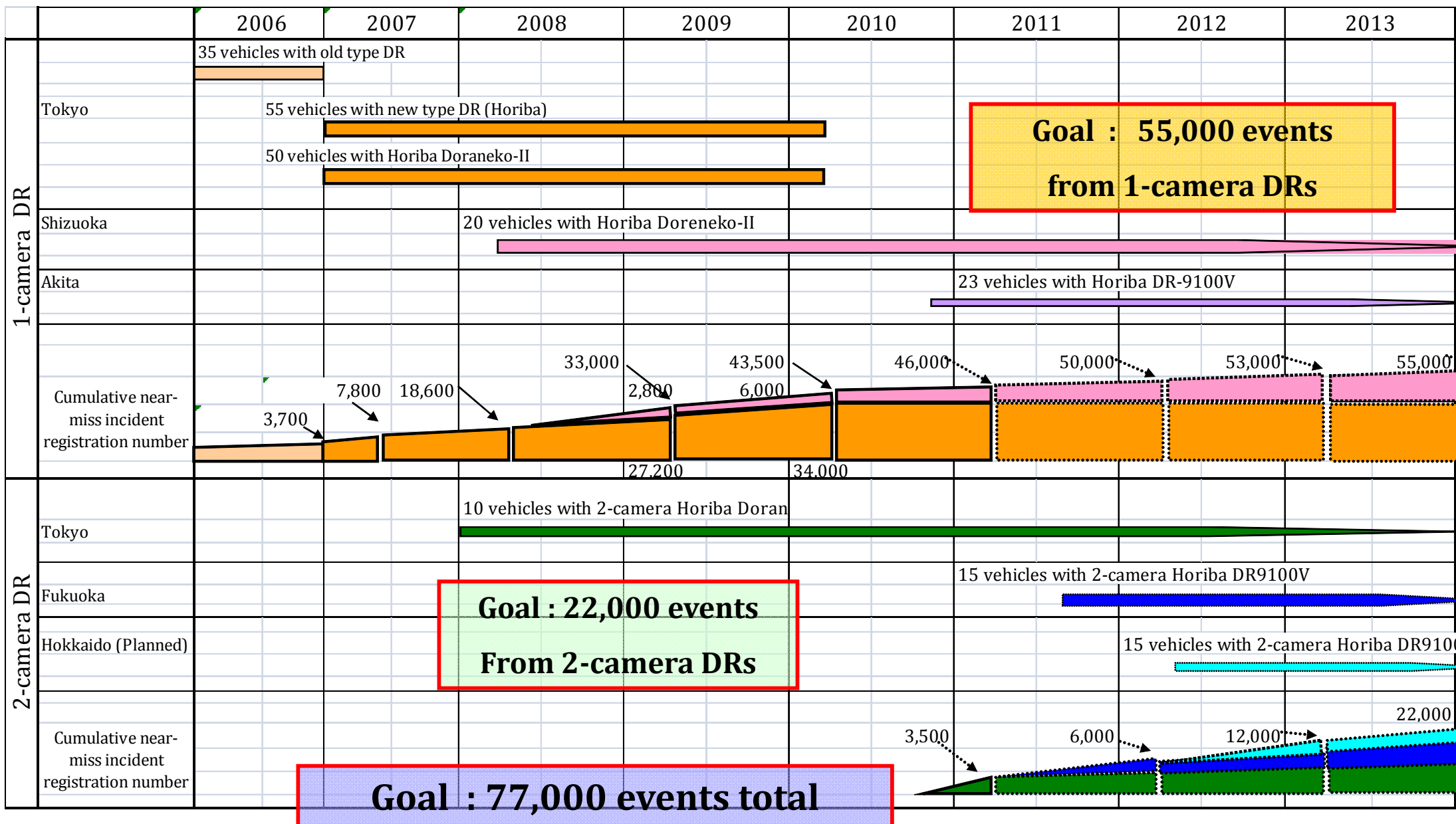
2. Governments and National Research Institutes

- **MLIT:** Traffic safety countermeasures of residential road based on scientific analysis
- **Jiken Center :** Analysis on low-speed rear-end collision accidents
- **NTSEL:** Vehicle-to-pedestrian incident analysis

3. Universities

- **TUAT, Univ. of Tokyo :** Analysis on causal factors of rear-end collisions
- **TUAT, Ibaraki Univ. :** Driver behavior analysis in yellow traffic signal
- **Akita Pref. Univ. :** Active safety countermeasure effectiveness estimation

Future Roadmap of TUAT Drive Recorder Data Center



Goal : 55,000 events from 1-camera DRs

Goal : 22,000 events From 2-camera DRs

Goal : 77,000 events total

Driving education DVD

- Sample of image data available on website of JSAE
- Hazard anticipation training DVD on sale



ドライブレコーダは見た！ 自動車技術会「ヒヤリハットデータベース」より

自動車技術会「ヒヤリハットデータベース」から様々なヒヤリハット事例映像をご紹介します。

各画像をクリックして映像をご覧下さい。※再生には Adobe® Flash® Player が必要です。



◆追突編 ～いつでもどこでも停止可能な車間距離～

今回はデータベースで最も件数の多い追突(全体の29%)についてよくある事例をご紹介します。

前方信号赤に変わって前車に...



停止時、後車に追突され...



右折前車が急停止...



雨、左折車に気付かず...



工事渋滞 誘導員に...



高速道路渋滞で...



さまざまなケースで、後車からの追突による事故が発生しています。
交通事故負傷者のうち、約半数が軽微の損傷で主ご「ムチウチ」です。
万一のとき、身構えていればムチウチは防げます。停止時はバックミラーでの後方確認を心がけましょう。



Thank you for
your attention.



Contact : pong@cc.tuat.ac.jp
<http://www.tuat.ac.jp/>

