Application of AD Database for Town Traffic Safety
Presentation for ASAM Open Label Ideation Workshop

Kikuo Muramatsu
e-SYNC Co., Ltd.
2. Dec. 2019
Iteration Loop of AD with AI

ML Create to Perception Model
Validated with OpenDRIVE & OpenSCENARIO

ML Create to Pass Planning & Trajectory Model
Validated with OpenSCENARIO

Sensor/V2X
Fusion
Security (J3061)
Pass & Trajectory Planning
Controller

V2X
Camera
Radar/Lidar

Proved Data
Controller

Functional Safety (SOTIF)
Lv3, Lv4 override action

HMI

Security (J3061)

ML Model
ML Model
Create Optimized Machine Learned Model

It is necessary to prepare the optimal Ground truth according to the purpose. Ground truth have physical (e.g. visual) and semantic meaning. Semantic meaning occasionally changes by context and connotation.

- Accident database
- NDS
- FOT
- Laboratory data
Challenge to make a Data Base for Safe for Pedestrian

- ODD Valuation < City, Urban, Site seeing area >
- 360 view with 4 Fish eye cameras, 90 Front camera, 5 Liders >
- Scene trigger < Operator’s voice, Key, Actuator signal >
- Time Valuation < morning, noon, evening, night >
- Weather Valuation
- Season Valuation

Raw Data

Laboratory, Institute, etc.
- Behavior analysis
- Model Create

Raw Data

JARI: Japan Automotive Research Institute, https://www.jari.or.jp
HAGIWARA: Hagiwara Electronics Co., Ltd, https://www.hagiwara.co.jp
# TAG Category at JARI Data Base

## How enhance 2D Tag to 3D, 4D Tag?

<table>
<thead>
<tr>
<th>Target</th>
<th>Category 1</th>
<th>Category 2</th>
<th>Direction</th>
<th>Attribute</th>
<th>Obstacle</th>
</tr>
</thead>
</table>
| Pedestrian     | Adult
Child
Unknown | Male
Female            | Front, Back, Left, Right Diagonal valuation Unknown | None, Umbrella, Cart, Bicycle, etc.       | Yes, NO, Out of frame                 |
| Vehicle        | Passenger Car
Large Car
Unknown | Preceding vehicle
Oncoming vehicle Parking, etc. | Front, Back, Left, Right Diagonal valuation Unknown | –                                      | Yes, NO, Out of frame           |
| Motorcycle     | Large, Small,
Unknown | –                       | Front, Back, Left, Right Diagonal valuation Unknown | None, Umbrella, etc.                   | Yes, NO, Out of frame           |
| Bicycle        | –                  | –                       | Front, Back, Left, Right Diagonal valuation Unknown | None, Umbrella, etc.                   | Yes, NO, Out of frame           |
| Roadside Object| Traffic Sign       | Red, Yellow, Green Direction(Arrow) | Front, Left, Right                          | –                                      | Yes, NO, Out of frame           |
| Roadside Object| Road Sign          | White line, Yellow line, etc. | –                                          | –                                      | –                              |
TAG Category at JARI Data Base

In reality, there are many complicated objects. How categorize? It should be flexible and custom-definable for next gen. perception AI model.

Source: JARI
Look-ahead is executed based on the extension of behavior. Time series (start-end time) tag information of the location, the behavior of the own vehicle, and the behavior of the surrounding objects is prepared, as the learning data for recognizing the behavior.
Data Acquisition and Scene Extraction at JARI Database

Acquisition Vehicle
Trigger (Voice, Key)
Camera, Lidar data
Acquisition target scene
Extracted Data for context analysis
Stored Data

How to Labeling?

Source: JARI & HAGIWARA
For create usable AI model

Data Management
1. Security and GDPR
2. Data quality control (including version management) and data transfer
3. Buying / Lending / Credit Assessment Support (Auction ??)

Raw data database
- Raw data container
  - RGB, JPEG, XML, CSV, etc.
- Annotated data
  - JSON, etc.

Annotation Tool
1. Scene Search
2. Vehicles, Pedestrians, Bicycle
3. Traffic sign, Road sign, ODD
4. Symantec Segmentation
   - AI technology utilization
5. Picture-Cloud Calibration
6. Risk heatmap Annotation

Scene Analysis
1. Extract Scenario
2. Create behavior Model

Static object Analysis
1. Create environment Model
2. Create object Model

Simulation Library
- Scenario
- Environment & Statically object Model

OpenSCENARIO
OpenDRIVE
Local Map

Simulation Tool
1. Scene Search
2. Vehicles, Pedestrians, Bicycle
3. Traffic sign, Road sign, ODD

How to Labeling?
A local government initiatives for autonomous driving

Shiojiri City Gov. will use AD technologies for local traffic safety, based on the area’s AI and annotation skill and resources.

Annotation

Scene/Scenario Selection

Risk Analysis

Improve Road Infrastructure
Create Safety City Drive Map etc.

Data Base

4G/5G

- NDS
- FOT
- Accident data

Infrastructure development for driving and utilizing autonomous driving

Laboratory

Simulation

Fusion and Trajectory Planning

ECU

AD Vehicle deployment

Feed Back Error

Reference

Optimized ML Model

Inspection

Ground Truth Data Set

Learning

Annotation Tool

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Annotation Tool
“Shiojiri” is the IT-City blessed with nature

Winery, Traditional wood craft, Precision machinery Industry area
Shiojiri's annotation organization for AD development

Shiojiri City Gov. has an annotation organization which is accepting work to create ground truths for ML.

- Raw data from OEM, Tier1
- JARI Database
- NDS data from FOT of AD project in Shiojiri

Check progress
- Accuracy
- Annotation Category

Annotated Data
Approach for reduce traffic incident risk in Shiojiri

Shiojiri is a city with an old historical city, so there are many narrow road with poor visibility. External support for car is essential.

How to Labeling?
Thank You your attention

Kikuo.muramatsu@e-sync.biz