智慧座艙與先進駕駛輔助系統

Smart Cockpit & ADAS Solutions

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ELAN Microelectronics Corporation

1 Key Technology for Smart Cockpit & ADAS Solutions

2 ELAN ADAS AI Algorithm & Datasets

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Key Technology for Smart Cockpit & ADAS Solutions

ELAN Microelectronics Corporation

Key Technology of AI Image Recognition in ADAS & Smart Cockpit

1. **High-quality Image** ：Image Signal Processing(ISP) and Optimizing the Sensor & Camera Module
2. **Edge AI Algorithm :** Edge Computing (SOC) AI Algorithm - Small Object Detection & Less Computing Power
3. **Application Datasets** : Collecting Datasets for Various Scenarios and Supplementing Specific Contexts with AR/VR and Generative AI
4. **Spec. & Domain Knowledge**：Determine the Right Datasets to Collect and the Items & Conditions for AI Training & Verification
5. **AI Development System** : MLOps Provide a Training Platform to Adjust AI Models Based on Local Specific Scenarios.
6. **Drive-By-Wire Technology**：Developing the Technology for Controlling the Steering Wheel, Acceleration and Deceleration.
7. **Practical Road Experience**：With Various Mass Production and On-road Operation Experience

ELAN ADAS AI Algorithm & Datasets

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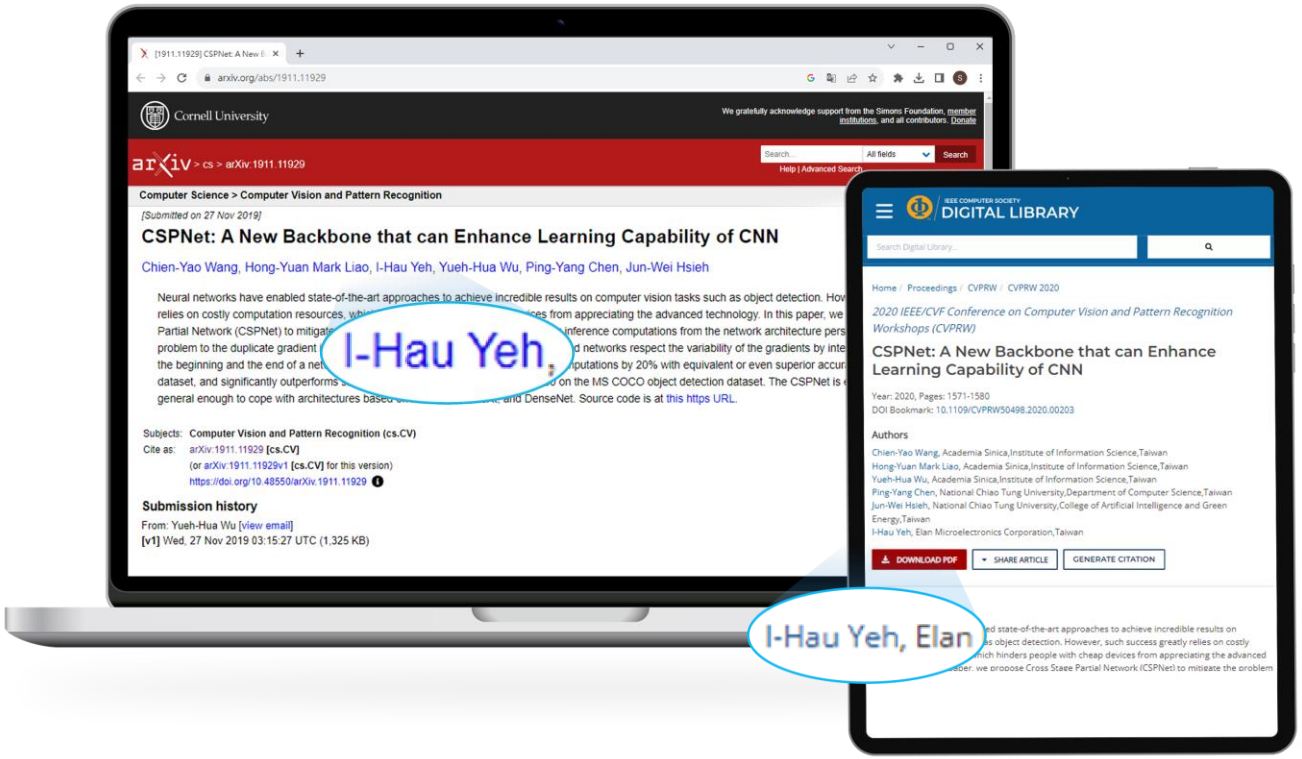
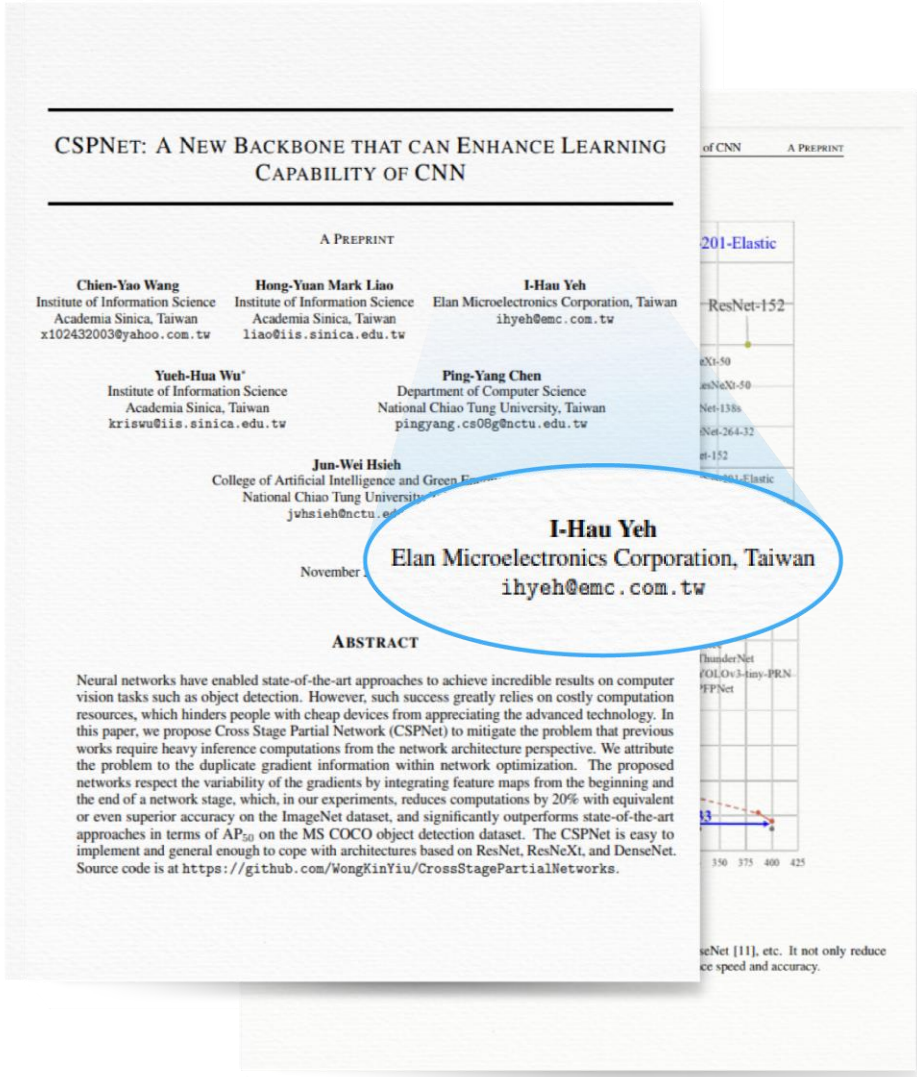
World's Fastest & Most Accurate Object Detection Papers

The Papers has been Cited > 10,000+ times



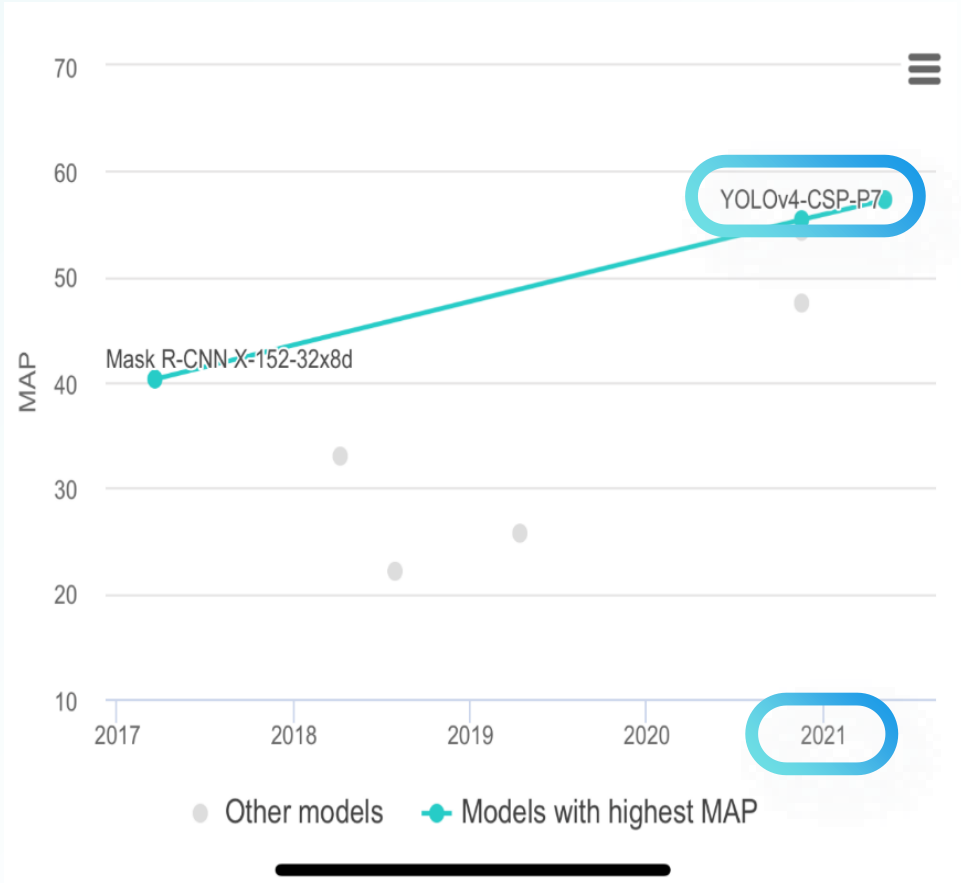


World's Fastest & Most Accurate Object Detection Algorithm

ELAN Cooperation with Academia Sinica

2021: YOLOv4 / YOLOR

Object Detection on COCO test-dev



2022: YOLOv7

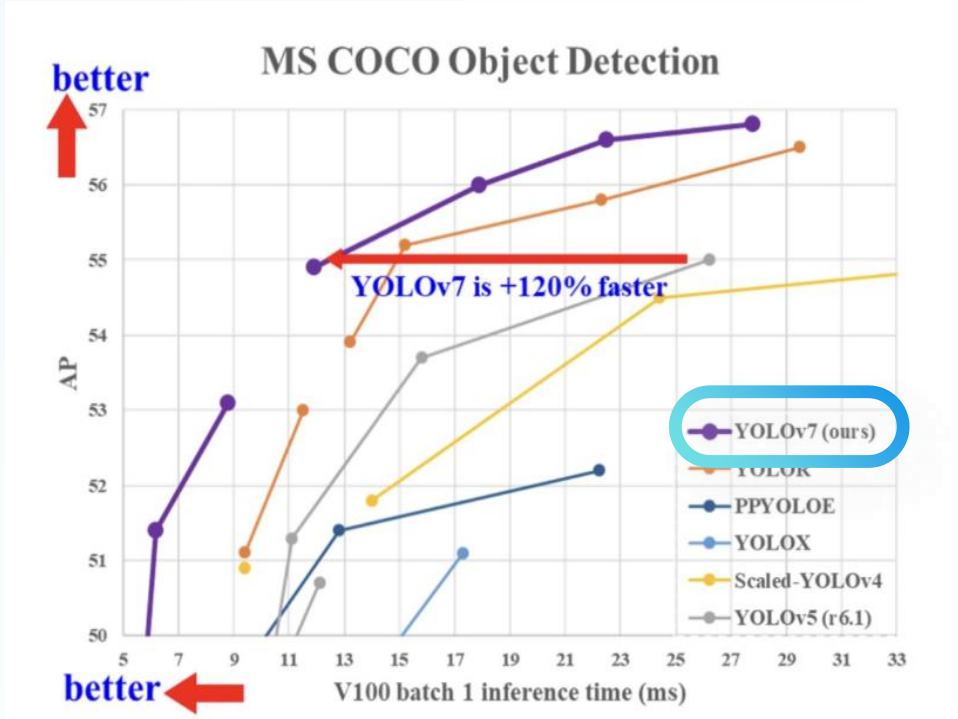
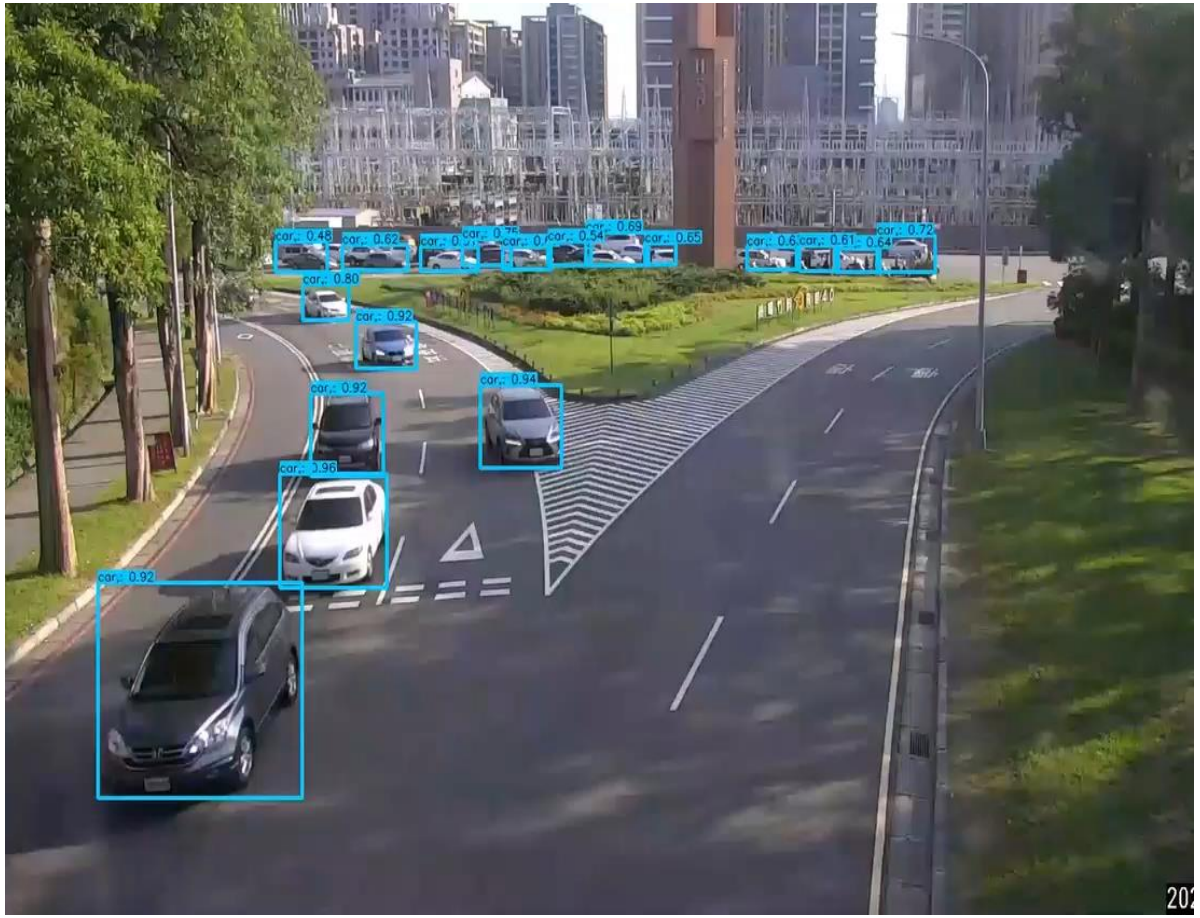


Figure 1: Comparison with other real-time object detectors, our proposed methods achieve state-of-the-arts performance.

AI Traffic Flow by Fisheye Camera with YOLOv4

Edge AI Image Recognition Platform in Traffic Sign Control



360° Fish-eye AI Camera

LPR AI Camera

AI Supervised Learning Collects Datasets of Different Scenarios

Freeway (Day/Night)

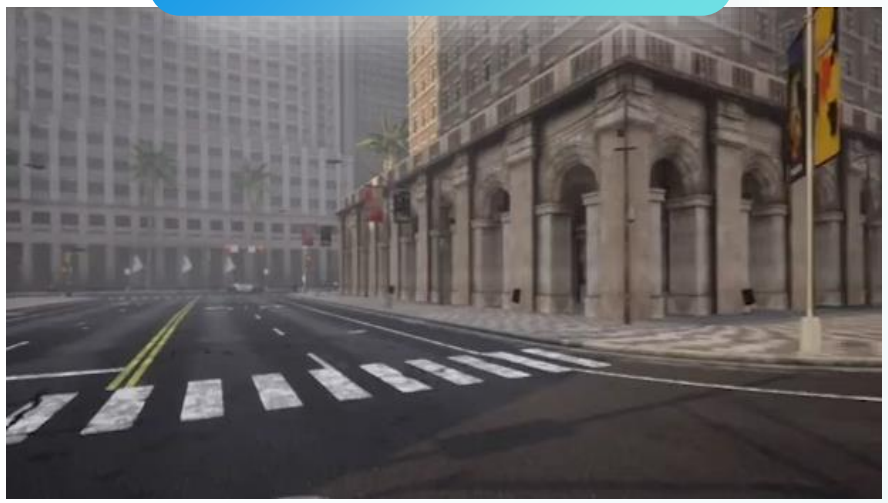
Highway (Day/Night)

ADAS – There is no Best , Only Better

More Than 50% Car Accidents in Taiwan had ADAS Installed

Datasets Augmentation by VR

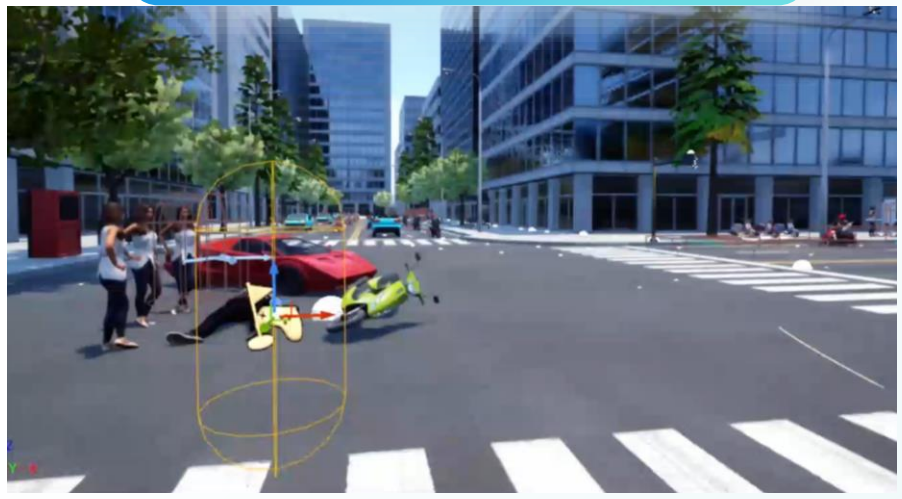
Various Weather Scenarios



Generation of Unique Scenarios

Light Control: with Strong Backlighting

Generation of Unique Scenarios



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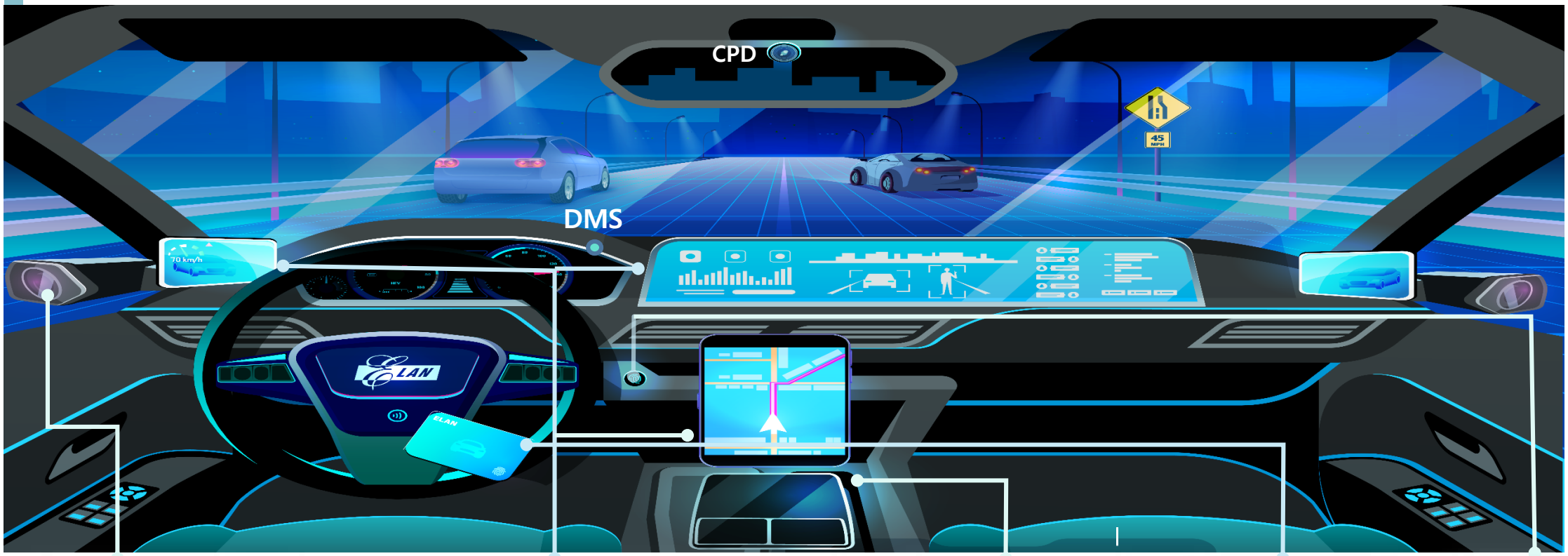


E-Mirror

1. Blind Spot Detection
2. ELAN in-house AI Algorithms

E-Mirror / Control & Infotainment Panel

1. Touch Display Driver Integrate (TDDI)
   - Support Glove Touch
   - Moisture Proof
   - Haptic Feedback
2. Mini LED with Local Dimming
   - High Brightness
   - Low Power
3. Gesture Control (IR or ToF)

Touchpad

1. Haptic Feedback
2. Lighting Icons

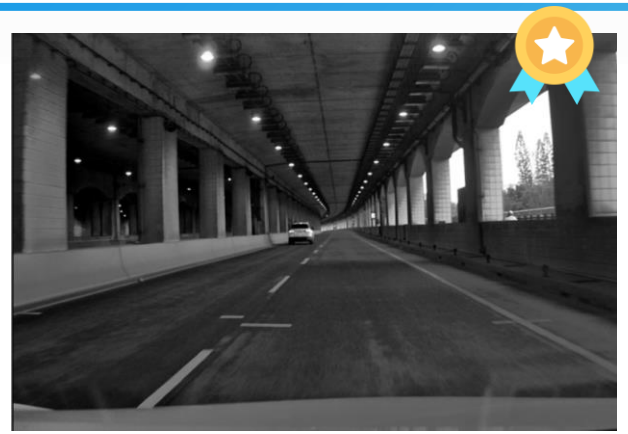
Biometric Card

1. Battery-less
2. Fingerprint Key Card Secure Access

Fingerprint

1. Personalized Settings
2. Anti-Spoof in Power/Engine Button

ISP Image Comparison

	Semi-enclosed Tunnel Low Lighting + Backlight	Tunnel Low Lighting	Outdoor Sunlit Backlight
Competitor ISP			
ELAN ISP			

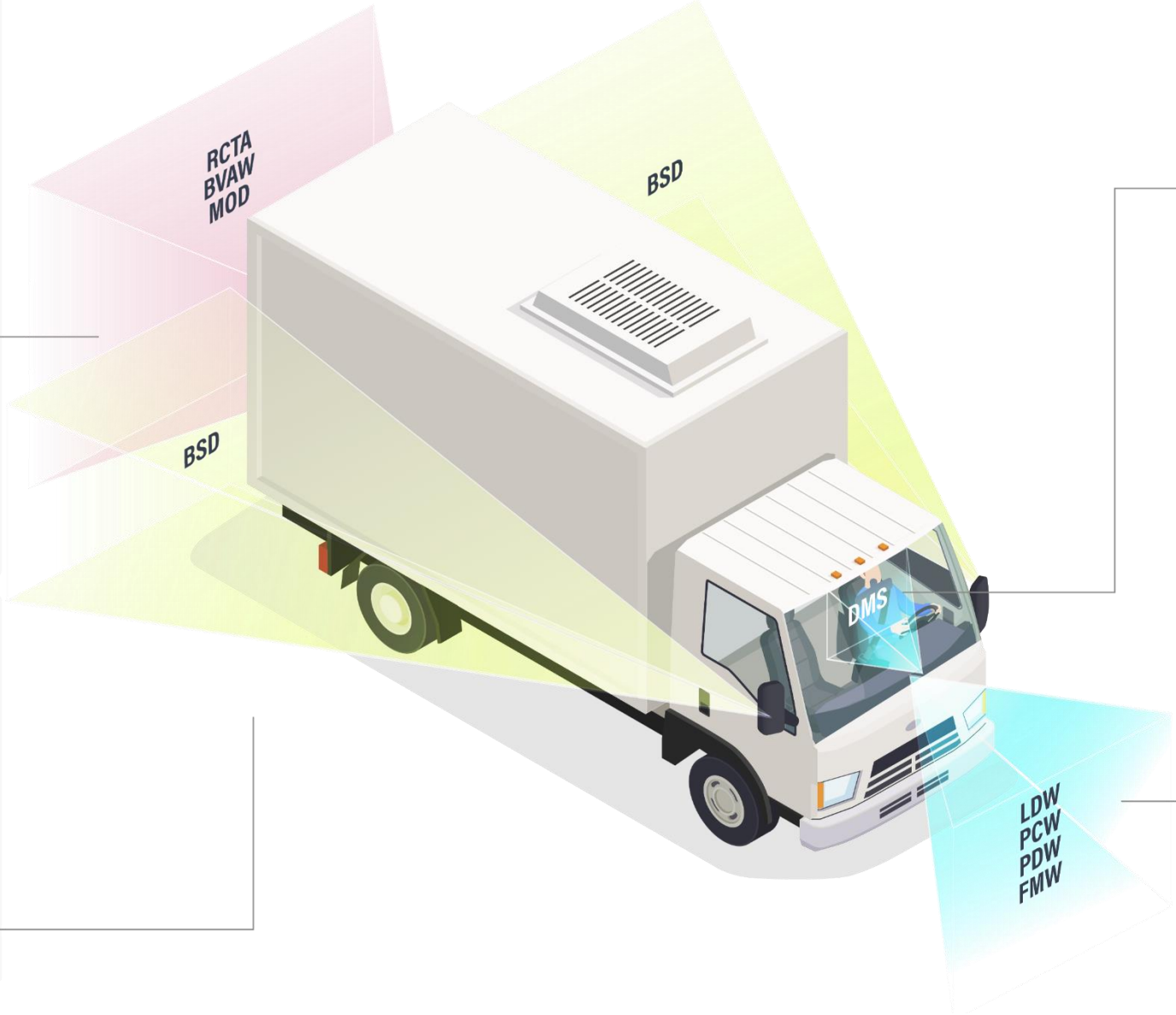
ELAN: AI ADAS Solutions

RCTA
Rear Cross Traffic Alert

BVAW
Backward Vehicle Approaching Warning

MOD
Moving Object Detection

BSD
E-Mirror
BSIS



DMS
Driver Monitioring System

LDW
Lane Departure Warning

FCW
Front Collision Warning

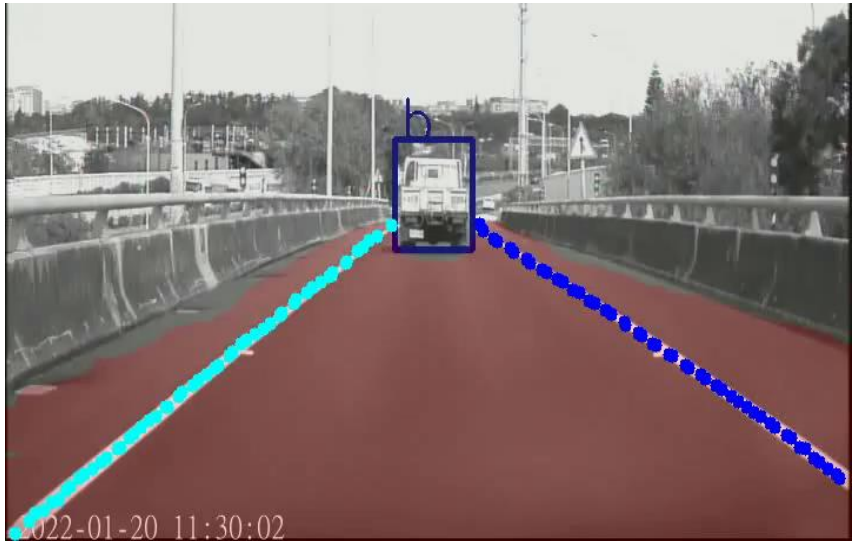
PDW
Pedestrian Detection Warning

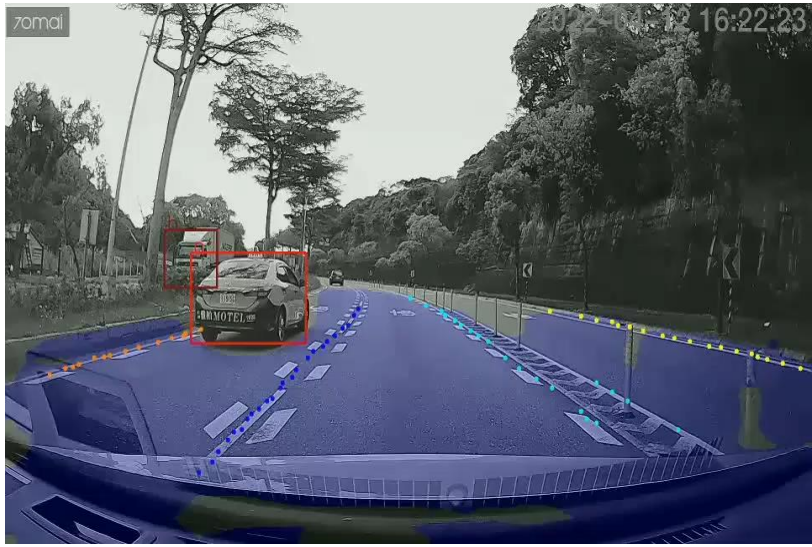
FMW
Forward Move Warning

ElanNet - Multi-tasks in Unify Model for ADAS

Object Detection + Drivable Road Segmentation + Car-Lane Line

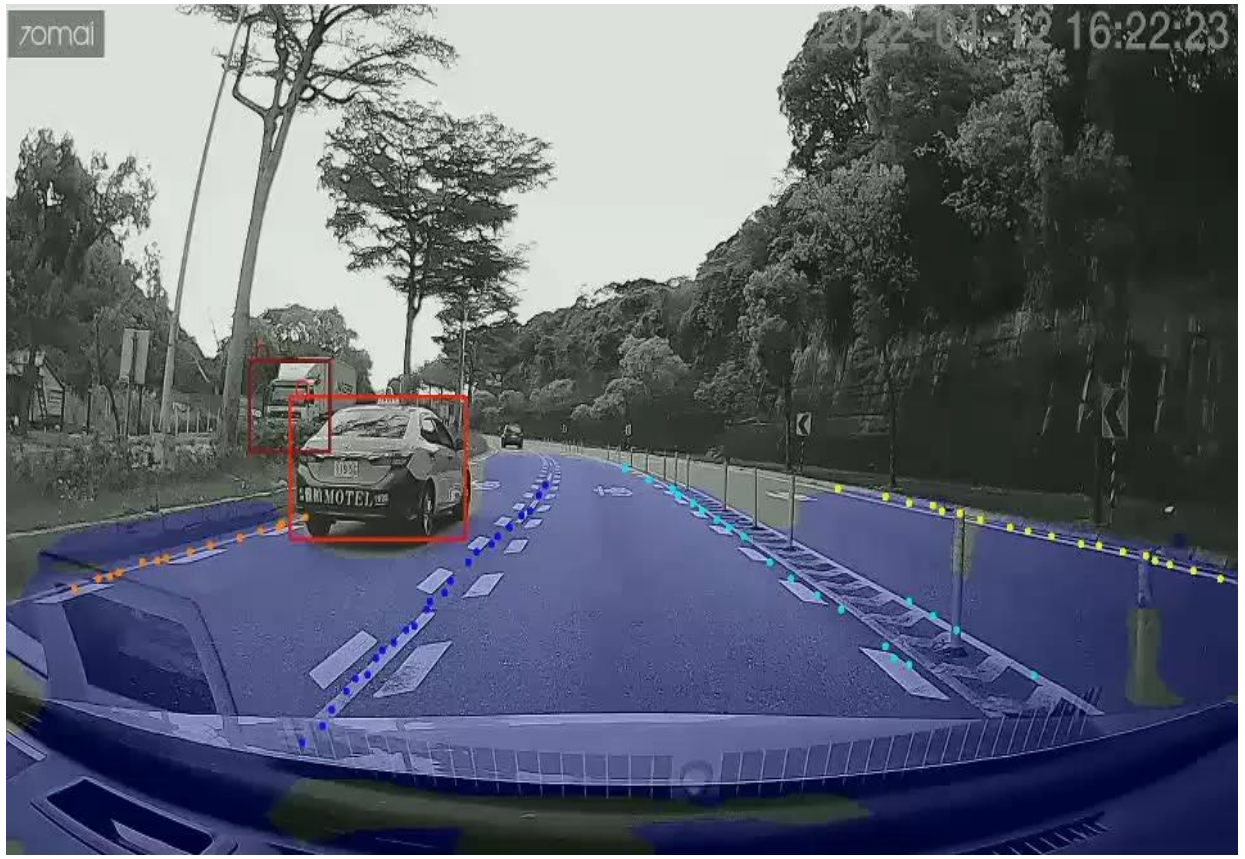
Dedicated Lane Markings





Front AI Camera for Front Vision ADAS

Front Camera with AI @720P / 1 TOPS



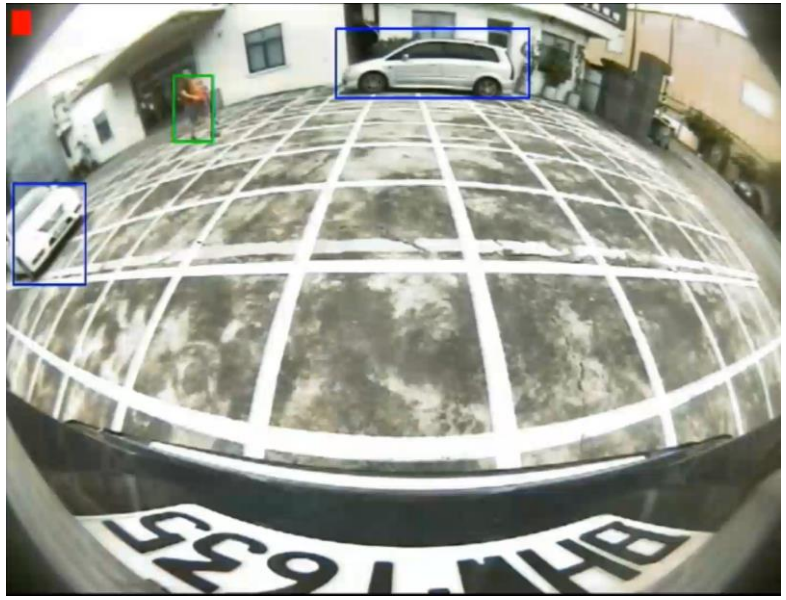
Multi-tasks in Unify Model - **ElanNet**

Object Detection
+ Drivable Road Segmentation + Car-Lane Line

- **FCW** (Front Collision Warning)
- **HMW** (Headway Monitoring Warning)
- **LDW** (Lane Departure Warning)
- **PDW** (Pedestrian Detection Warning)
- **SCW** (Slide Collision Warning)
- **FMW** (Forward Move Warning)
- AI based Multi-Lane Detection
- Road Edge/ Lane Detection
- Drivable Area Detection

Rear AI Camera for Rear Vision ADAS

Reverse Mode



Drive Mode

RCTA (Rear Cross Traffic Alert)

BVAW
(Backward Vehicle Approaching Warning)

MOD (Moving Object Detection)

DRD (Drivable Road Detection)

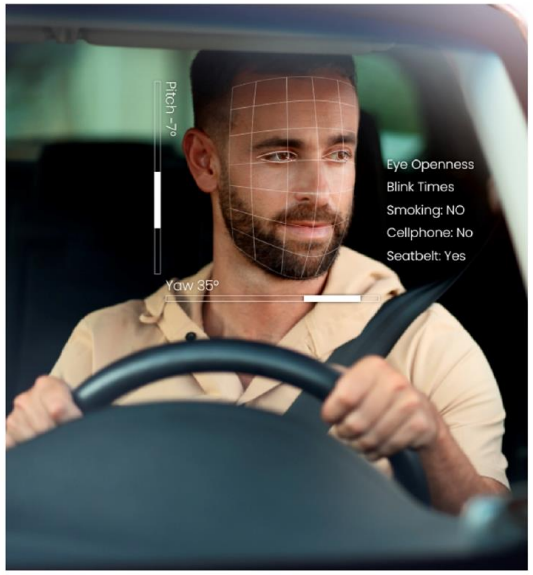
BSW (Blind Spot Warning)

RCW (Rear Collision Warning)

DOW (Door Open Warming)

Rear Fisheye Camera with AI @720P / 1 TOPS

Driver Behavior Monitoring System (DMS) Solution



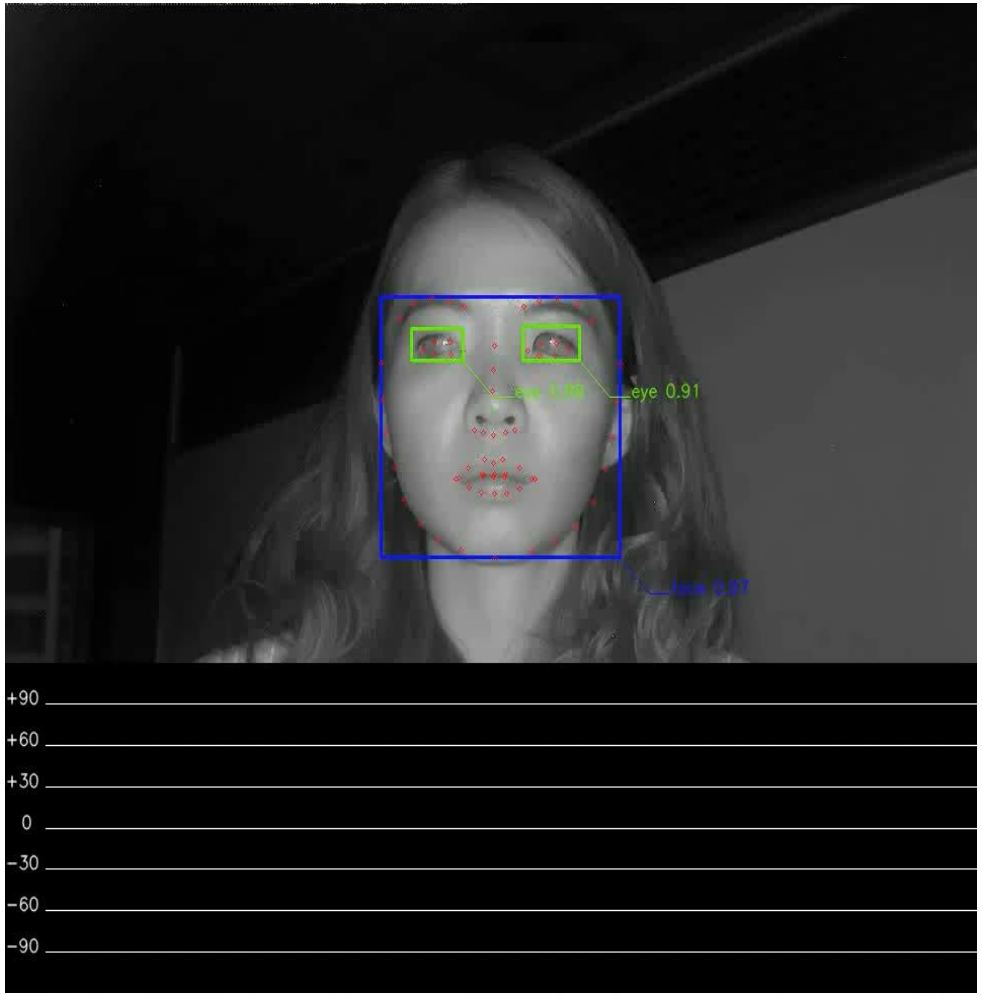
DMS

Our Function

- Eye Closing Frequency
- Yawn Detection
- Distraction Detection
- Smoking Detection
- Using Cellphone Detection
- Head Precision Detection
- Gaze Estimation
- Attitude Abnormal Detection
- Seat Belt Detection

Multi-tasks in Unify Model

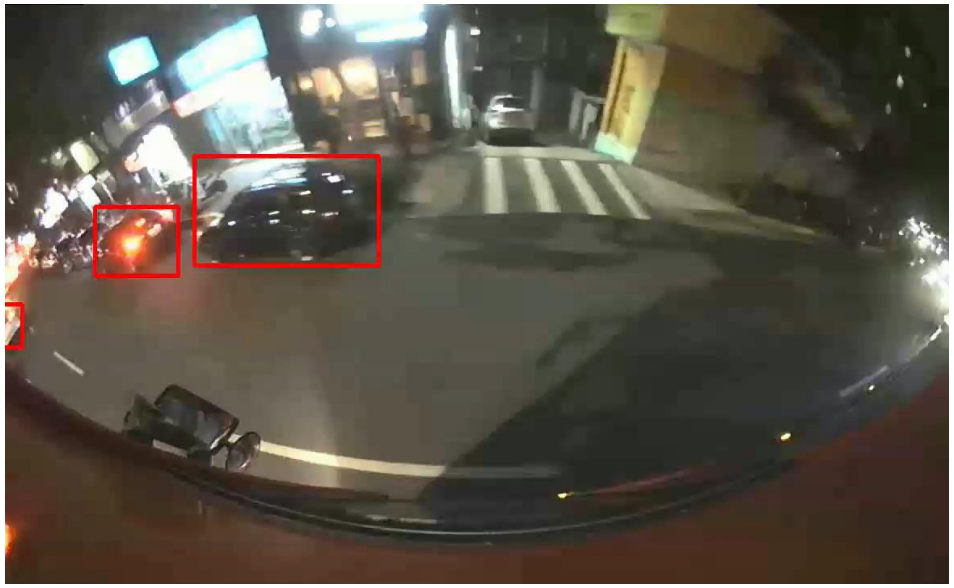
Object Detection+ Facial Landmarks + Gaze Estimation



Yaw Red: Turn Around / Pitch Green: Look Up/Down

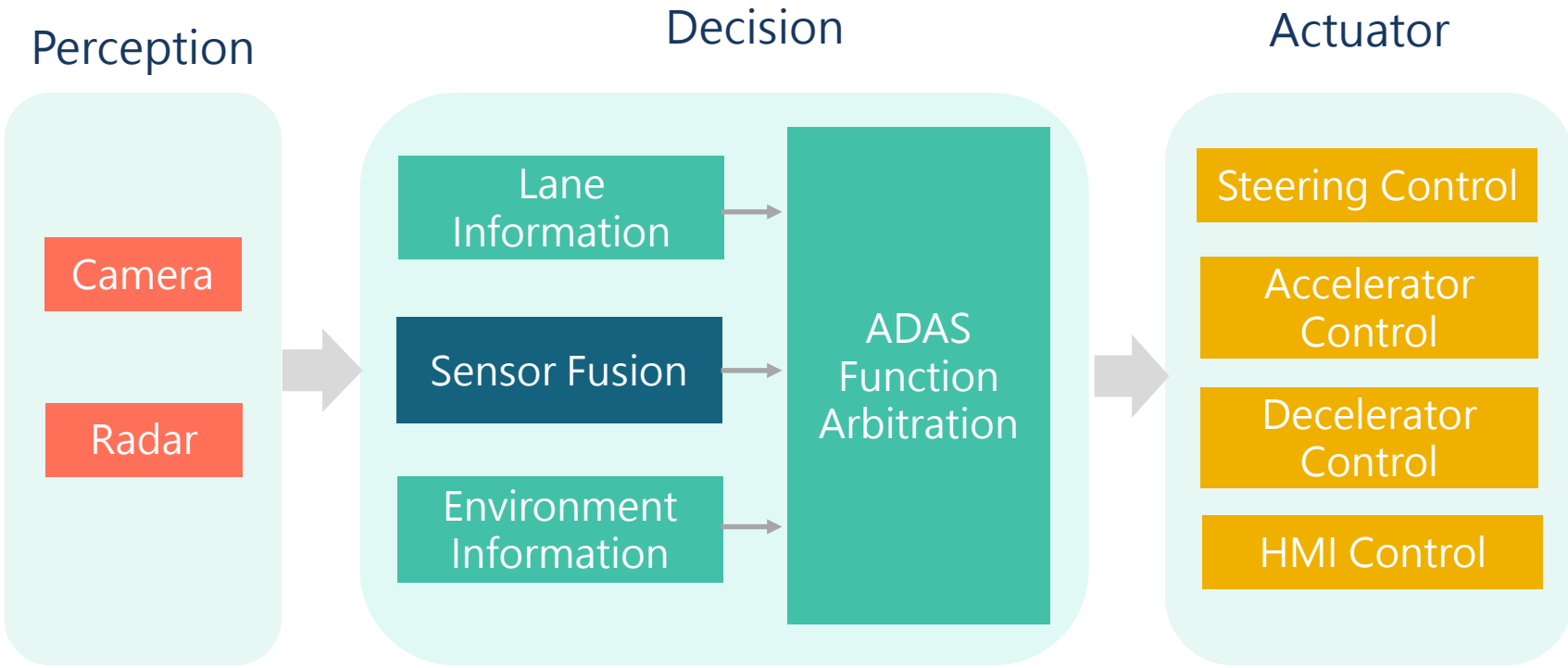
Bus Blind Spot Information System (BSIS) & Difference of Radius Between Inner Wheels

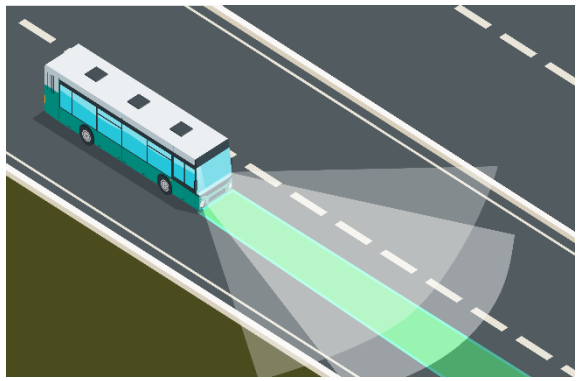
Fisheye Camera
with AI
@720P / 1 TOPS



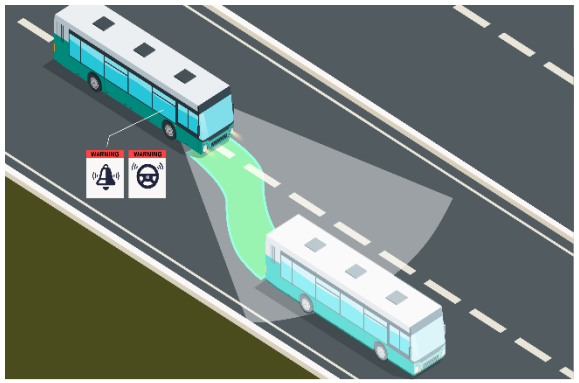
大型車盲區及
內輪差解決方案

ELAN: AI ADAS Level 2 System Architecture



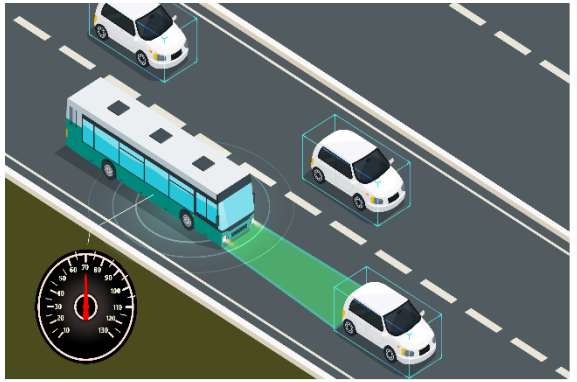


Lane Following System (LFS)



Lane Keeping Assistance (LKA)

Autonomous Emergency Braking (AEB)



Adaptive Cruise Control (ACC)

ELAN eBus ADAS Solutions

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2023~2027 eBus ADAS Subsidy Programs by Government

Starting from the 2023, electric buses' ADAS evolved from lateral control (Steering) to longitudinal control (Acceleration and Deceleration);
From equipping a single front camera to five camera modules and two radars modules with monitoring side, rear vehicles, and obstacles.

Subsidy Items / Year	Subsidy Amount	Drive-By-Wire	Number of Camera & Radar
2023: CSF(Corrective Steering Function)	2023 : 1.5M NTD 2024 : 0.5M NTD	Lateral (Steering)	1 pcs Camera
2024: CSF+ACSF B1 (Automatically Commanded Steering Function)	2024 : 1.5M NTD 2025 : 0.5M NTD	Lateral (Steering)	1 pcs Camera
2025: CSF+ACSF B1+ESF (Emergency Steering Function)	2025 : 1.5M NTD 2026 : 0.5M NTD	Lateral (Steering) & Longitude (Acceleration and Deceleration)	1 pcs Camera
2026: CSF+ACSF B1+ESF+ACSF C (Automatically Commanded Steering Function)	2026 : 1.5M NTD 2027 : 0.5M NTD	Lateral (Steering) & Longitude (Acceleration and Deceleration)	4 pcs Cameras + 2 pcs Radars
2027: CSF+ACSF B1+ESF+ACSF C +ALKS (Automated Lane Keeping System)	2027 : 1.5M NTD 2028 : 0.5M NTD	Lateral (Steering) & Longitude (Acceleration and Deceleration)	5 pcs Cameras + 2 pcs Radars

Source：電動大客車配備自動自動駕駛輔助系統之加碼補助(交通部)

ELAN's Key Technology of ADAS & Smart Cockpit

1. **High-quality Image** ： ELAN Developed Image Signal Processing(ISP) and Optimizing the Sensor & Camera Module to Apply High-end Image Quality.
2. **Edge AI Algorithm :** ELAN Developed Edge AI Algorithm with Academia Sinica (YOLOv4 – 2021 Global Rank No.1 & YOLOv7-2022 Global Rank No.1) , the Latest Edge AI Algorithm – ElanNet is the Multi-tasks in Unify Model Integrated into ADAS Solutions
3. **Application Datasets** : ELAN Developed AR/VR and Generative AI to enhance the Datasets.
4. **Spec. & Domain Knowledge** ： ELAN Uses Domain Knowledge with the Right Datasets for AI Training & Verification
5. **AI Development System** : ELAN Provides MLOps a Training Platform to Adjust AI Models Based on Local Specific Scenarios.
6. **Drive-By-Wire Technology ：** ELAN Developing the Technology for Controlling the Steering Wheel, Acceleration and Deceleration & Provides Total Solutions
7. **Practical Road Experience** ： ELAN has Various Mass Production and On-road Operation Experience


THANK YOU
ELAN