AutoBrains.

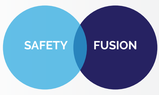
Hello,

Cartex 4F

Cartex 4F is based on a Renesas V3M architecture with at least a 100° FOV
It is composed of two kernels: Base, and Fusion

The two kernels utilize most of the Renesas V3H resources:

The base kernel requirements are set to allow full score in NCAP VRU, C2C, and SA test cases which is needed for the overall 5 stars rating. In addition to other base functionality such as: ACC, LCA, TJP, and Traffic light assist.



BASE

OBJECT DETECTION

	Detection	Maximal distance (day)	Maximal distance (night)	Classification
Vehicle	3D (width, length, height)	150m – car, truck 80m - motorcycle	150m – car, truck 80m - motorcycle	Car, truck/bus, motorcycle
Pedestrian	2D (width, height)	75m	50m	Pedestrian, cyclist

Objects detection is used for AEB, and ACC applications only. At host vehicle speed of 0-120km/h

Up to 20 relevant objects will be detected in the host lane direction, and oncoming lanes. Parked vehicles are excluded

LANES DETECTION

- The algorithm detects continuous host, next right, next left lane marks, and road edges when the camera field of view allows for it up to 150m
- Lane detection will be used for LDW, LKA, and LCA applications only. At host vehicle speed of 0-120km/h
- Detected lane marks will be classified into the following categories: solid, dashed, Bott's dots, solid-dashed, dashed-solid, and triple lane marks)
- Detected lane marks colours will be classified into the following categories: White, Yellow, Blue, and Orange
- Detected road edge will be classified as road edge

TRAFFIC SIGNS, AND TRAFFIC LIGHT DETECTION

- Detection of traffic signs based on the road signs listed in the Vienna convention
- Detection of traffic signs is limited to signs relevant to the host lane
- Detection range for traffic signs is based on common TSR industry standards
- Traffic signs classification is limited to round, rectangle, and triangle
- Detection of traffic lights will be based on the traffic lights listed in the Vienna convention
- Detection of traffic lights is limited to traffic lights relevant to the host lane
- There is no classification for traffic lights

FUSION

The Fusion kernel is oriented towards providing the best value for money regarding ego vehicle, and VRUs safety

By using a one box solution for both camera, and LRR (long range radar) it allows for low level fusion inside the camera itself. Simplifying the fusion process, and integration overhead. All commodity functions such as: ADB, hazards detection, road profile, etc. are an integral part of the fusion kernel.

OPTIONAL NARROW FUNCTIONS

Open door AEB, FCW child, parking assist, School zone assist, overtake assist, Zebra crossing alert, Vehicle cut in alert, Pullover maneuver, Highway exit reminder, Scooter alert, Wrong way alert, speed bump ahead, Open door steer assist, Turn assist, Lateral "FCW", Dog/cat FCW, Animal FCW/AEB, Lane assignment and Construction area pilot

NARROW FUNCTIONS

These functions (all are patent pending) will provide added value to the basic NCAP functionality. The OEM will need to define a certain set as full deployment of all together is not feasible on V3M

OPEN DOOR AEB/STEER ASSIST

AutoBrains solution can both classify a new obstacle as the open door of a parked vehicle and also detect partially open doors and estimate their final position and dimensions, allowing the ego vehicle ECU to adjust the vehicle path

SCOOTER ALERT

AutoBrains solution can refine the classification as pedestrian or cyclist into a specific electric scooter sub-category. The time-to-collision alert is increased accordingly, so the AEB will have enhanced sensitivity to electric scooters within its field of view

SCHOOL ZONE ASSIST

AutoBrains solution deploys OCR only after detecting a School Zone sign and the relevant frame areas for the OCR, which may be part of the traffic sign or as a supplementary sign. GPS data is then used to infer is Speed Alert is required when ego speed exceeds the speed indicated in the School Zone sign

ZEBRA CROSSING ALERT

AutoBrains provides a solution which takes into account VRUs position, zebra crossing location, and other zebra crossing indications (Traffic signs)

It is based on several indications:

- Zebra crossing detection, and location
- Zebra crossing traffic signs
- VRUs proximity to any of the avove

When either a Zebra crossing, or a zebra crossing sign is detected with pedestrians in near proximity an alert will be issued.

TURN ASSIST

Our solution will predict, and calculate the trajectory of all objects in the field of view of the camera. When the objects predicated trajectory intersects with the ego vehicle trajectory. Torque adjustments will be given to avoid collision, and the need for AEB

SPEED BUMPS AHEAD

The system will detect speed bumps only (a reduced road profile) and provide longitudinal distance and alerts to the driver

CONSTRUCTION AREA PILOT

The system will detect roadworks based on lane marks and construction area objects. It will adjust ACC, and TJP behaviour accordingly

PARKING ASSIST

The average driver uses many "tell signs" to understand what a parking spot is and what is not: Parking signs, curb colour, spaces between parked vehicles, etc. AutoBrains solution will use a similar approach based on the following detection functions: traffic signs recognition, road edge detection, and vehicles detection

FCW CHILD

Autobrains solution is to not only use unsupervised machine learning to classify a target as a pedestrian, or cyclists. But add a sub category of adult or child. After we determine if the target is a child. We will increase the various alerts time to collision accordingly. So the AEB function will be more sensitive to detected children in its field of view

OVERTAKE ASSIST

Autobrains solution is based on two processes:

- Detecting driver intention to overtake a preceding vehicle - This can be done based on ego vehicle acceleration, yaw, and yaw rate. Compared to the preceding vehicle velocity, acceleration, yaw, and yaw rate. Also, comparing the ego lane curve radius, and the ego vehicle yaw
- Detecting vehicles in the soon-to-be ego-lane, and calculating the TTC to such objects. Then, compare those TTCs to the estimated time needed to successfully complete the bypass

VEHICLE CUT IN ALERT

The system detects vehicles in adjacent lanes as well as in the closest two, or even three lanes to each side within the Field of View and measures approximate yaw, and yaw rate of those vehicles. The system alerts when a specific threshold is reached

HIGHWAY EXIT REMINDER

The system detects lane mark splits indicating an upcoming exit at long ranges. and provides an indication of the upcoming exit by fusing it with the navigation system route.

WRONG WAY ALERT

The system will detect when the ego vehicle is moving in the wrong direction based on target vehicles positions, traffic signs positions, etc.

COMPARISON TO THE COMPETITION

ADAS application	Cartex 4F	Mobileye EyeQ4 High/EyeQ5M
FCW	√	√
AEB	√	√
SA	√	√
LDW	√	√
LKA	√	√
ACC/TJP	√	√
No entry	√	√
HLB	√	√
ADB	√	√
TFL	√	√
LCA	√	√
Free space	√	√
Open door AEB	√	
Open door steer assist	√	
Parking assist	√	
Scooter alert	√	
FCW child	√	
"Lateral "FCW	√	
Dog\cat FCW	√	
Speed bump ahead	√	
School zone assist	√	
Overtake assist	√	
Zebra crossing alert	√	
Vehicle cut in alert	√	
Pullover manouver	√	
Wrong way alert	√	
Highway exit reminder	√	
Turn assist	√	
Construction area pilot	√	
Offroad road profile	√	
Tag along	√	
Parking pilot	√	
Sensors fusion	√	