



"Eyes" Make "Eyes" More Intelligent “眼睛”让“眼睛”更明眸

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First "Eyes" of Car

ADB Type:

Matrix : 10,20,32,84 pixel

High Resolution : DLP



"Eyes" of the
car

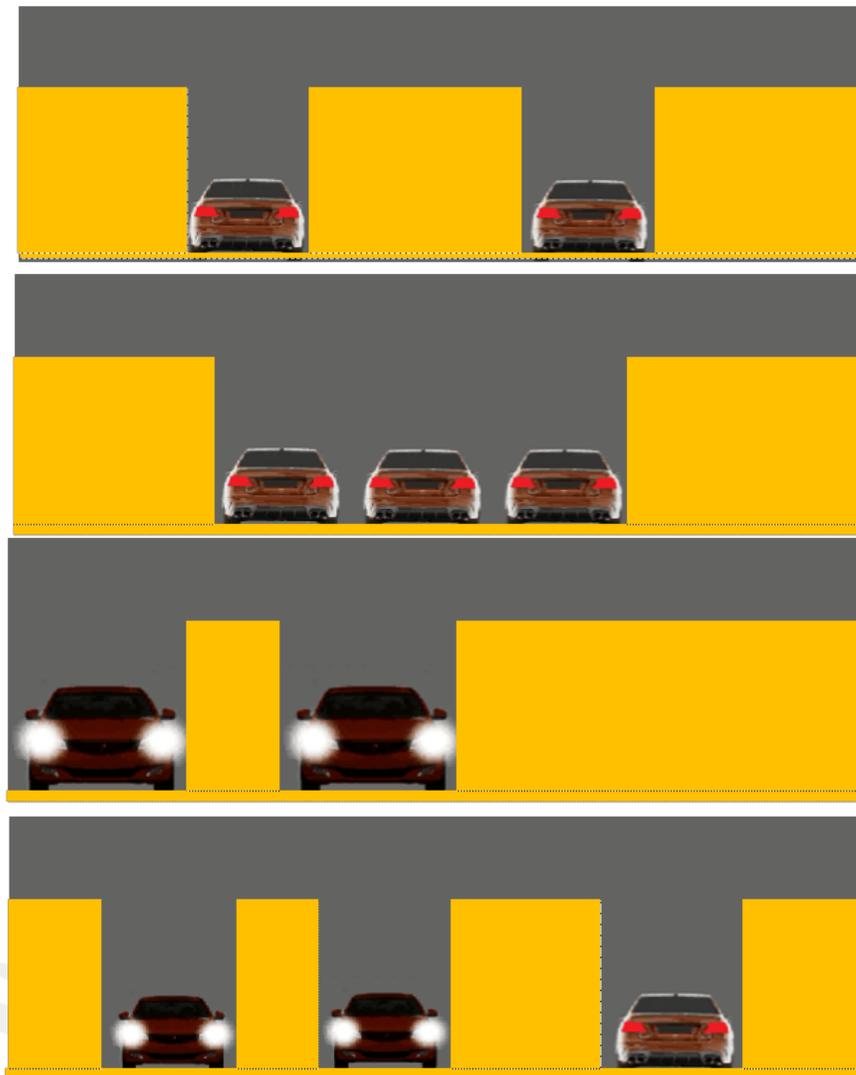
Next “Eyes” of Car



Detect Objects (night) :
Vehicle (400m/100m) ,
pedestrian (75m)

“Eyes ” of the Car,
ADB’s Brain

ADB Function



"Eyes" Make "Eyes" More Intelligent

How to make “Eyes”more intelligent?

The Brain (“Eyes“) should do more!

The Brain (“Eyes”) can do more!

HASCO VISION’s “Eyes” make
HASCO VISION’s “Eyes”more intelligent !

HASCO Vision ADAS Function



功能 Function		识别目标 Object	Parameter
ADB	车辆遮蔽 Vehicle shading	对向车辆/Opposite vehicle	135m
		同向车辆/Same direction vehicle	
		同向和对向车灯/ Automotive lighting	Taillight: 200m Headlamp: 400m
		二轮车/Two-wheeled	70m
	行人提醒/Pedestrian warning	行人/Pedestrian	100m
	弯道灯光自动转向	车道线/lane	60m
	路况判断/Road condition	路灯/street lamp	
	灯光高度自动调节/ Automatic Lighting height control	坡道/Ramp	
	路口灯光增强/Crossing Enhanced lighting	交通信号灯/Traffic light 斑马线/Zebra crossing	
	雨天防眩目/Anti-glare in rainy days	路面积水/ponding	
车辆精确遮蔽/Vehicle Precision Shielding	前后风挡/Windshield, 外后视镜/Mirror		
智能信息投影/Intelligent Information projection	路面信息/Pavement information		

HASCO VISION's camera support:
ADB,LDW,FCW,PCW,TSR,
FSD
up to L2

HASCO Vision ADB DEMO



跟会车车灯
Vehicle(Tail) and Headlamp



会车车灯
Headlamp



路口识别
Crossing recognition



地面标识
Pavement marking



坡道识别
Ramp recognition

Hardware Parameters

处理器/MPU	TI	Cortex A15x2,DSPx2,EVEx4
存储器/Memory	DDR3	1GB
	Nor Flash	32MB
摄像头/Camera	像素/Pixel	1280*720
	视场角/FOV	H:52°, V:28.6°,D:66°
工作温度/Operating Temp		-40°C~95°C
存储温度/Storage Temp		-40°C~105°C
功耗/Power Consumption		5W



FVCM2.0

Research on the Integration of Two "Eyes"

Can the two "Eyes" be integrated?

Influence factor:

Image distortion

Wear resistance

Cleaning problem

Waterproof, fog-proof and dust-proof

Calibration

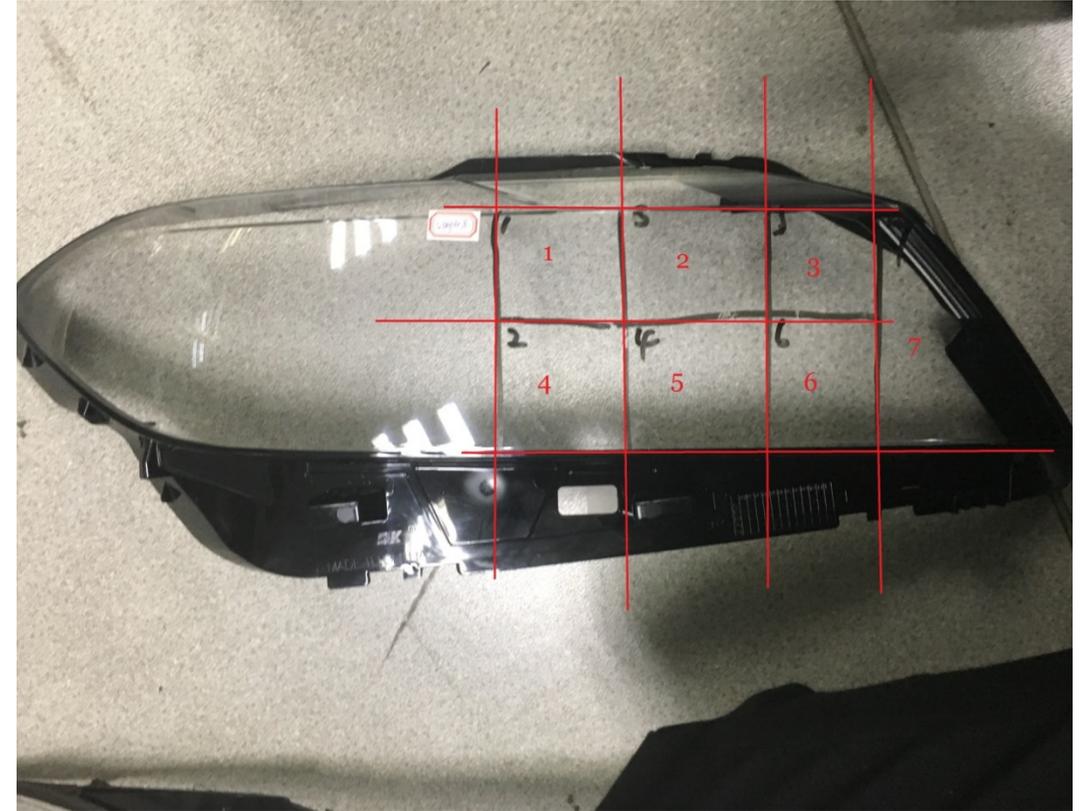
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Image distortion

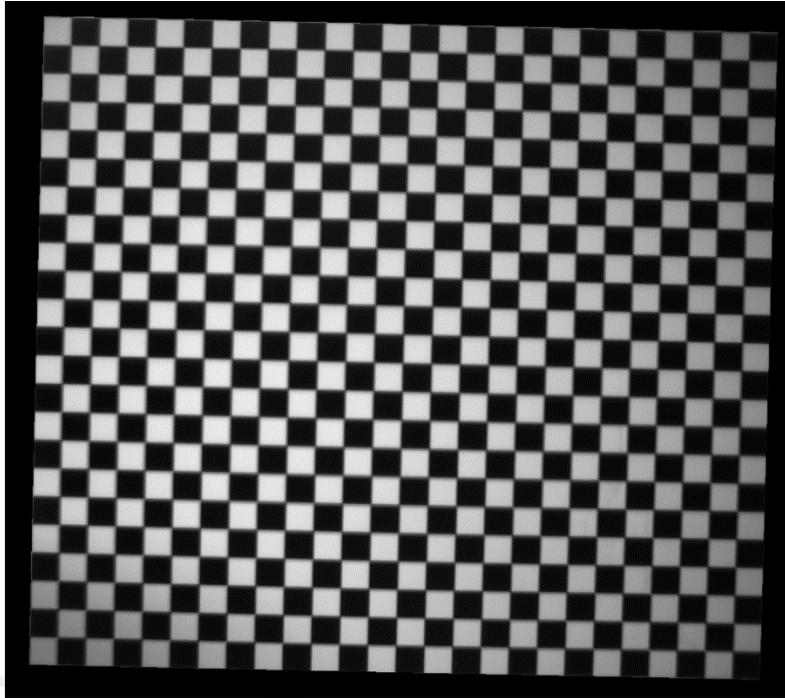
External lens is not uniform in thickness;

Curved surface

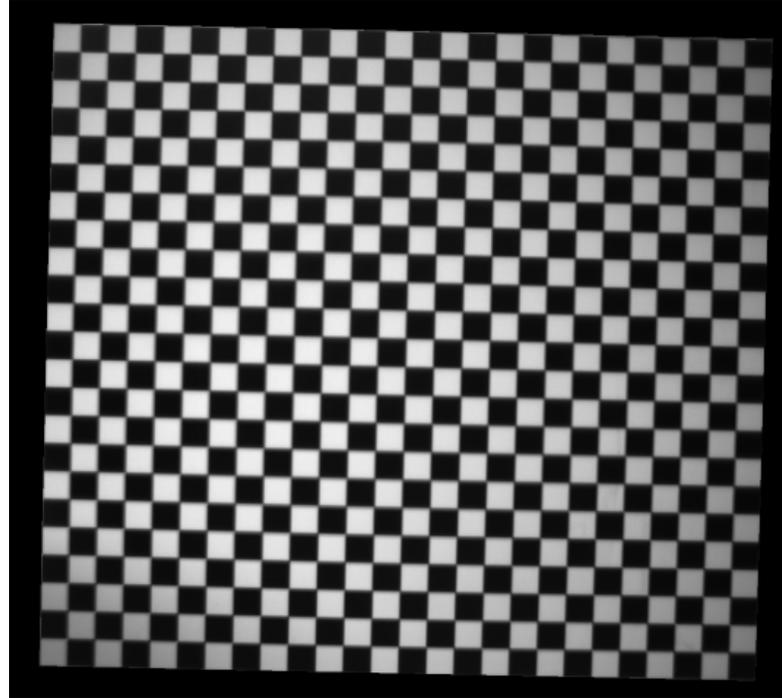


Research on the Integration of Two "Eyes"

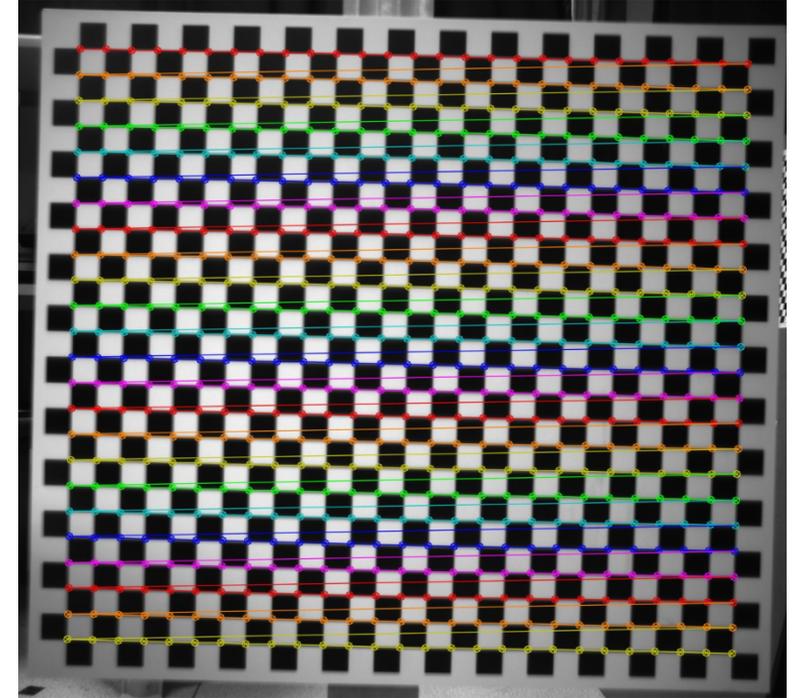
Testing and Verification



WithoutMask



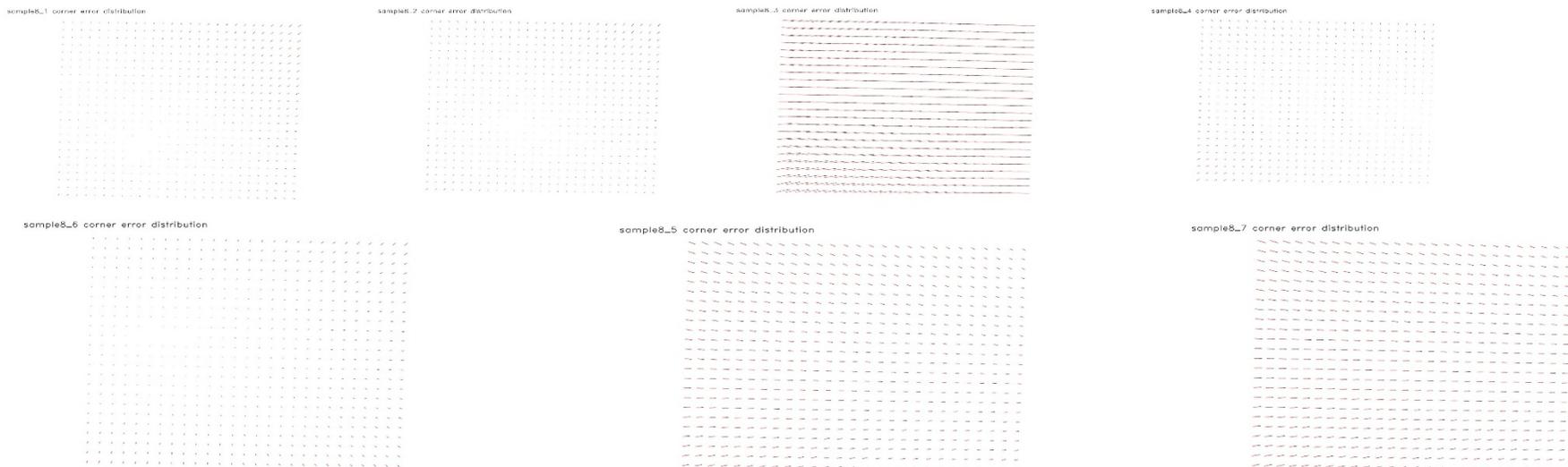
WithMask



WithMask CornnerImage

Research on the Integration of Two "Eyes"

Testing and Verification



Distortion Distribution Map

Sample8	MeanError	StdError	gradientAvg	Roll	Yaw	Pitch	TransX	TransY	TransZ	xErrorMax	yErrorMax	distErrorMax	Coating
region 1	13.029264%	12.310227%	18.434357%	0.005040	0.157193	0.031598	0.231165	0.157193	2.888759	4.187012	3.516975	5.468106	×
region 3	5.624176%	4.605277%	14.546548%	0.019622	0.589595	0.089099	10.134515	0.589595	6.383920	19.418182	4.921265	20.032091	×
region 5	13.467372%	12.875533%	18.270508%	0.017296	0.111523	0.036598	3.015770	0.111523	4.018259	7.123810	3.222542	7.396466	×
region 2	10.849795%	9.978808%	12.543973%	0.006905	0.024481	0.005658	0.084453	0.024481	4.054077	3.168457	3.823128	4.965423	×
region 4	11.287757%	10.261139%	12.663489%	0.012399	0.025175	0.017695	0.851447	0.025175	3.705281	3.541306	2.916306	4.348967	×
region 6	12.467334%	11.499366%	18.507366%	0.003348	0.040699	0.003039	0.435557	0.040699	3.225121	3.286377	2.994934	4.245569	×
region 7	12.722998%	12.178827%	14.181185%	0.011886	0.152278	0.031393	4.056128	0.152278	3.998535	8.299469	2.988075	8.658680	×

Test data

Research on the Integration of Two "Eyes"

Test Analysis

- 1、均值/mean value > 90%
- 2、标准差、平均梯度/Standard deviation and average gradient > 90%
- 3、信噪比/SNR \approx 73.89%
- 4、角点误差Corner Errors
最大值Maximum: 2.72 pixel
平均值Mean : 0.57 pixel

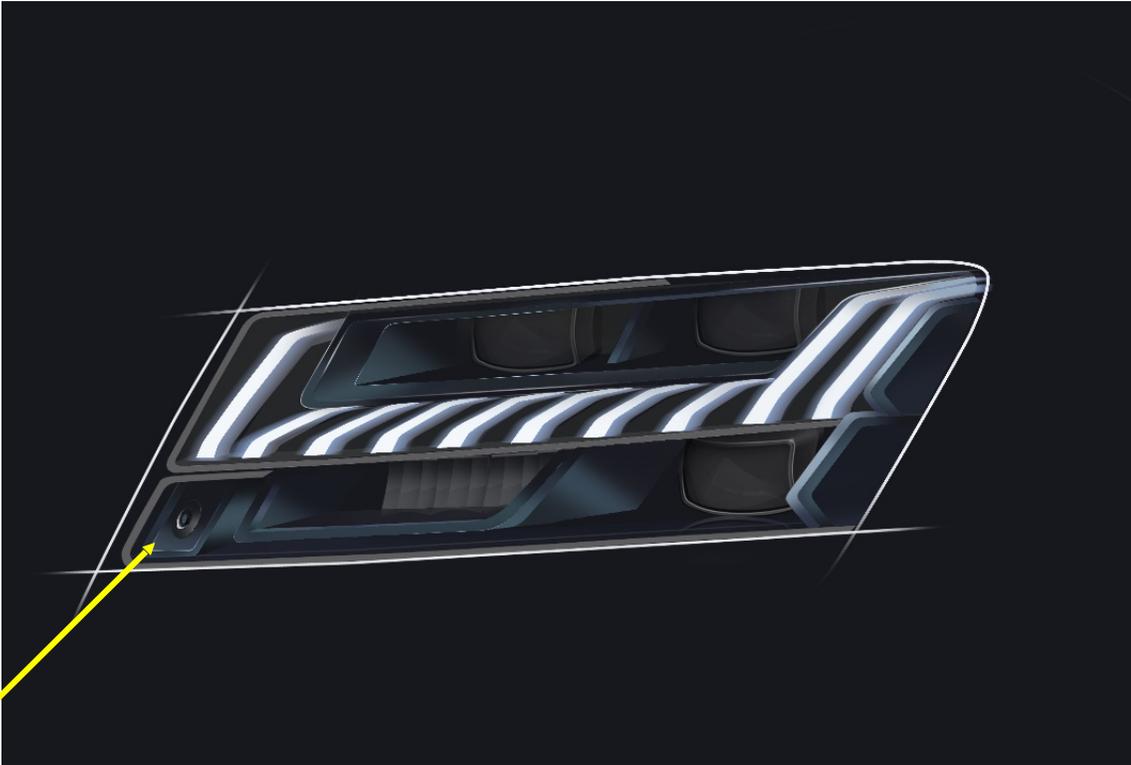
能满足ADB的精度要求/It can meet the accuracy requirement of ADB

结论：通过设计和工艺优化,可以将扭曲像素最大偏差控制在小于2个像素以内，摄像头和大灯可以实现有机结合.

Conclusion: By design and process optimization, the distortion pixel deviation can be controlled within 2 pixels . The camera and the headlamp can be Integrated

Research on the Integration of Two "Eyes"

Camera built in Lamp



Headlight

Camera

谢谢!

Thanks!



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