UNISOC Android9.0 UDS710+UDX710 Camera IIRCNR Tuning Guide

修改历史

版本号	日期	注释
V1.0	2020/4/20	初稿

文档信息

适用产品信息	适用版本信息	关键字
UDS710+UDX710	Android 9.0	IIRCNR

Contents

原理介绍

IIRCNR模块作用在YUV域，主要用于去除前面的色彩降噪模块PRECDN，CDN，POSTCDN没有去除的颜色噪声

算法会在Y/U/V三个不同的平面进行处理

在调试IIRCNR之前除了确保RAW域及RGB域的模块都已经调试完毕外，还需要确保前面的颜色处理模块PRECDN，CDN，POSTCDN也已经调试完毕。

原理介绍

level number 1 Gain : 1.00 Copy Paste

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1280
uv_low_thr2_1	1024	uv_high_thr2_1	1920
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

Name	Value	Name	Value
ymd_u	491520	ymd_v	491520
ymd_min_u	0	ymd_min_v	0
slop_uv_0	5	slop_uv_1	4
slop_uv_2	3	slop_uv_3	3
slop_uv_4	3	slop_uv_5	3
slop_uv_6	3	slop_uv_7	3
slop_y_0	409	slop_y_1	546
slop_y_2	546	slop_y_3	124
slop_y_4	124	slop_y_5	124
slop_y_6	124	slop_y_7	124
middle_factor_uv_0	19392	middle_factor_uv_1	19712
middle_factor_uv_2	17792	middle_factor_uv_3	17792
middle_factor_uv_4	17792	middle_factor_uv_5	17792
middle_factor_uv_6	17792	middle_factor_uv_7	17792
middle_factor_y_0	24552	middle_factor_y_1	34946
middle_factor_y_2	34946	middle_factor_y_3	20592
middle_factor_y_4	20592	middle_factor_y_5	20592
middle_factor_y_6	20592	middle_factor_y_7	20592

Tune Get Set

YUV

判断是否要进行去噪

控制去噪强度

输出

原理介绍

level number 1 Gain : 1.00 Copy Paste

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1280
uv_low_thr2_1	1024	uv_high_thr2_1	1920
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

Name	Value	Name	Value
ymd_u	491520	ymd_v	491520
ymd_min_u	0	ymd_min_v	0
slop_uv_0	5	slop_uv_1	4
slop_uv_2	3	slop_uv_3	3
slop_uv_4	3	slop_uv_5	3
slop_uv_6	3	slop_uv_7	3
slop_y_0	409	slop_y_1	546
slop_y_2	546	slop_y_3	124
slop_y_4	124	slop_y_5	124
slop_y_6	124	slop_y_7	124
middle_factor_uv_0	19392	middle_factor_uv_1	19712
middle_factor_uv_2	17792	middle_factor_uv_3	17792
middle_factor_uv_4	17792	middle_factor_uv_5	17792
middle_factor_uv_6	17792	middle_factor_uv_7	17792
middle_factor_y_0	24552	middle_factor_y_1	34946
middle_factor_y_2	34946	middle_factor_y_3	20592
middle_factor_y_4	20592	middle_factor_y_5	20592
middle_factor_y_6	20592	middle_factor_y_7	20592

Tune Get Set

uv_th: UV方差阈值。该值越大，越多的像素被滤波。

uv_dist: UV梯度阈值。该值越大，越多的像素被滤波。

uv_low_thr1_0/1/2/3: 不同亮度的UV阈值。该值越大越多像素在对应亮度被滤波。

y_edge_thr_min_0/1/2/3: 在不同亮度下的最小边缘判断阈值。该值用来在边缘和平坦像素之间做平滑过渡。

y_edge_thr_max_0/1/2/3: 在不同亮度下的最大边缘判断阈值。该值将决定当前像素是否在边缘位置，如果在边缘上，将不会被滤波。所以该值越大，越多的像素会被滤波。

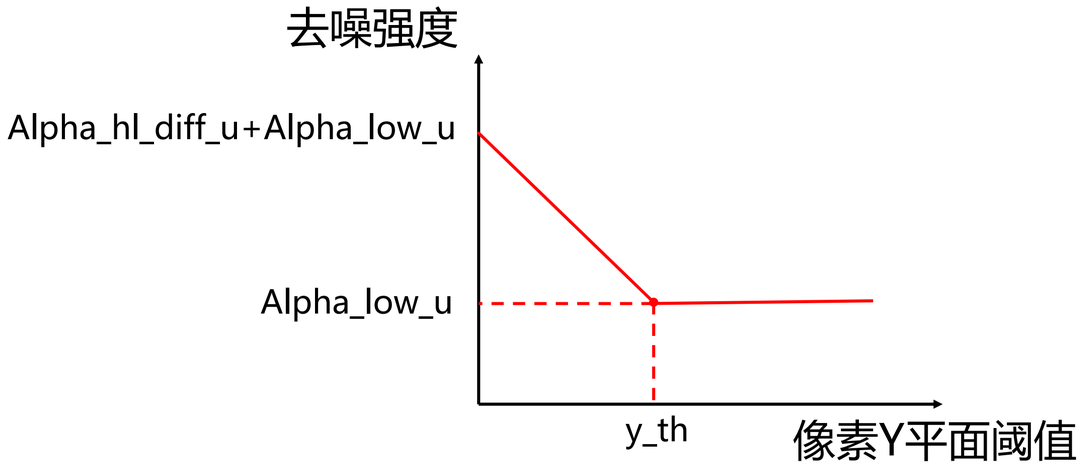
原理介绍

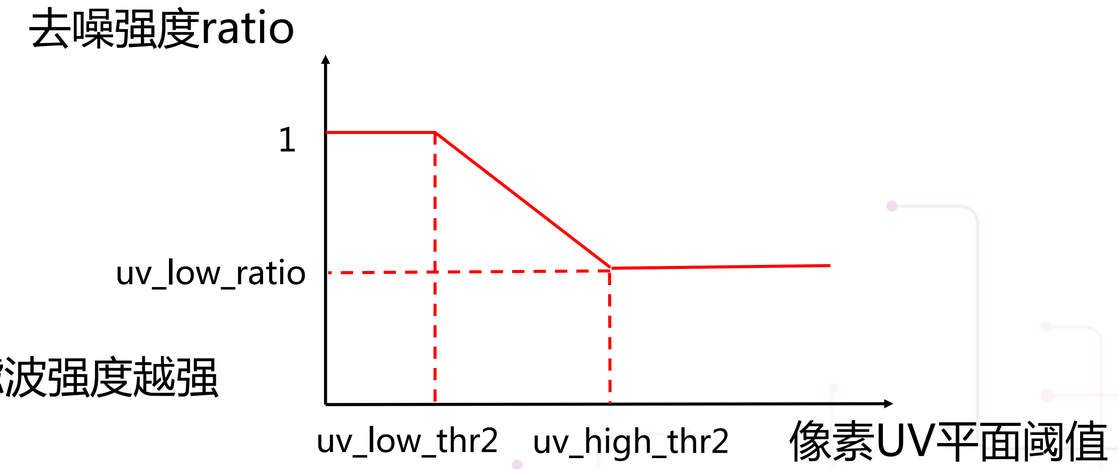
level number 1 Gain : 1.00 Copy Paste

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1280
uv_low_thr2_1	1024	uv_high_thr2_1	1920
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

Name	Value	Name	Value
ymd_u	491520	ymd_v	491520
ymd_min_u	0	ymd_min_v	0
slop_uv_0	5	slop_uv_1	4
slop_uv_2	3	slop_uv_3	3
slop_uv_4	3	slop_uv_5	3
slop_uv_6	3	slop_uv_7	3
slop_y_0	409	slop_y_1	546
slop_y_2	546	slop_y_3	124
slop_y_4	124	slop_y_5	124
slop_y_6	124	slop_y_7	124
middle_factor_uv_0	19392	middle_factor_uv_1	19712
middle_factor_uv_2	17792	middle_factor_uv_3	17792
middle_factor_uv_4	17792	middle_factor_uv_5	17792
middle_factor_uv_6	17792	middle_factor_uv_7	17792
middle_factor_y_0	24552	middle_factor_y_1	34946
middle_factor_y_2	34946	middle_factor_y_3	20592
middle_factor_y_4	20592	middle_factor_y_5	20592
middle_factor_y_6	20592	middle_factor_y_7	20592

Tune Get Set





Y_th: 亮度阈值

Alpha_hl_diff_u: UV平面低强度与高强度之间的差值。该值越大滤波强度越强

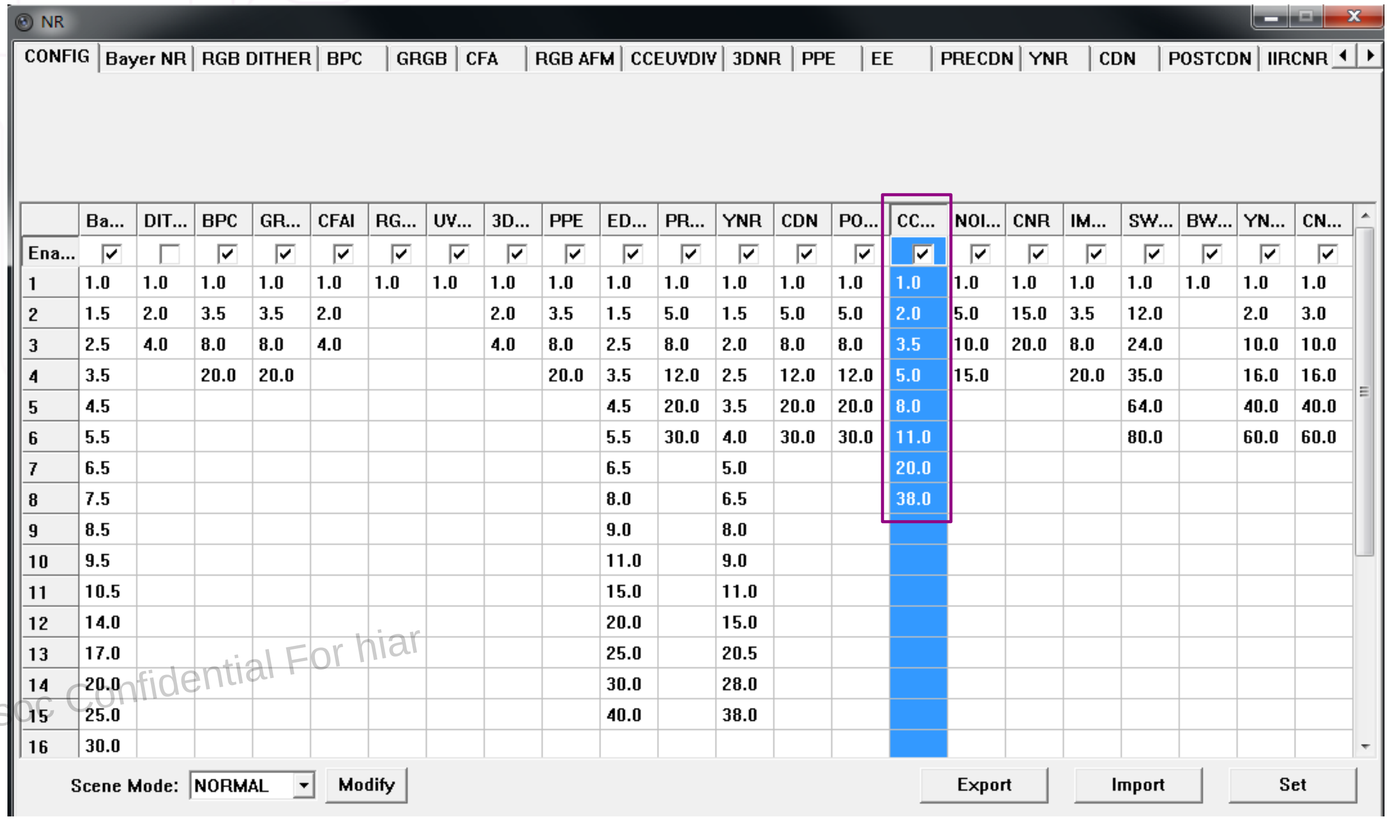
Alpha_low_u: UV平面低强度滤波。该值越大滤波强度越强

Uv_low_thr2_0/1/2/3: 不同亮度下，随着边缘度增加用来控制减小滤波器强度。该值越小，去噪强度会越弱

Uv_high_thr2_0/1/2/3: 不同亮度下，随着边缘度增加用来控制减小滤波器强度。该值越小，去噪强度会越弱

Css_lum _thr: 色彩抑制阈值。该值越大，越多的像素被色彩抑制。

调试流程



	Ba...	DIT...	BPC	GR...	CFAI	RG...	UV...	3D...	PPE	ED...	PR...	YNR	CDN	PO...	CC...	NOI...	CNR	IM...	SW...	BW...	YN...	CN...
Ena...	☑	☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	1.5	2.0	3.5	3.5	2.0			2.0	3.5	1.5	5.0	1.5	5.0	5.0	2.0	5.0	15.0	3.5	12.0		2.0	3.0
3	2.5	4.0	8.0	8.0	4.0			4.0	8.0	2.5	8.0	2.0	8.0	8.0	3.5	10.0	20.0	8.0	24.0		10.0	10.0
4	3.5		20.0	20.0					20.0	3.5	12.0	2.5	12.0	12.0	5.0	15.0		20.0	35.0		16.0	16.0
5	4.5									4.5	20.0	3.5	20.0	20.0	8.0				64.0		40.0	40.0
6	5.5									5.5	30.0	4.0	30.0	30.0	11.0				80.0		60.0	60.0
7	6.5									6.5		5.0			20.0							
8	7.5									8.0		6.5			38.0							
9	8.5									9.0		8.0										
10	9.5									11.0		9.0										
11	10.5									15.0		11.0										
12	14.0									20.0		15.0										
13	17.0									25.0		20.5										
14	20.0									30.0		28.0										
15	25.0									40.0		38.0										
16	30.0																					

- 在调试该模块时，需要先根据gain值配置不同的档位，并且enable位要使能
- gain值要按照从小到大的规则填写，不能反转或者空置
- 参数档位可以根据调试者的需要增加或者删减

调试流程

level number 1 Gain : 1.00 Copy Paste

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1280
uv_low_thr2_1	1024	uv_high_thr2_1	1920
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

① ②

Name	Value	Name	Value
ymd_u	491520	ymd_v	491520
ymd_min_u	0	ymd_min_v	0
slop_uv_0	5	slop_uv_1	4
slop_uv_2	3	slop_uv_3	3
slop_uv_4	3	slop_uv_5	3
slop_uv_6	3	slop_uv_7	3
slop_y_0	409	slop_y_1	546
slop_y_2	546	slop_y_3	124
slop_y_4	124	slop_y_5	124
slop_y_6	124	slop_y_7	124
middle_factor_uv_0	19392	middle_factor_uv_1	19712
middle_factor_uv_2	17792	middle_factor_uv_3	17792
middle_factor_uv_4	17792	middle_factor_uv_5	17792
middle_factor_uv_6	17792	middle_factor_uv_7	17792
middle_factor_y_0	24552	middle_factor_y_1	34946
middle_factor_y_2	34946	middle_factor_y_3	20592
middle_factor_y_4	20592	middle_factor_y_5	20592
middle_factor_y_6	20592	middle_factor_y_7	20592

③

Tune Get Set

① 频域划分参数

② 去噪强度控制

③ 通过左侧参数tool自动生成的参数

调试流程

Android9.0平台调试步骤：

1、在调试IIRCNR之前需要先采集任意一张主观场景的YUV图片

adb shell setprop debug.camera.save.snpfile 1

在data/misc/cameraserver目录下生产yuv图片

2、将y.raw改名为.y420，将uv.raw改名为.vu420，并将2个文件导入isp tool

3、修改tuning参数后，点击tune，生成右侧参数

4、点set保存

注意：每次修改tuning参数后，都需要导入任意一张YUV图片，用来生成上页③中的参数

调试流程

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1280
uv_low_thr2_1	1024	uv_high_thr2_1	1920
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

调试过程中，建议调试左图方框中的参数，其他参数填写默认值即可

uv_th：数值越大，更多的像素会被滤波

uv_dist：数值越大，更多的像素会被滤波

uv_low_thr1：数值越大，更多的像素会被滤波

alpha_hl_diff_u：数值越大，去噪强度越强

alpha_low_u：数值越大，去噪强度越强

uv_low_thr2：数值越大，去噪强度越强

css_lum_thr：数值越大，去噪强度越强

参数修改规则：

- alpha_hl_diff_u+alpha_low_u < 16384
- uv_high_thr2 = uv_low_thr2 或 uv_high_thr2 - uv_low_thr2 > 65
- y_edge_thr_max = y_edge_thr_min 或 y_edge_thr_max - y_edge_thr_min > 5

功能确认

先将其他去彩噪模块bypass，如PRECDN/CDN/POSTCDN/CCEUVDIV/CNR模块等，在暗处同一场景，拍摄对比图，图1关闭IIRCNR，图2开启IIRCNR并使用较强去噪参数

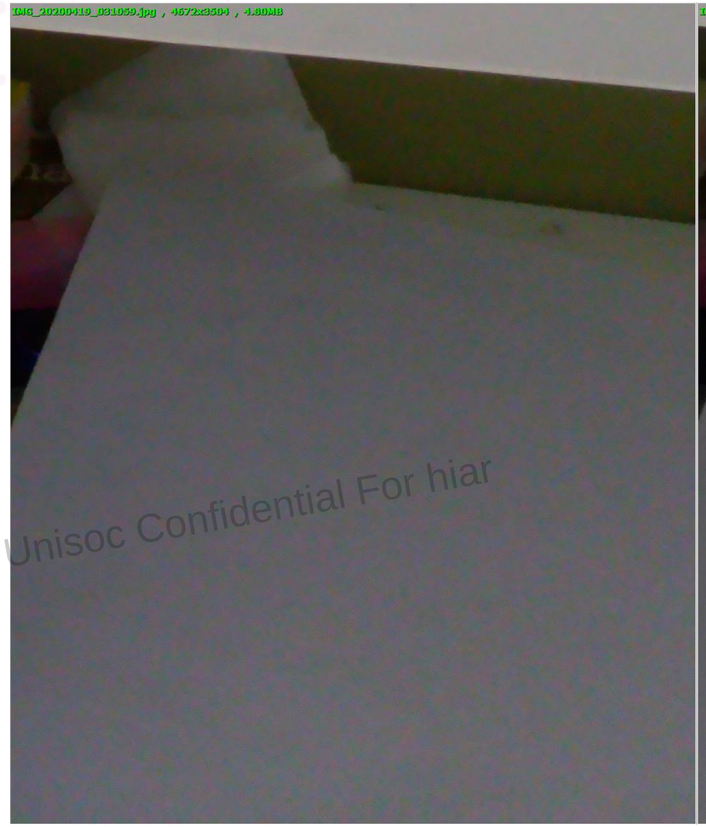


图1：IIRCNR关闭

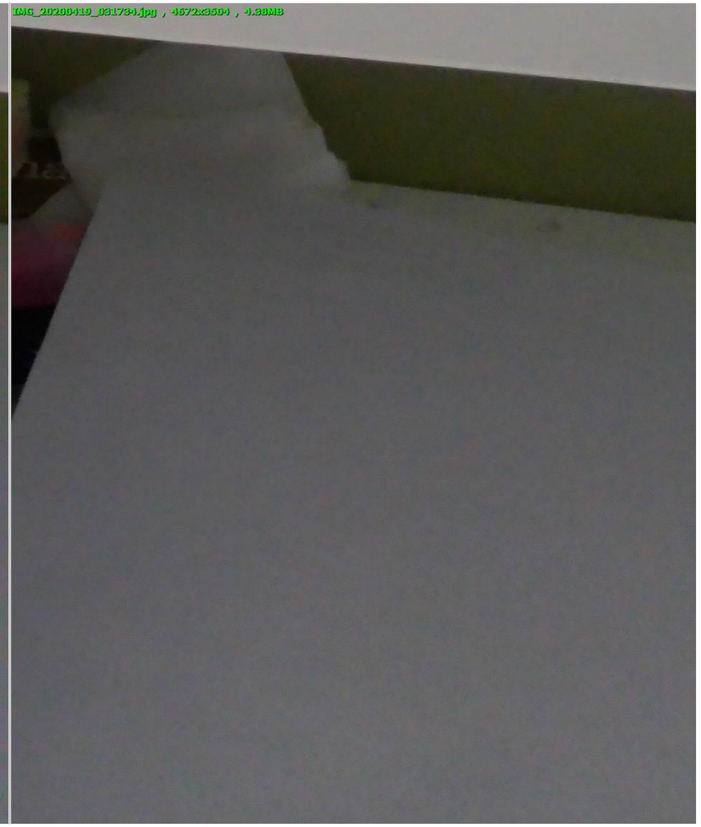


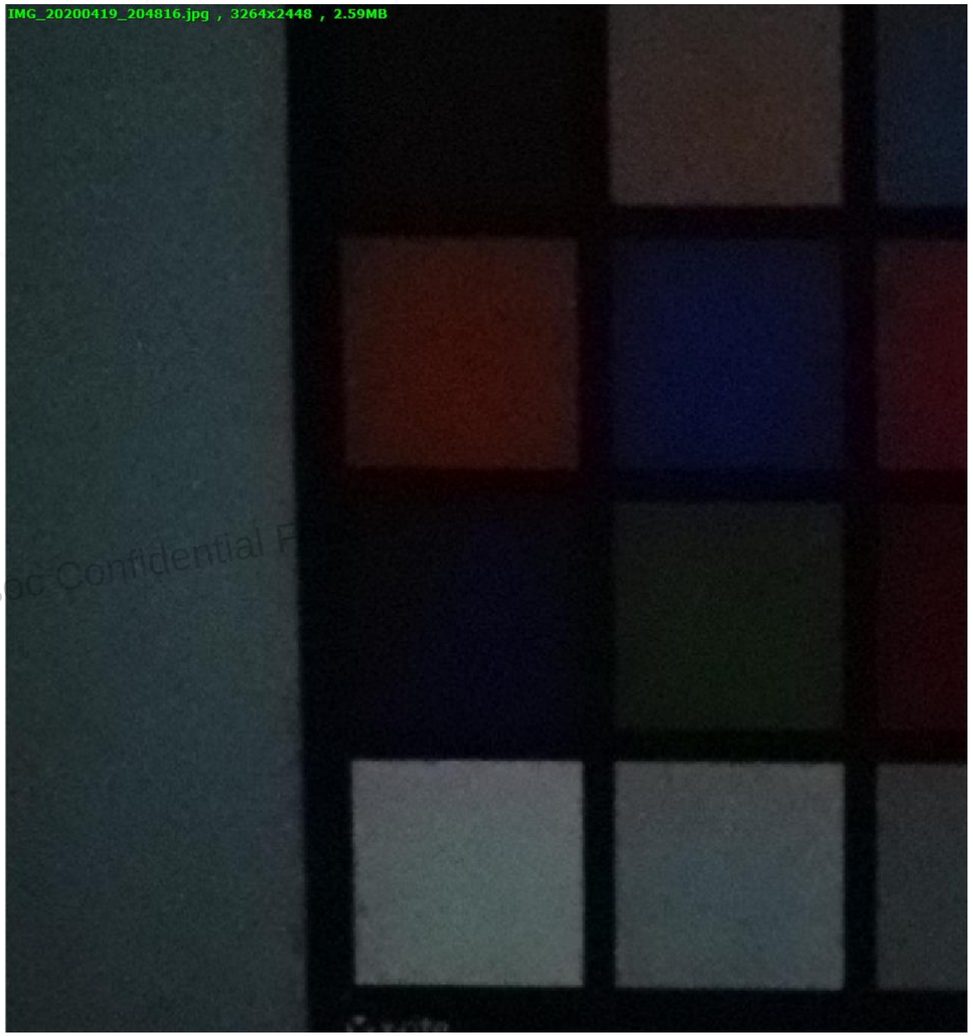
图2：IIRCCNR开启

Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	200	uv_dist	600
uv_low_thr1_0	1000	uv_low_thr1_1	1000
uv_low_thr1_2	1000	uv_low_thr1_3	1000
y_edge_thr_max_0	1000	y_edge_thr_max_1	1000
y_edge_thr_max_2	1000	y_edge_thr_max_3	1000
y_edge_thr_min_0	900	y_edge_thr_min_1	900
y_edge_thr_min_2	900	y_edge_thr_min_3	900
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	700	alpha_low_u	15683
uv_low_thr2_0	7000	uv_high_thr2_0	8000
uv_low_thr2_1	7000	uv_high_thr2_1	8000
uv_low_thr2_2	7000	uv_high_thr2_2	8000
uv_low_thr2_3	7000	uv_high_thr2_3	8000
css_lum_thr	255		

强去噪参数示例

调试案例

暗态下色卡色块颜色丢失，如下图



调试案例

图像大片颜色丢失，优先查看CMC，若CMC无异常，需要检查IIRCNR模块是否去噪太强

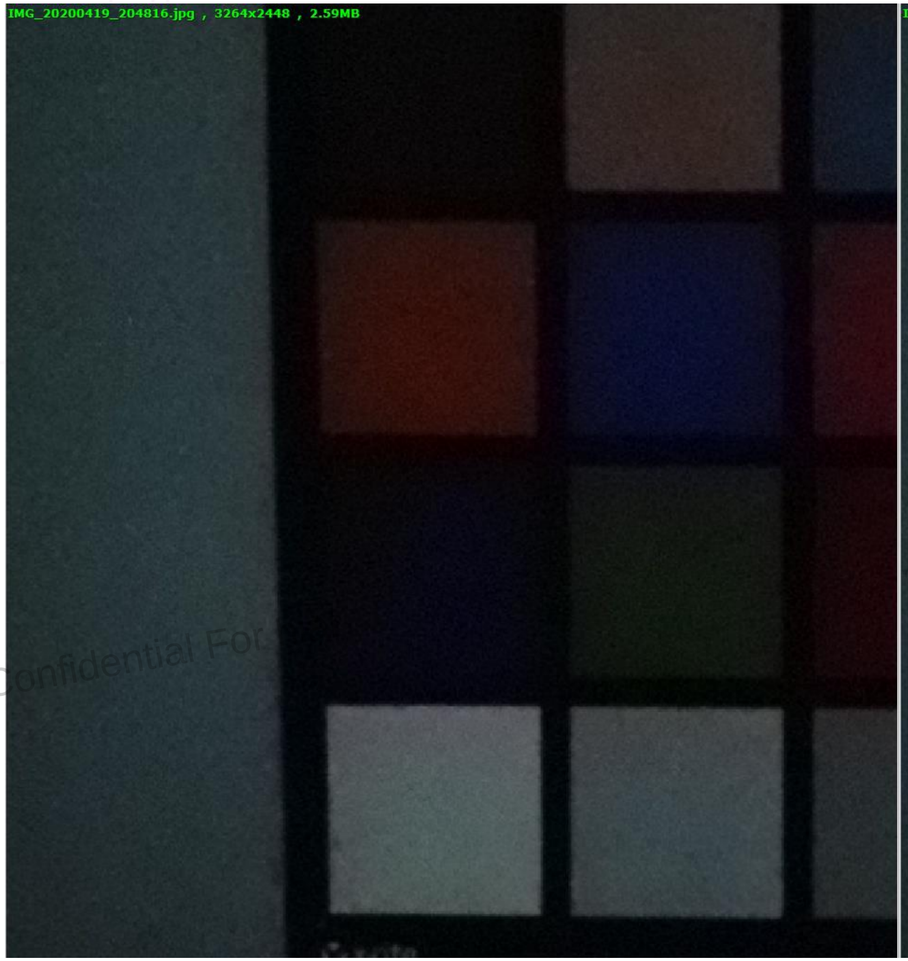
Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	60	uv_dist	70
uv_low_thr1_0	1200	uv_low_thr1_1	1600
uv_low_thr1_2	1780	uv_low_thr1_3	1780
y_edge_thr_max_0	400	y_edge_thr_max_1	512
y_edge_thr_max_2	512	y_edge_thr_max_3	512
y_edge_thr_min_0	350	y_edge_thr_min_1	480
y_edge_thr_min_2	480	y_edge_thr_min_3	480
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	3200	uv_high_thr2_0	4000
uv_low_thr2_1	3400	uv_high_thr2_1	4300
uv_low_thr2_2	3600	uv_high_thr2_2	4600
uv_low_thr2_3	4000	uv_high_thr2_3	5000
css_lum_thr	200		

修改前

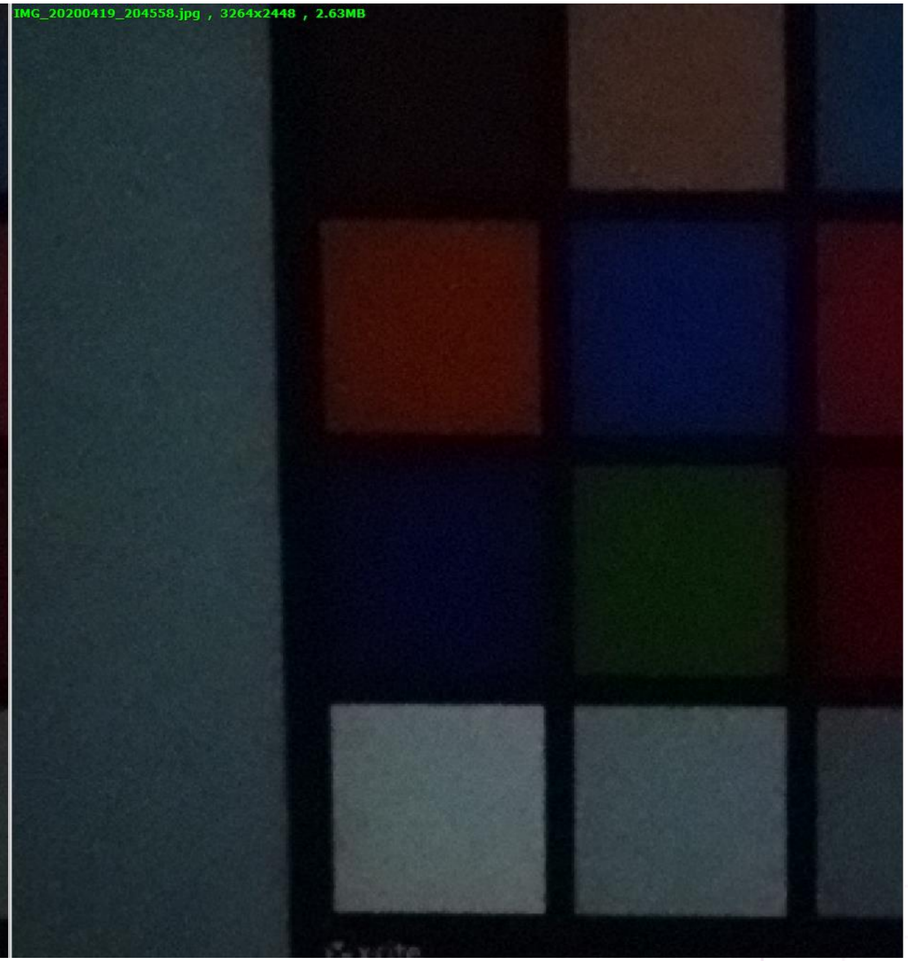
Name	Value	Name	Value
ccnr_bypass	0		
pre_uv_th	30		
uv_th	15	uv_dist	10
uv_low_thr1_0	384	uv_low_thr1_1	512
uv_low_thr1_2	772	uv_low_thr1_3	772
y_edge_thr_max_0	40	y_edge_thr_max_1	49
y_edge_thr_max_2	49	y_edge_thr_max_3	49
y_edge_thr_min_0	20	y_edge_thr_min_1	34
y_edge_thr_min_2	34	y_edge_thr_min_3	34
y_th	240	uv_diff_thr	16
alpha_hl_diff_u	500	alpha_low_u	15683
uv_low_thr2_0	576	uv_high_thr2_0	1920
uv_low_thr2_1	1024	uv_high_thr2_1	2560
uv_low_thr2_2	1280	uv_high_thr2_2	3860
uv_low_thr2_3	1280	uv_high_thr2_3	3860
css_lum_thr	32		

修改后

调试案例



修改前



修改后

附： param list

Parameters	Description	Range	Default
ccnr_bypass	控制CCNR打开和关闭	[0, 1]	0
pre_uv_th	针对第一行像素点uv方差阈值	[0, 255]	30
uv_th	uv方差阈值	[0, 255]	15
uv_dist	uv梯度阈值	[0, 765]	10
uv_low_thr1_0	该亮度下的uv低频阈值	[0, 16383]	384
uv_low_thr1_1	该亮度下的uv低频阈值	[0, 16383]	512
uv_low_thr1_2	该亮度下的uv低频阈值	[0, 16383]	772
uv_low_thr1_3	该亮度下的uv低频阈值	[0, 16383]	772
y_edge_thr_max_0	该亮度下的最大亮度边缘阈值	[0, 65535]	40
y_edge_thr_max_1	该亮度下的最大亮度边缘阈值	[0, 65535]	49
y_edge_thr_max_2	该亮度下的最大亮度边缘阈值	[0, 65535]	49
y_edge_thr_max_3	该亮度下的最大亮度边缘阈值	[0, 65535]	49

附： param list

Parameters	Description	Range	Default
y_edge_thr_min_0	该亮度下的最小亮度边缘阈值	[0, 65535]	20
y_edge_thr_min_1	该亮度下的最小亮度边缘阈值	[0, 65535]	34
y_edge_thr_min_2	该亮度下的最小亮度边缘阈值	[0, 65535]	34
y_edge_thr_min_3	该亮度下的最小亮度边缘阈值	[0, 65535]	34
y_th	亮度阈值	[0, 255]	240
uv_diff_thr	uv平面与周围像素点差值的阈值	[0, 255]	16
alpha_hl_diff_u	滤波低强度与高强度之间的差值	[0, 16383]	500
alpha_low_u	uv平面低强度滤波	[0, 16383]	15683
uv_low_thr2_0	该亮度下低频的去噪强度	[0, 81600]	576
uv_low_thr2_1	该亮度下低频的去噪强度	[0, 81600]	1024
uv_low_thr2_2	该亮度下低频的去噪强度	[0, 81600]	1280

附： param list

Parameters	Description	Range	Default
uv_low_thr2_3	该亮度下低频的去噪强度	[0, 81600]	1280
uv_high_thr2_0	该亮度下高频的去噪强度	[0, 81600]	1920
uv_high_thr2_1	该亮度下高频的去噪强度	[0, 81600]	2560
uv_high_thr2_2	该亮度下高频的去噪强度	[0, 81600]	3860
uv_high_thr2_3	该亮度下高频的去噪强度	[0, 81600]	3860
css_lum_thr	色彩抑制阈值	[0, 255]	32

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