



MEDIATEK

CONFIDENTIAL B

Edge Enhancement

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Support Chip

- MT6771

What is Edge Enhancement

An image processing to improve image's or video's sharpness

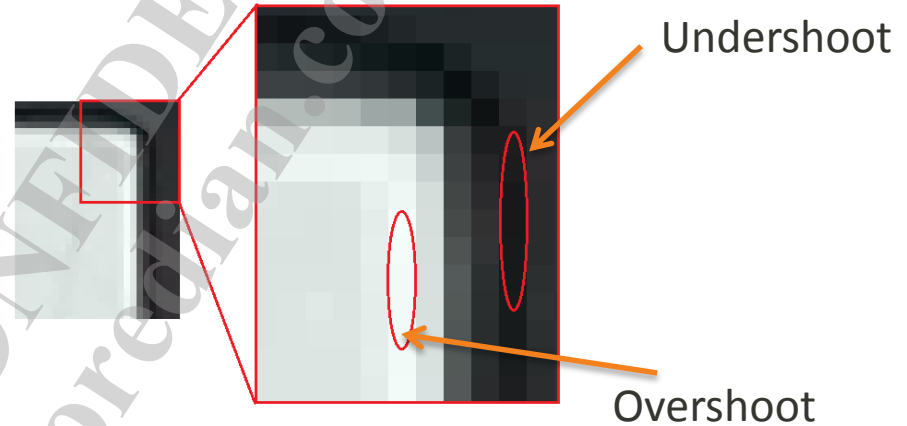
Before EE

After EE



What issue might meet

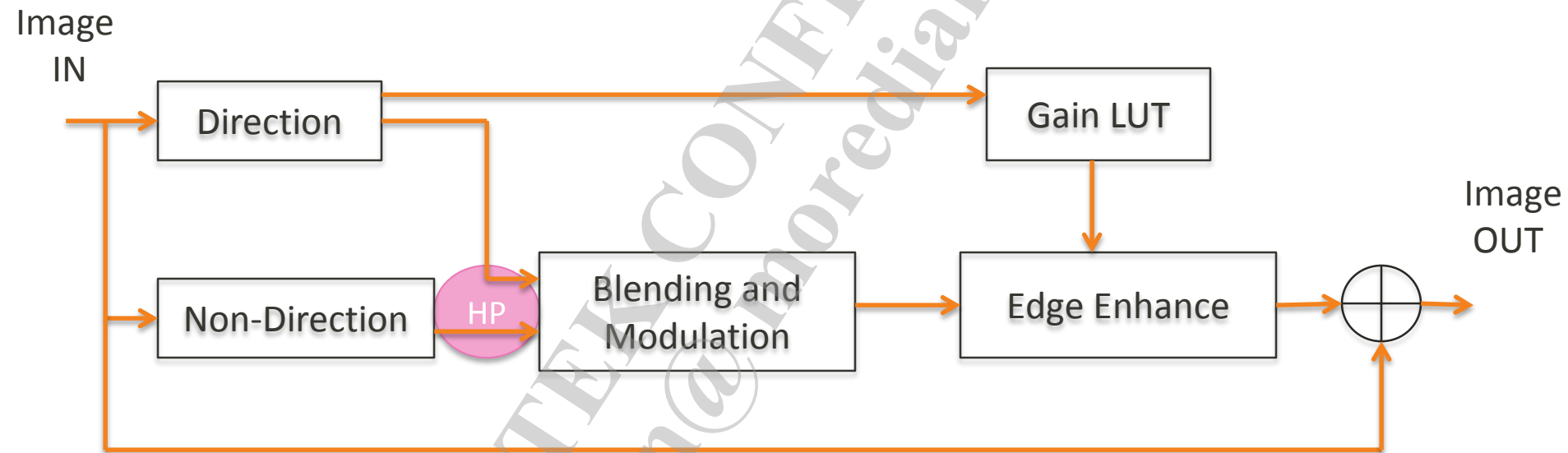
- Overshoot/Undershoot



- Edge Enhance (include Detail & Texture)



Block Diagram



UI

EE

HF Band Control		GLUT		* Slow Transition	
H1 DI BLND OFST	0	X1	0	ST OFST RESP	100
H2 DI BLND OFST	0	X2	32		
H3 DI BLND OFST	0	X3	64		
HX ISO BLND RAT	3	X4	96		
H1 GN	14	Y1	32		
H2 GN	4	Y2	96		
H3 GN	1	Y3	192		
		Y4	240		
		Y5	192		
Luma/Shading Mod		Artifact Control			
GLUT LINK EN	<input type="checkbox"/>	Dot TH	6		
SLNK GN Y1	255	DOT REDUC STR	128		
SLNK GN Y2	255	OVRSH CLIP STR	2		
*YCE		Clipping			
LUMA CNTST LV	3	CLIP LUMA UPB	255		
		CLIP LUMA LWB	0		
		CLIP LUMA SPC TH	0		
		RESP CLIP	64		
		*POS GN	16		
		*NEG GN	16		

Freq. Division EE

- Parameters
 - H1 GN
 - Means Signal level. Fine Detail ↑, Signal ↑, more Noisy
 - H2 GN
 - Means Signal level. Fine Texture ↑, Signal ↑, more Noisy
 - H3 GN
 - Means Signal level. Fine Edge ↑, Signal ↑, more Noisy
 - Suggestion
 - Sharpness is the combination of three parameters
 - If not satisfied the Sharpness result, fine tune Detail and fine Texture and fine tune Edge

H1 GN	14
H2 GN	4
H3 GN	1

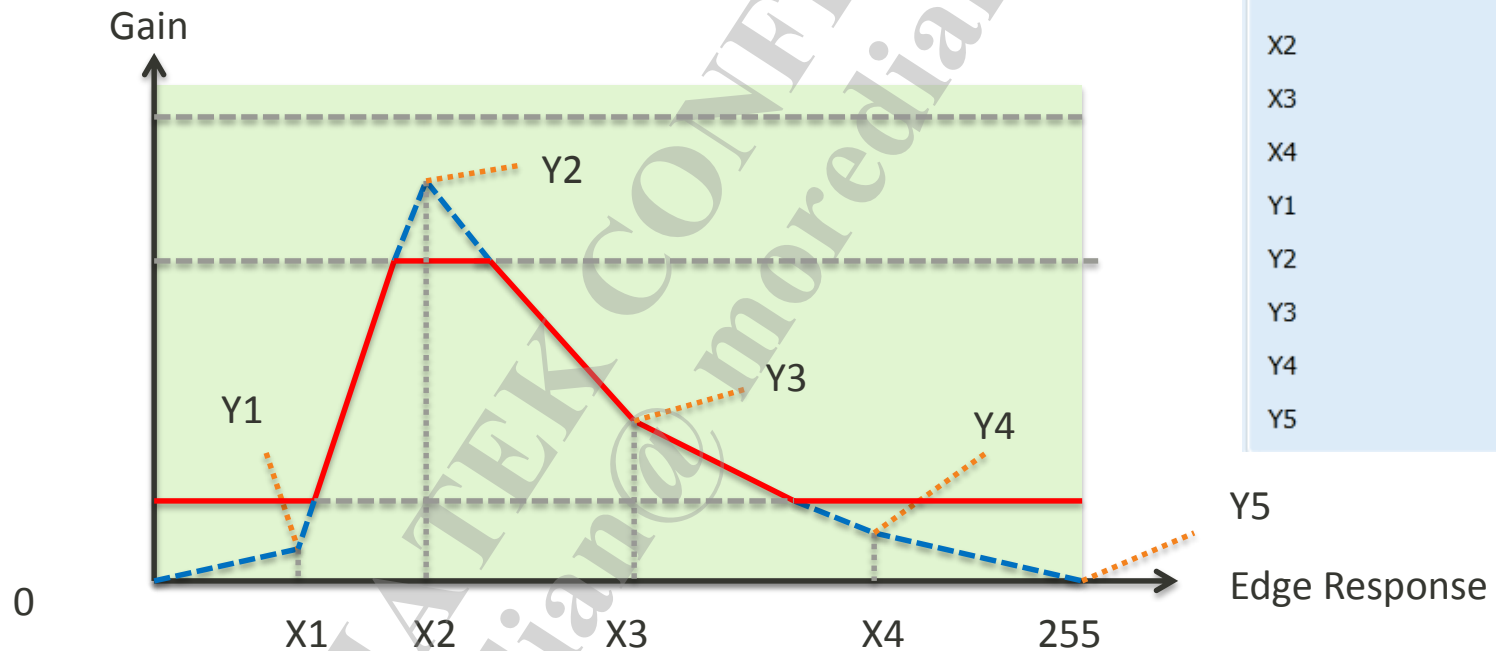
Edge Response

- We will enhance edge by High Pass Filter
- Use edge response to judge which to enhance or not



LUT

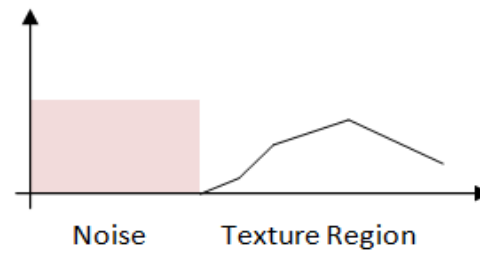
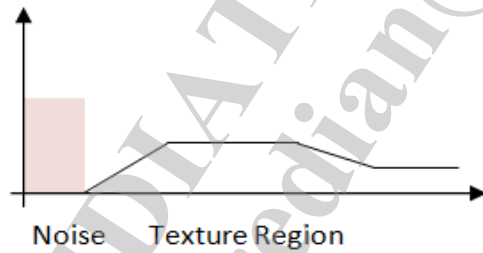
- Use Look Up Table to add edge strength of different scales
- Use Edge Response to decide enhance region



LUT Example

Small Noise Region

Large Noise Region



Corner Noise

- Some noise will be enhance than center, by control strength to decrease corner noise

The image shows a settings menu for 'Luma/Shading Mod'. It includes a 'GLUT LINK EN' checkbox, which is highlighted with a dashed line and an arrow pointing to a callout box labeled 'Enable bit'. Below this are two sliders: 'SLNK GN Y1' and 'SLNK GN Y2', both set to '255'. A large dashed box contains explanatory text about 'Y1/Y2 Usage'. It states that 'GN Y1/Y2' controls 'Corner Noise' and 'Corner Sharpness'. It further explains that 'GN Y1' controls the noise between the center and the boundary, while 'GN Y2' controls the noise of the boundary. Orange arrows point from the text to the respective sliders.

Luma/Shading Mod	
GLUT LINK EN	<input type="checkbox"/>
SLNK GN Y1	255
SLNK GN Y2	255

Enable bit
0: off 1: on

Y1/Y2 Usage:
GN Y1/Y2 → Corner Noise, Corner Sharpness
GN Y1: Control the noise between center and boundary
GN Y2: Control the noise of boundary

White/Dark Edge Suppression (1)

- Overshoot/Undershoot Clipping

- Default Value

Clipping	
CLIP LUMA UPB	255
CLIP LUMA LWB	0
CLIP LUMA SPC TH	0
RESP CLIP	64
*POS GN	16
*NEG GN	16



Method 1 (Locally adjusted by luma value and edge response)

CLIP LUMA UPB: To suppress overshoot

CLIP LUMA UPB ↓ → Overshoot ↓

CLIP LUMA LWB : To suppress undershoot

CLIP LUMA LWB ↑ → Undershoot ↓

CLIP LUMA SPC TH: Select suppression signal

Only the edge response > CLIP LUMA SPC TH would be suppressed

(0: flat region; 255: strong edge)

White/Dark Edge Suppression (2)

- Overshoot/Undershoot Clipping

- Default Value

Clipping	
CLIP LUMA UPB	255
CLIP LUMA LWB	0
CLIP LUMA SPC TH	0
RESP CLIP	64
*POS GN	16
*NEG GN	16



Method 2 (Global clipping)

- RESP CLIP: Overall edge enhancement would not exceed this limit (0: no EE)

Method 3 (Only depends on overshoot or undershoot response)

- POS GN: Adjust overshoot level (base = 16; 0 = no overshoot)
- NEG GN: Adjust undershoot level (base = 16; 0 = no undershoot)

Line Pattern Reduction

■ Use for reducing line pattern

Default Value

HF Band Control	
H1 DI BLND OFST	0
H2 DI BLND OFST	0
H3 DI BLND OFST	0
HX ISO BLND RAT	3

Step:

1. Use default value as initial
2. First fine tune H1~3 DI BLND OFST
3. Then fine tune HX ISO BLND RAT

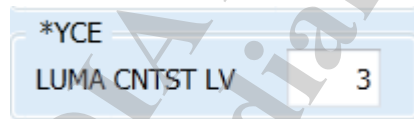
H1 DI BLND OFST ↓ → Detail line pattern ↓
H2 DI BLND OFST ↓ → Texture line pattern ↓
H3 DI BLND OFST ↓ → Edge line pattern ↓
HX ISO BLND RAT ↓ → Line Pattern ↓

YCE

- Speed up edge transition speed by drawing pixels close to local max/min ones.



- No overshoot/undershoot introduced



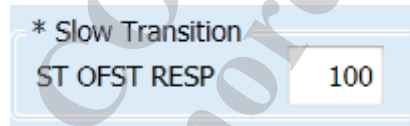
LUMA CNTST LV



→ Stronger EE

Slow Transition

- Avoid applying EE in gradient region for preventing **contour** artifact



- Range suggestion: 96~128
 - Lower means less contour (but the edge may become smoother)

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everyday genius