

大话成像之 数字成像系统 32讲

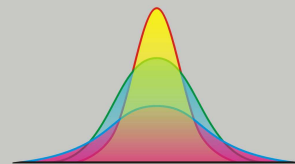
ISP 统计信息

Maver Jiang

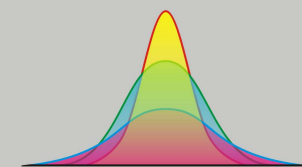
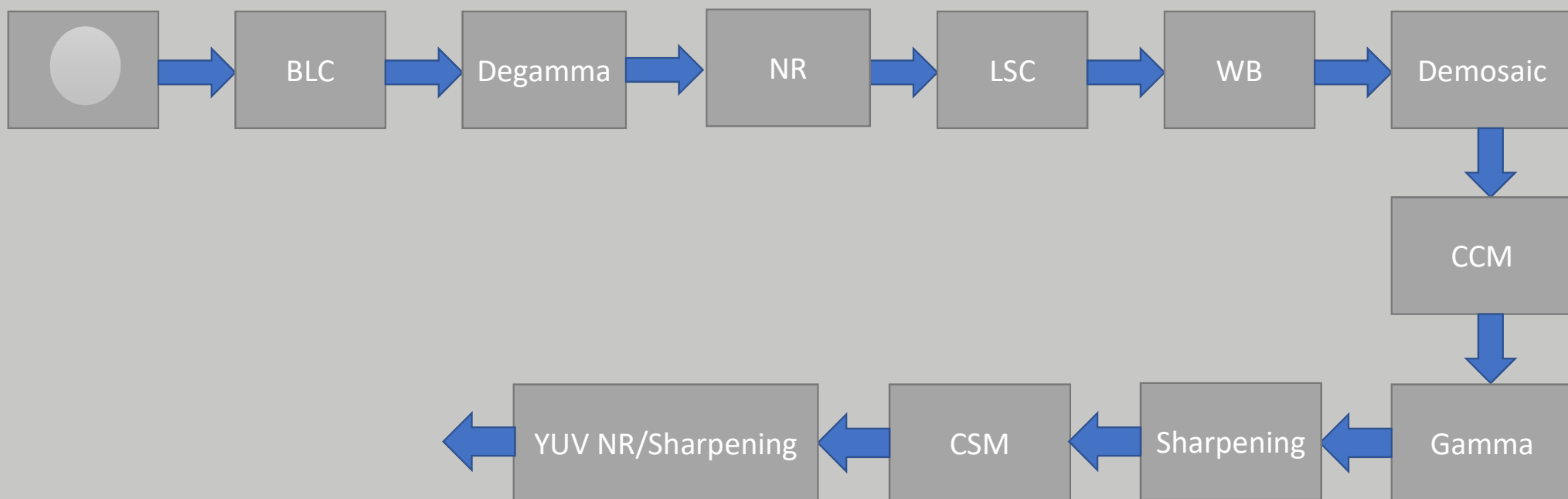
imaging algorithm specialist

staff image quality engineer

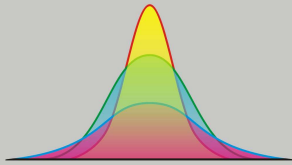
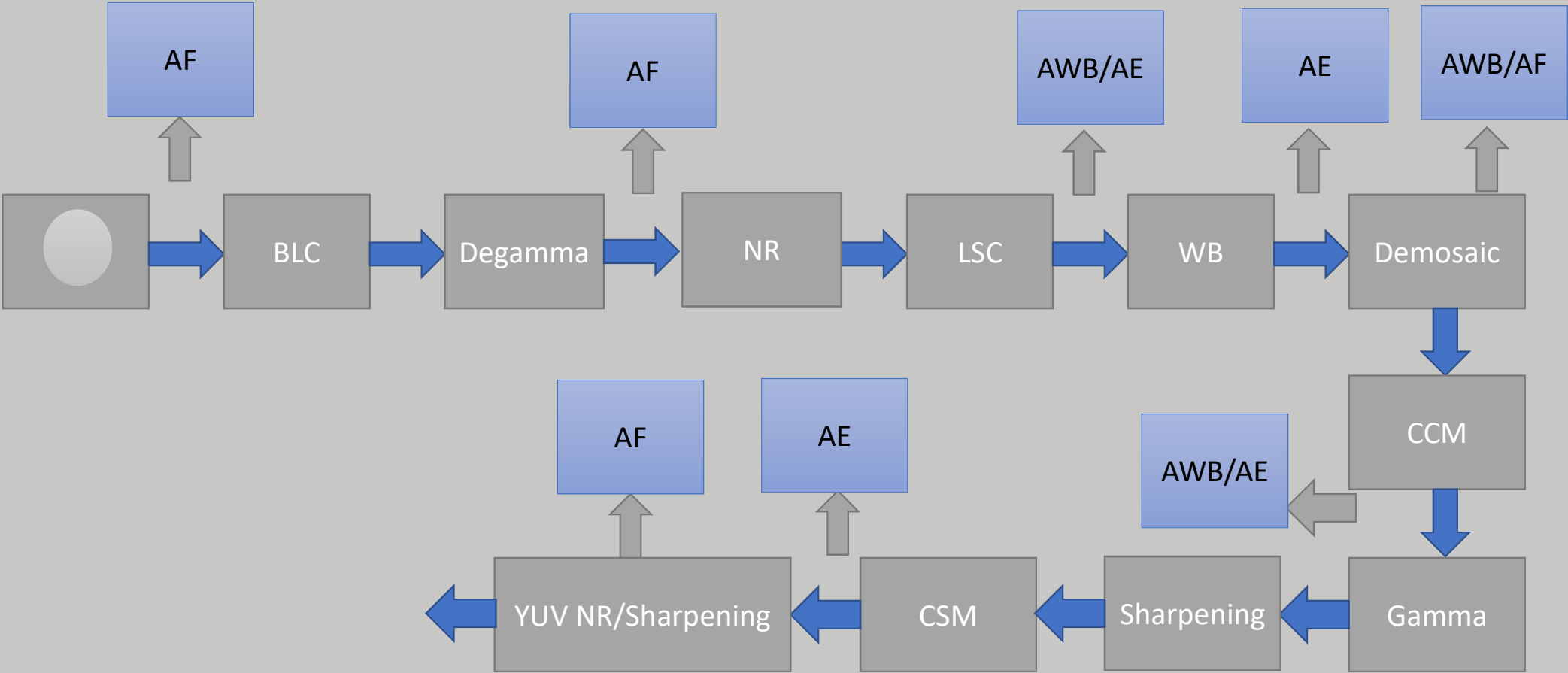
maver.jiang@gmail.com



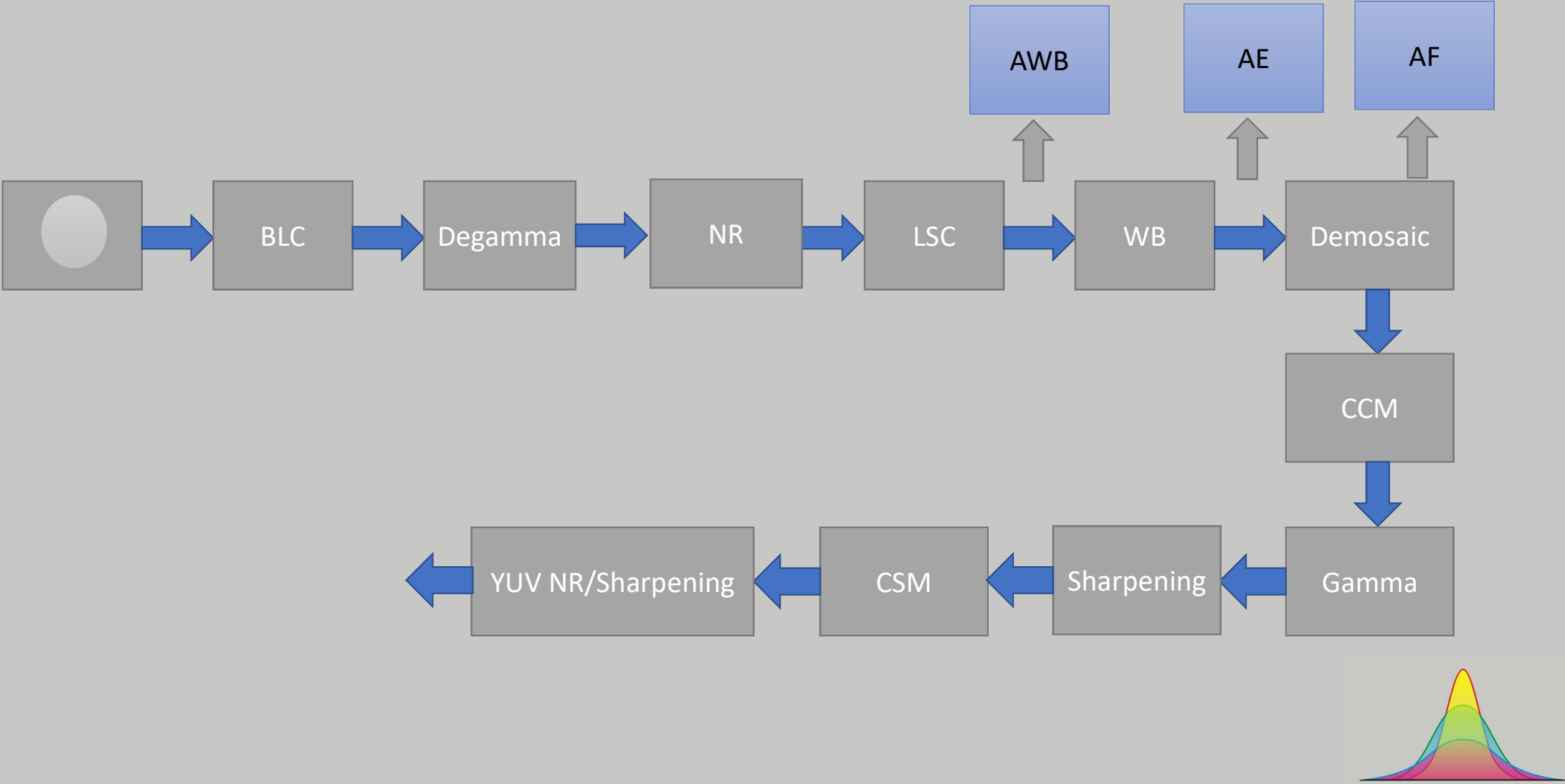
典型的ISP pipeline



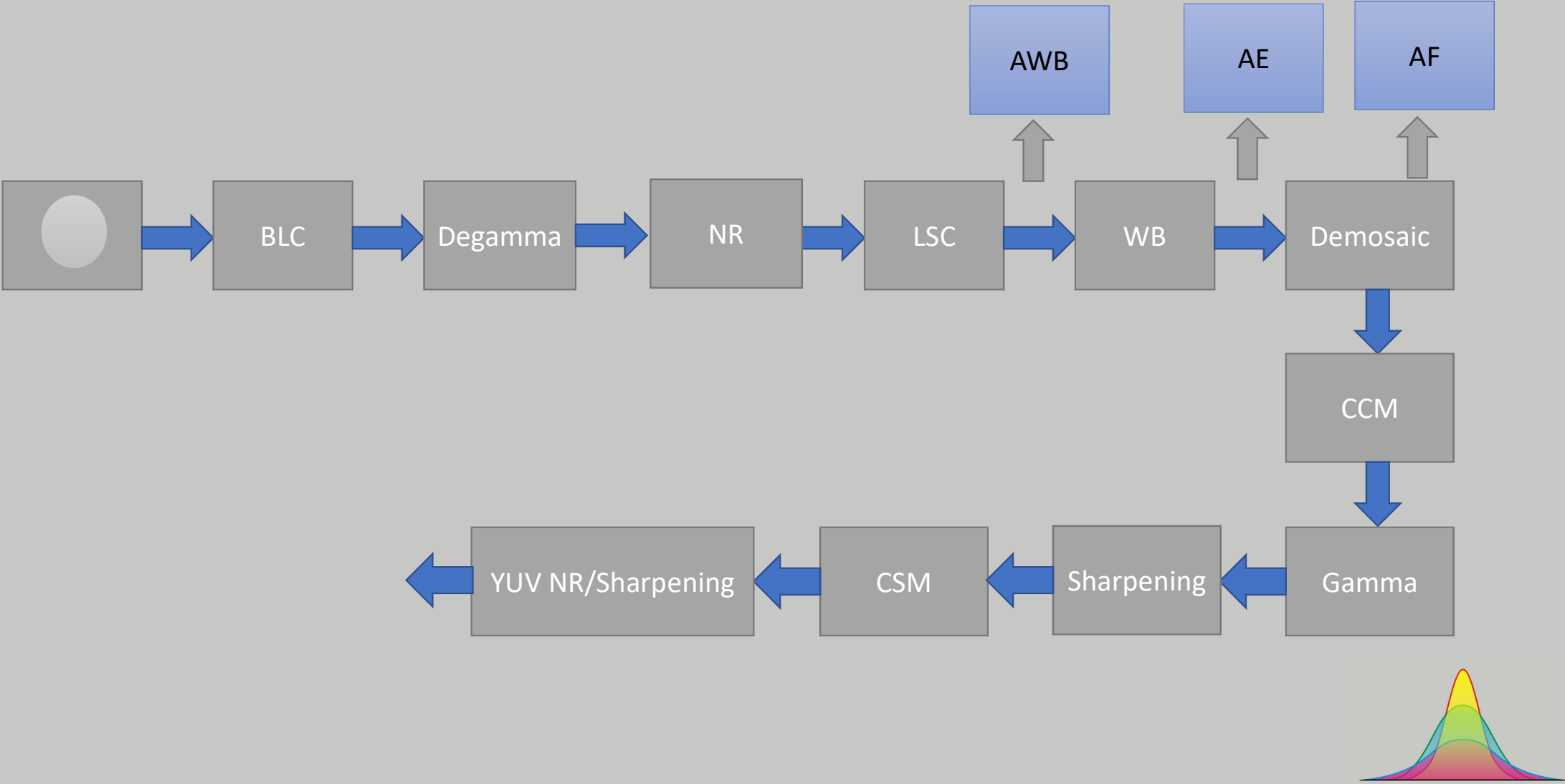
3A 统计信息位置



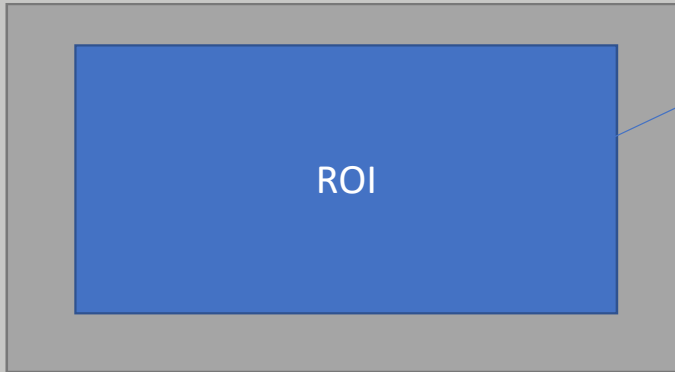
3A 统计信息位置比较流行的一种配置



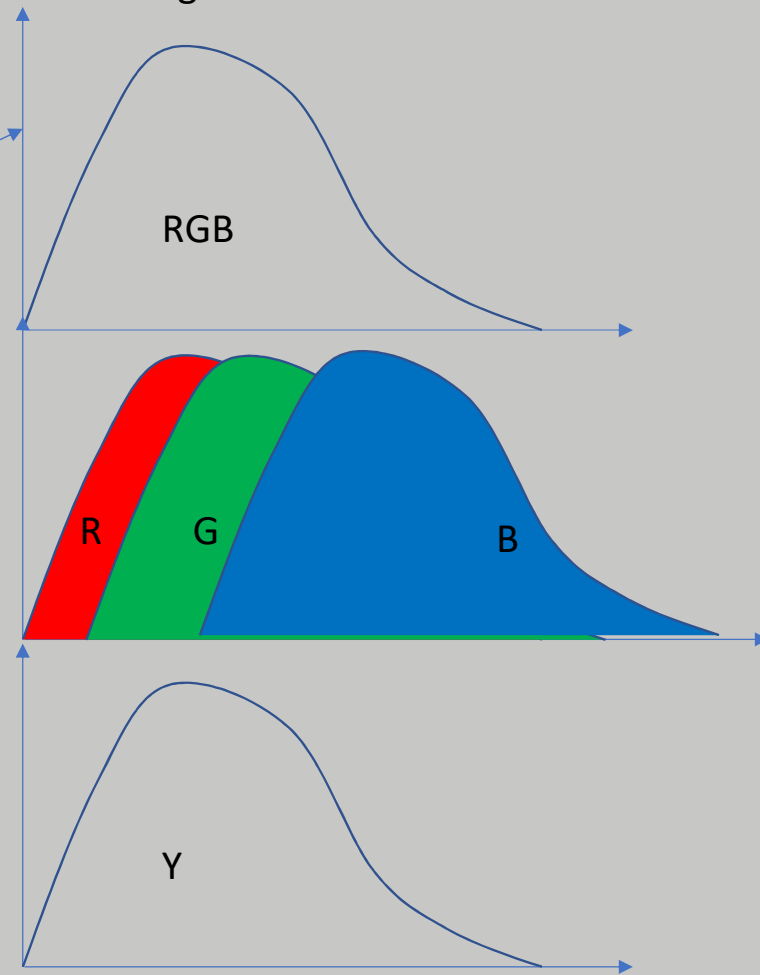
3A 统计信息位置比较流行的一种配置



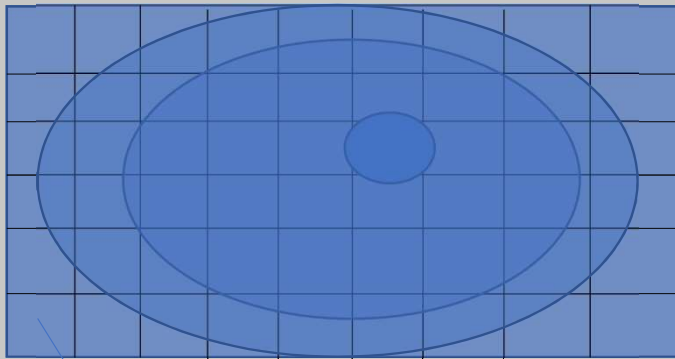
AE 统计信息典型举例



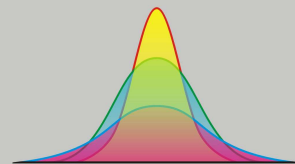
histogram



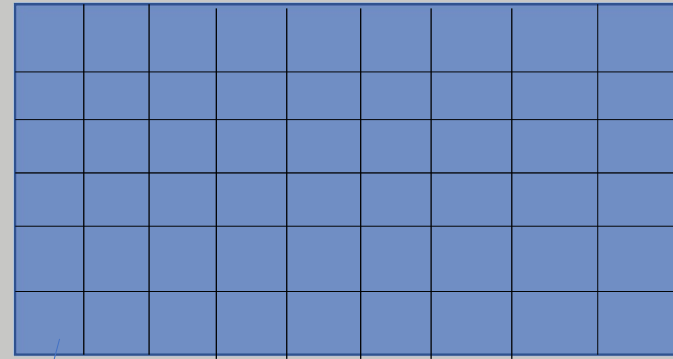
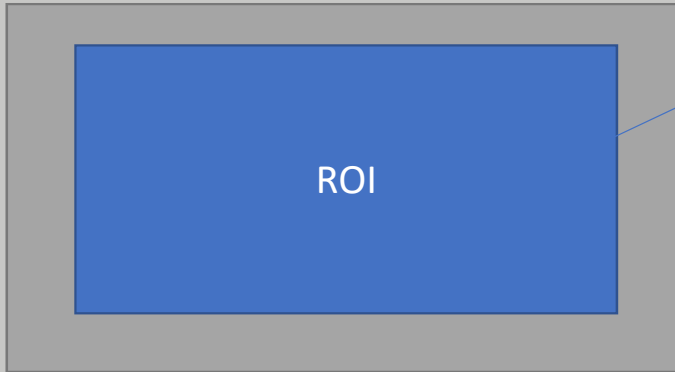
AE metering mode



Luminance,
R,G,B

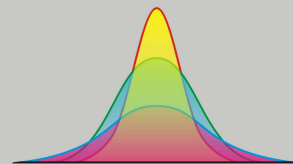


AWB 统计信息举例：

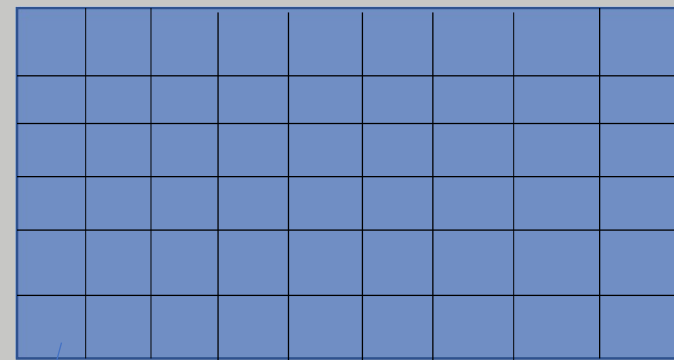
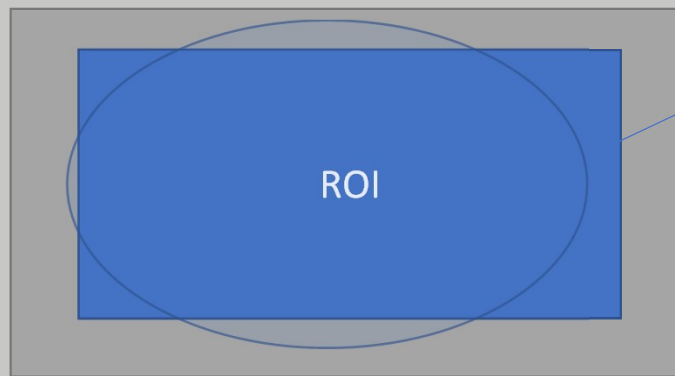


思考：哪种更好？

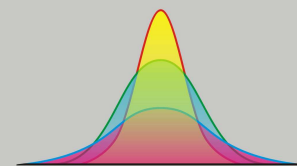
Mean R,G,B, Count_number
Mean R/G , B/G



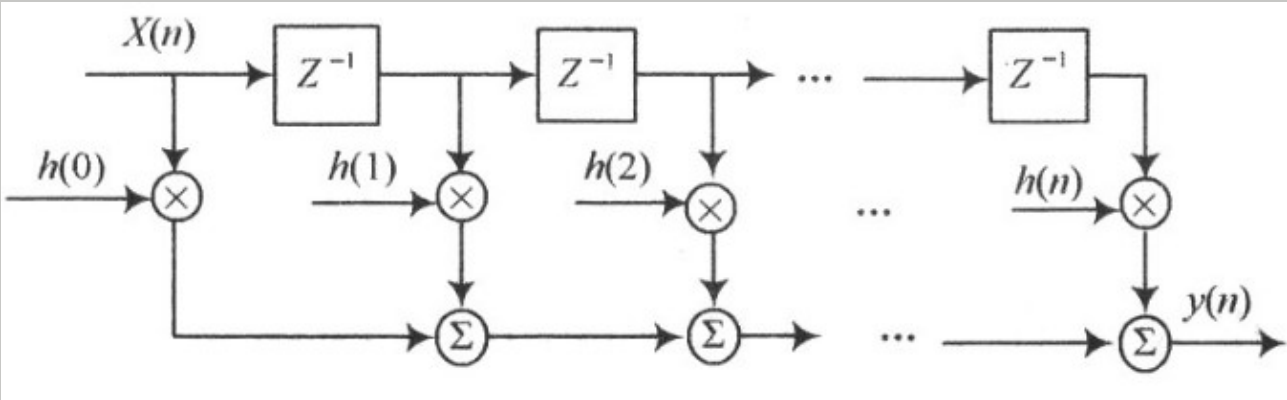
CDAF 统计信息举例：



Focus Value, Luminance



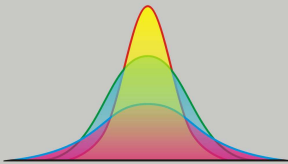
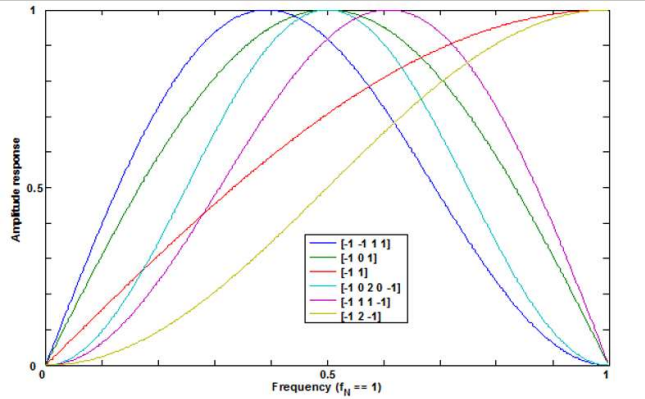
FIR filter



$$y[n]=\sum_{k=0}^n h(k)x(n-k)$$

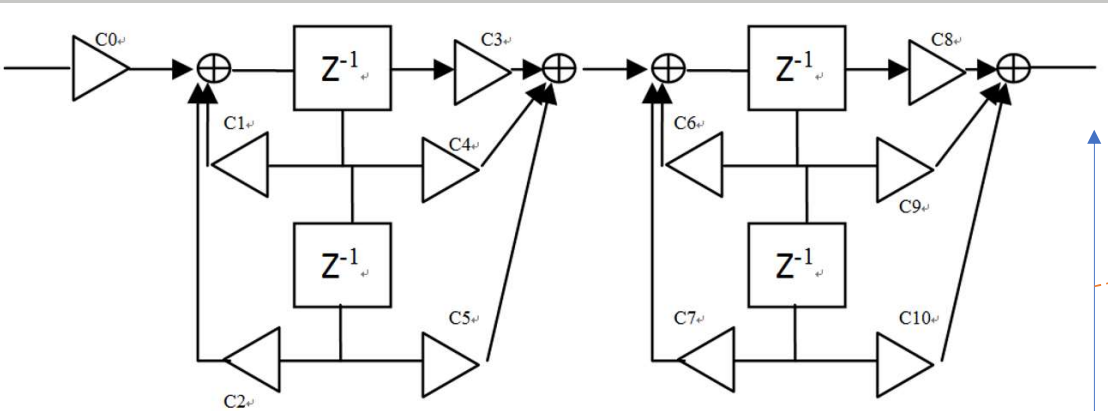
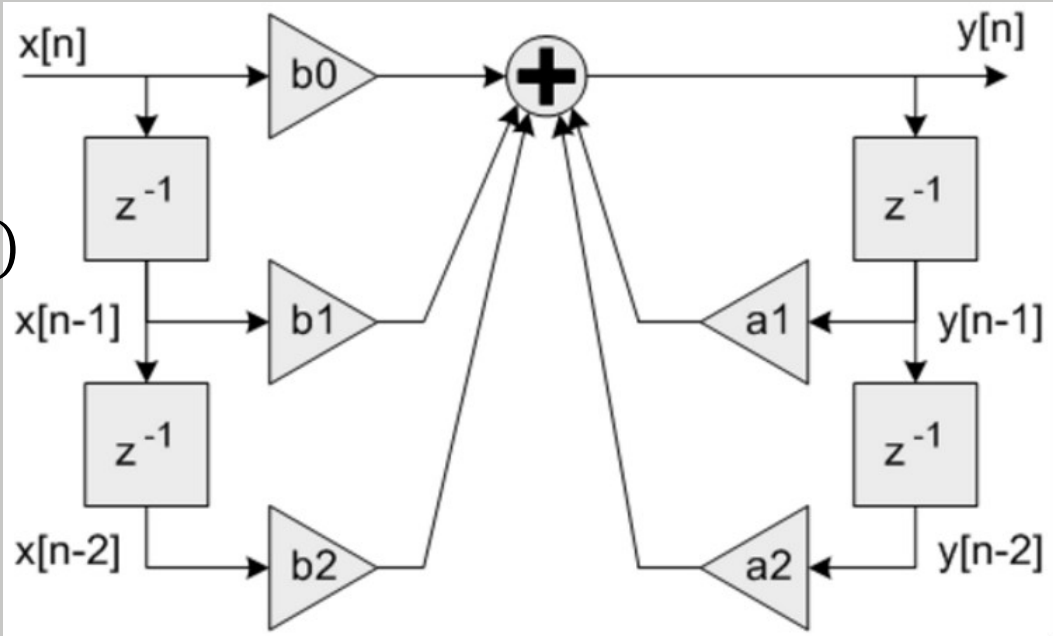
https://en.wikipedia.org/wiki/Finite_impulse_response

Operator	3 × 3	5 × 5
Laplacian	<div>$\begin{bmatrix} -1 & -1 & -1 \\ -1 & +8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$</div>	<div>$\begin{bmatrix} -1 & -3 & -4 & -3 & -1 \\ -3 & 0 & +6 & 0 & -3 \\ -4 & +6 & +20 & +6 & -4 \\ -3 & 0 & +6 & 0 & -3 \\ -1 & -3 & -4 & -3 & -1 \end{bmatrix}$</div>
Horizontal Sobel	<div>$\begin{bmatrix} +1 & +2 & +1 \\ -2 & -4 & -2 \\ +1 & +2 & +1 \end{bmatrix}$</div>	<div>$\begin{bmatrix} +1 & +4 & +6 & +4 & +1 \\ 0 & 0 & 0 & 0 & 0 \\ -2 & -8 & -12 & -8 & -2 \\ 0 & 0 & 0 & 0 & 0 \\ +1 & +4 & +6 & +4 & +1 \end{bmatrix}$</div>
Vertical Sobel	<div>$\begin{bmatrix} +1 & -2 & +1 \\ +2 & -4 & +2 \\ +1 & -2 & +1 \end{bmatrix}$</div>	<div>$\begin{bmatrix} +1 & 0 & -2 & 0 & +1 \\ +4 & 0 & -8 & 0 & +4 \\ +6 & 0 & -12 & 0 & +6 \\ +4 & 0 & -8 & 0 & +4 \\ +1 & 0 & -2 & 0 & +1 \end{bmatrix}$</div>
Cross Sobel	<div>$\begin{bmatrix} -1 & 0 & +1 \\ 0 & 0 & 0 \\ +1 & 0 & -1 \end{bmatrix}$</div>	<div>$\begin{bmatrix} -1 & -2 & 0 & +2 & +1 \\ -2 & -4 & 0 & +4 & +2 \\ 0 & 0 & 0 & 0 & 0 \\ +2 & +4 & 0 & -4 & -2 \\ +1 & +2 & 0 & -2 & -1 \end{bmatrix}$</div>

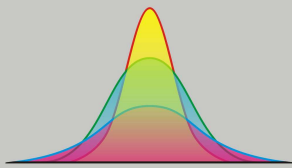
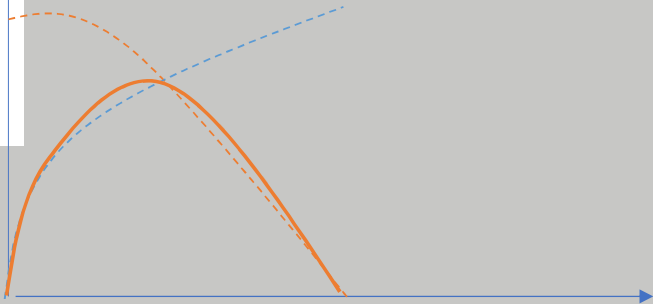


IIR filter

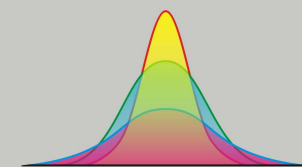
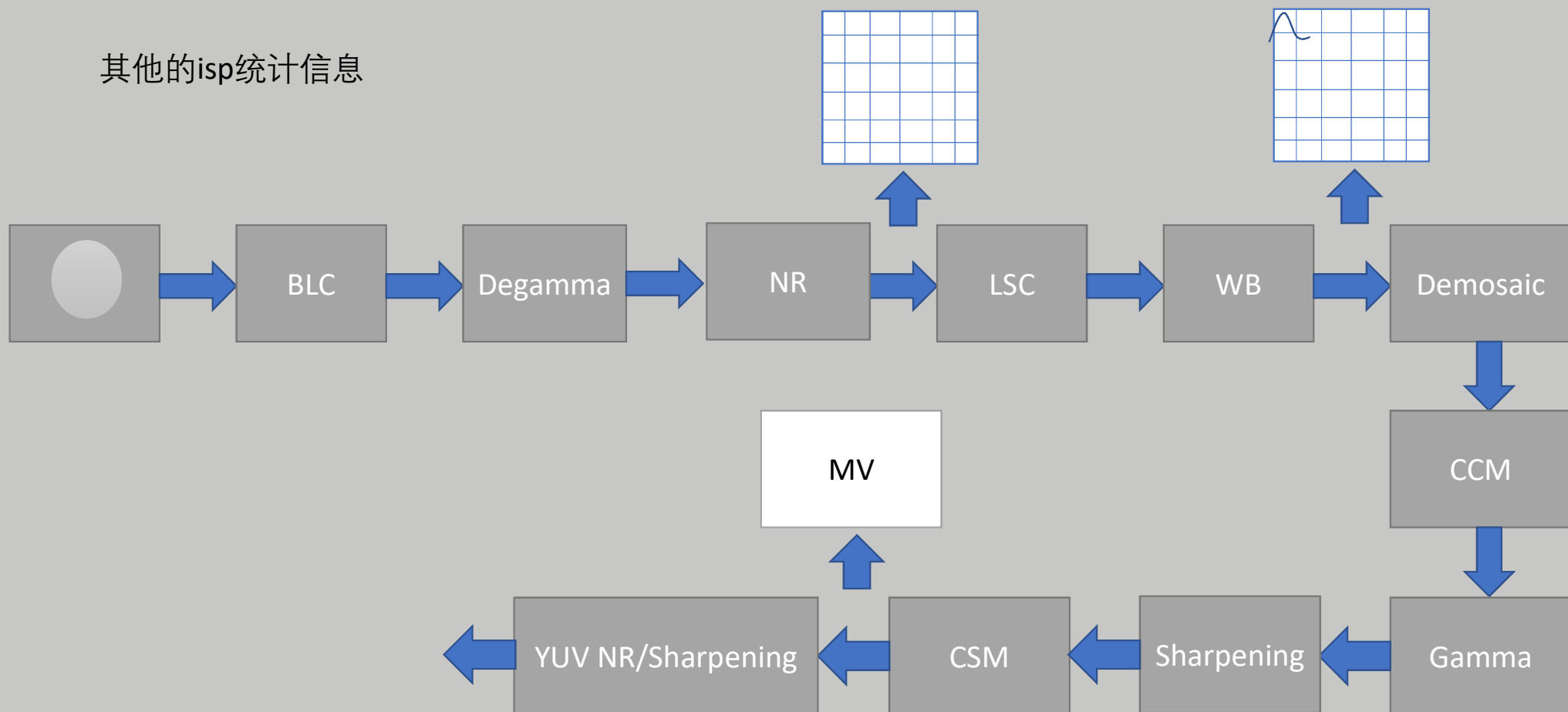
$$y[n] = \sum_{k=0}^m b_k x[n-k] - \sum_{k=1}^N a_k y[n-k]$$



$c = [8, -95, -49, 38, 76, 38, -111, -54, 17, -34, 17];$

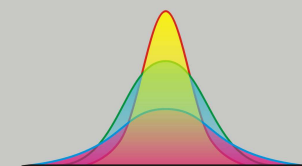


其他的isp统计信息



THANKS

本课程由 Maver Jiang提供



大话成像之 数字成像系统 32 讲

内容目录

1. 数字成像系统介绍
2. CMOS image sensor基础
3. 光学基础
4. 颜色科学基础
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6. 3A概述
7. 黑电平与线性化
8. Green Imbalance
9. 坏点消除
10. Vignetting与Color shading
11. SNR 与Raw Denoise
12. Dynamic Range与Tone Mapping
13. MTF与Demosaic
14. 色彩空间与色彩重建
15. Color Correction Matrix与3D LUT
16. Gamma与对比度增强
17. Sharpening
18. Color Space Conversion
19. 空域去噪
20. 时域去噪
21. Color Aberrance Correction and Depurple
22. ISP 的统计信息
23. 自动曝光
24. 自动白平衡
25. 自动对焦
26. 闪光灯
27. HDR
28. Exif 和DNG
29. Encoder
30. 图像防抖
31. 图像质量评价工具与方法
32. 画质调优

