大话成像之

数字成像系统 32讲

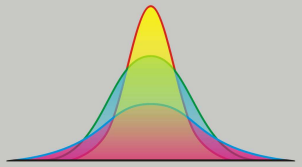
文件格式

Eric Zhang

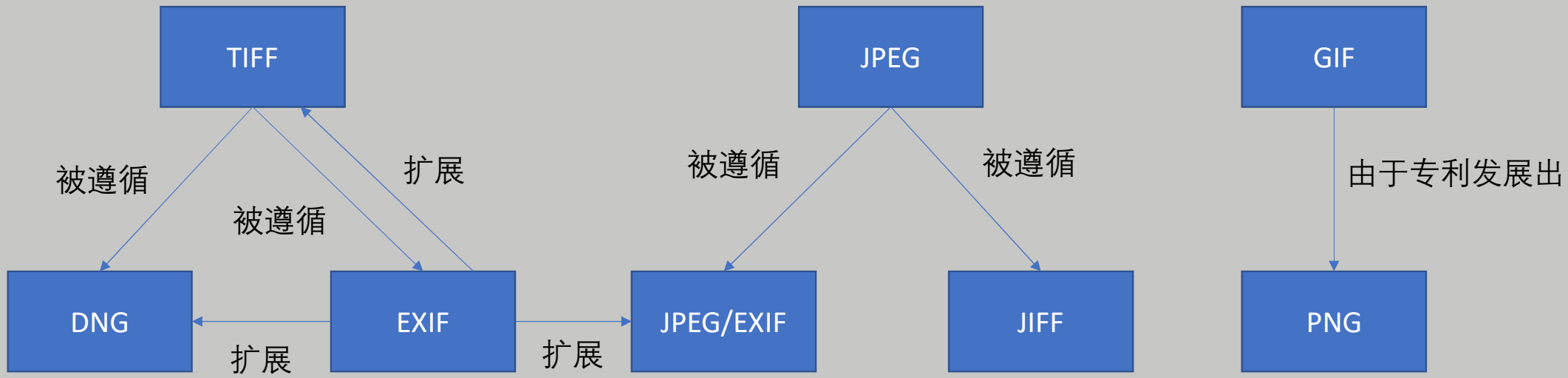
imaging algorithm specialist

staff camera engineer

zxzombie@msn.com

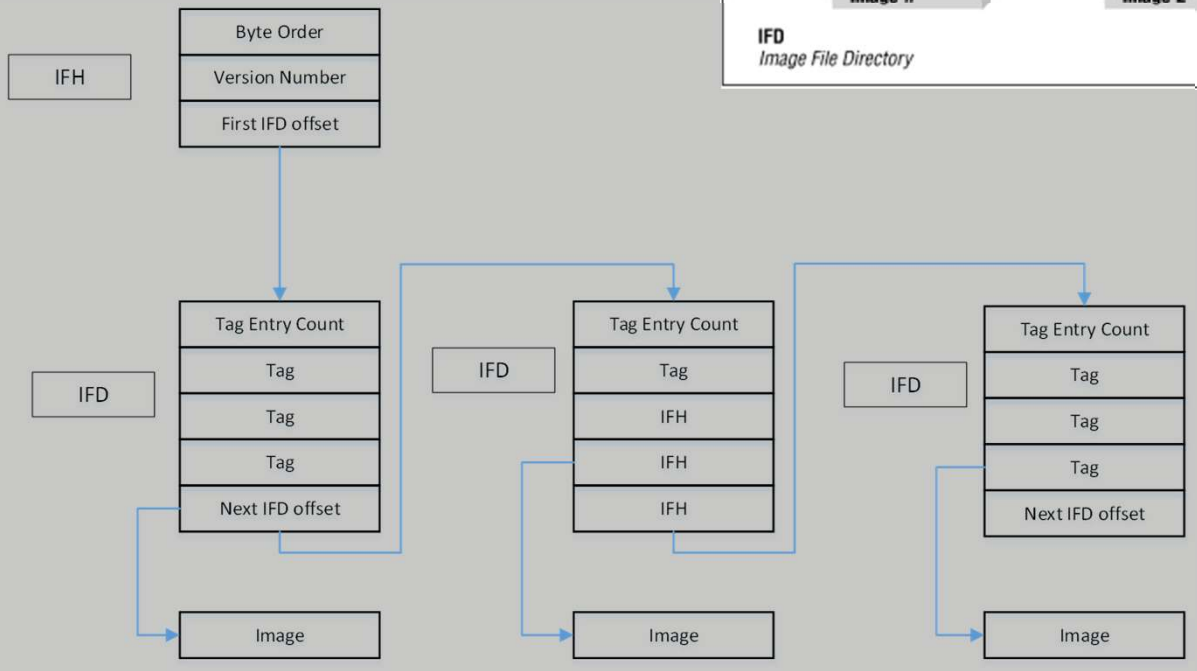


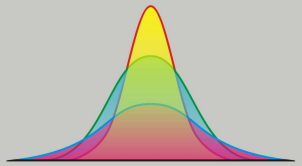
乱糟糟的文件格式


TIFF
JPEG
GIF
被遵循
被遵循
扩展
被遵循
被遵循
由于专利发展出
DNG
EXIF
JPEG/EXIF
JIFF
PNG
扩展
扩展

TIFF

Header
IFD 0
IFD 1
IFD n
Image 0
Image 1
Image n
Header
IFD 0
Image 0
IFD 1
Image 1
IFD 2
Image 2
Header
Image 0
Image 1
Image 2
IFD 0
IFD 1
IFD 2
IFD
Image File Directory

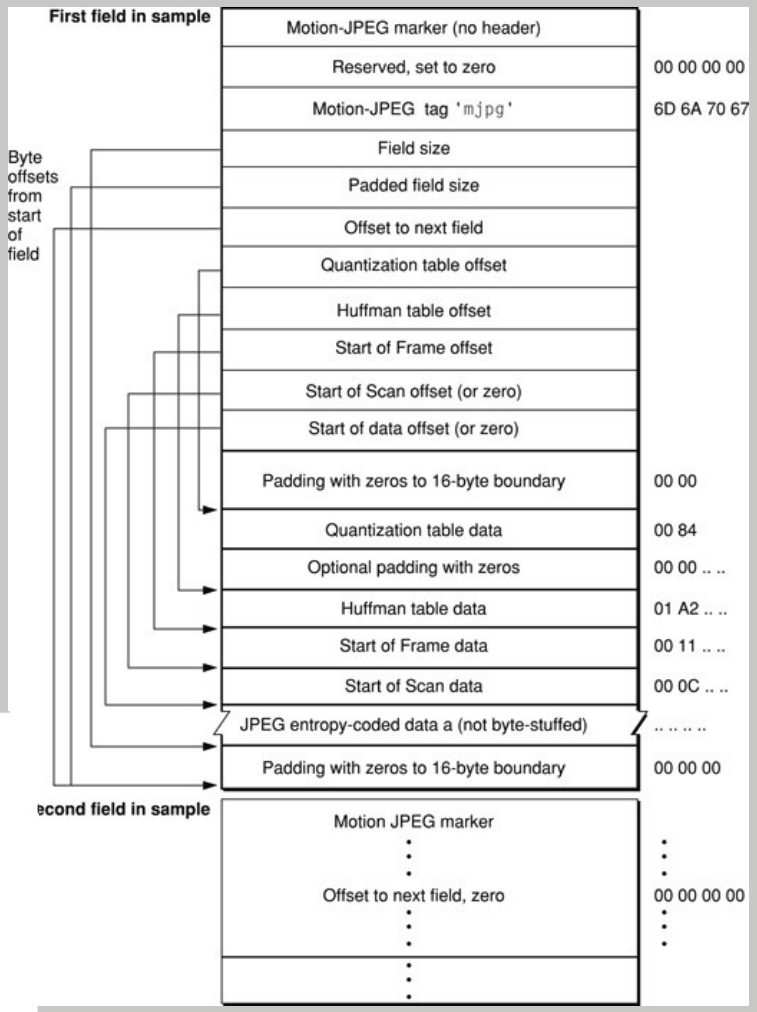

IFH
Byte Order
Version Number
First IFD offset
IFD
Tag Entry Count
Tag
Tag
Tag
Next IFD offset
Image
IFD
Tag Entry Count
Tag
IFH
IFH
IFH
Image
IFD
Tag Entry Count
Tag
Tag
Tag
Next IFD offset
Image



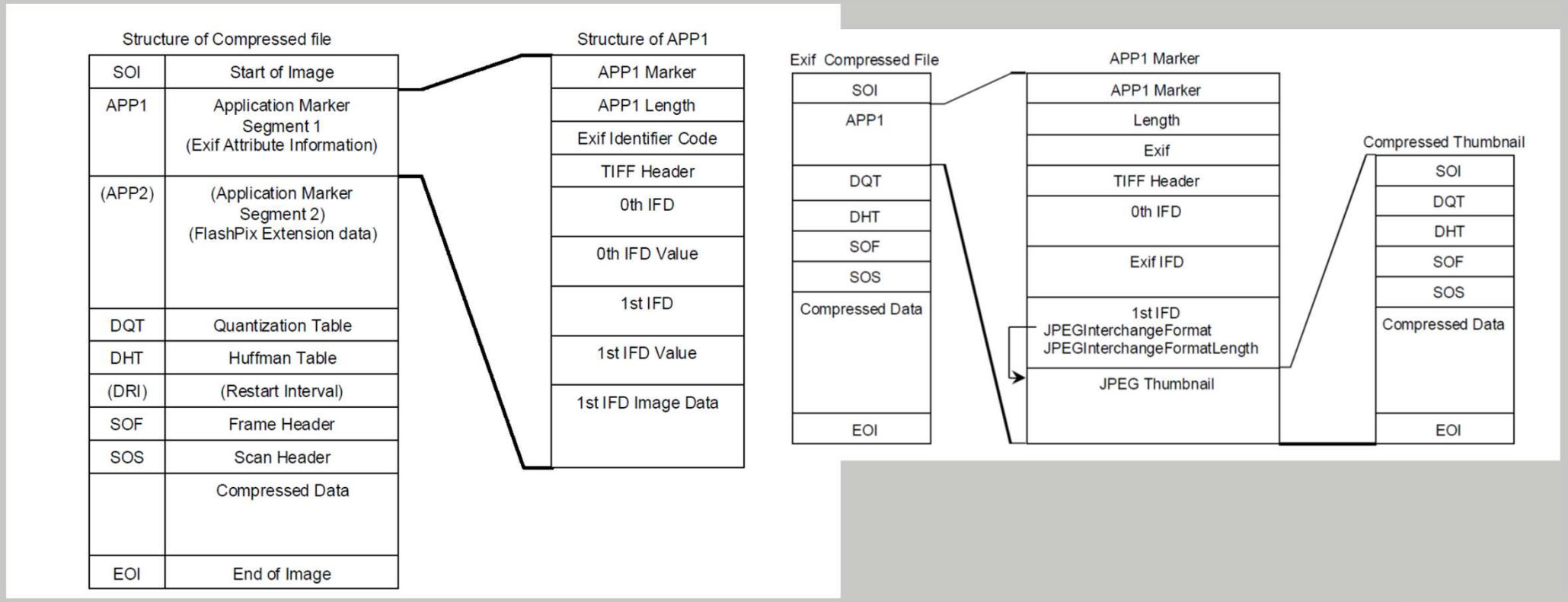
JPEG

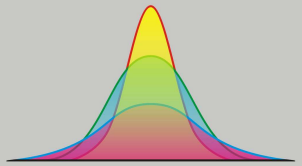
Marker	Code	Name
FF D8	SOI	Start Of Image
FF E0	APP0	JFIF File
FF DB	DQT	Define Quantization Table
FF C0	SOF	Start Of Frame
FF C4	DHT	Define Huffman Table
FF DA	SOS	Start Of Scan
FF D9	EOI	End Of Image

Marker Name	Marker Identifier	Description
SOI	0xd8	Start of Image
APP0	0xe0	JFIF application segment
APPn	0xe1 – 0xef	Other APP segments
DQT	0xdb	Quantization Table
SOF0	0xc0	Start of Frame
DHT	0xc4	Huffman Table
SOS	0xda	Start of Scan
EOI	0xd9	End of Image

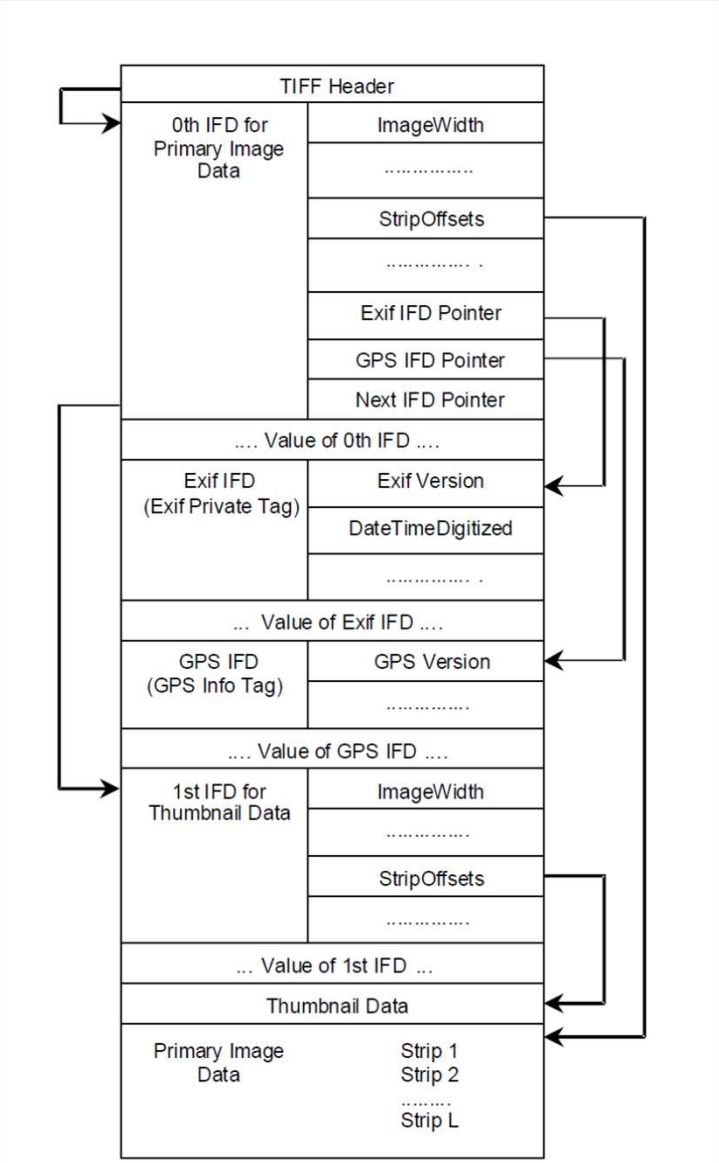


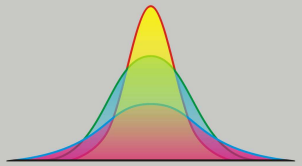
EXIF


Structure of Compressed file
SOI
Start of Image
APP1
Application Marker Segment 1 (Exif Attribute Information)
(APP2)
(Application Marker Segment 2) (FlashPix Extension data)
DQT
Quantization Table
DHT
Huffman Table
(DRI)
(Restart Interval)
SOF
Frame Header
SOS
Scan Header
Compressed Data
EOI
End of Image
Structure of APP1
APP1 Marker
APP1 Length
Exif Identifier Code
TIFF Header
0th IFD
0th IFD Value
1st IFD
1st IFD Value
1st IFD Image Data
Exif Compressed File
SOI
APP1
DQT
DHT
SOF
SOS
Compressed Data
EOI
APP1 Marker
APP1 Marker
Length
Exif
TIFF Header
0th IFD
Exif IFD
1st IFD
JPEGInterchangeFormat
JPEGInterchangeFormatLength
JPEG Thumbnail
Compressed Thumbnail
SOI
DQT
DHT
SOF
SOS
Compressed Data
EOI

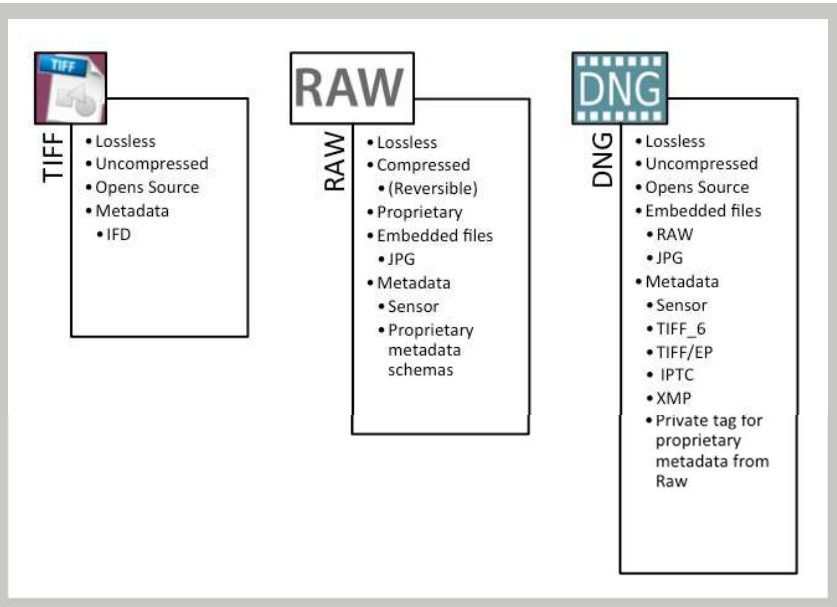


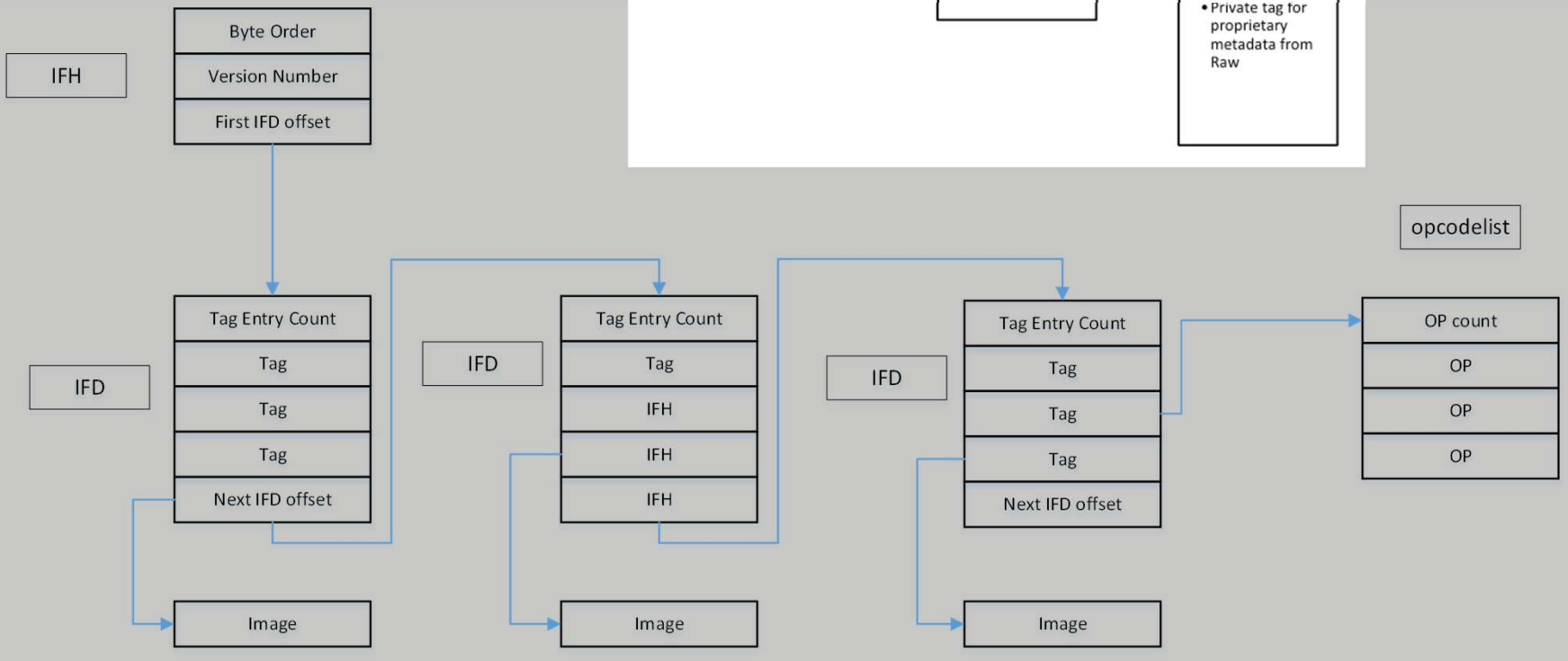
EXIF/TIFF

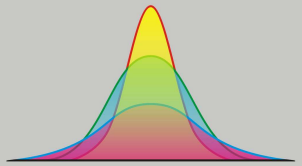

TIFF Header
0th IFD for Primary Image Data
ImageWidth
StripOffsets
Exif IFD Pointer
GPS IFD Pointer
Next IFD Pointer
.... Value of 0th IFD ....
Exif IFD (Exif Private Tag)
Exif Version
DateTimeDigitized
... Value of Exif IFD ....
GPS IFD (GPS Info Tag)
GPS Version
.... Value of GPS IFD ....
1st IFD for Thumbnail Data
ImageWidth
StripOffsets
... Value of 1st IFD ...
Thumbnail Data
Primary Image Data
Strip 1
Strip 2
Strip L



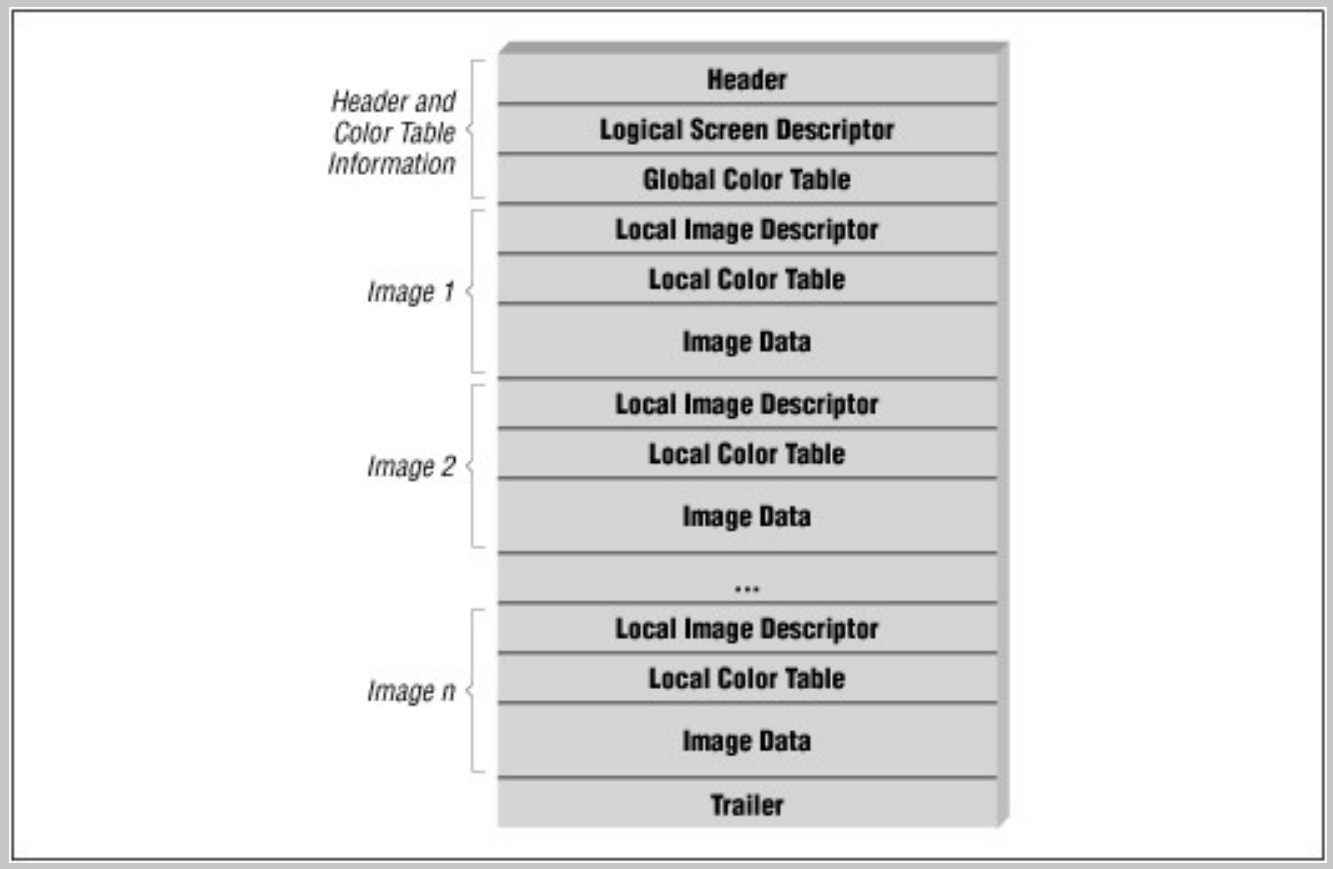
DNG

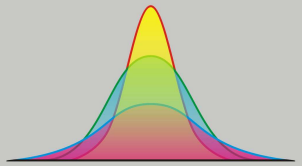

TIFF
• Lossless
• Uncompressed
• Opens Source
• Metadata
• IFD
RAW
RAW
• Lossless
• Compressed
• (Reversible)
• Proprietary
• Embedded files
• JPG
• Metadata
• Sensor
• Proprietary metadata schemas
DNG
DNG
• Lossless
• Uncompressed
• Opens Source
• Embedded files
• RAW
• JPG
• Metadata
• Sensor
• TIFF_6
• TIFF/EP
• IPTC
• XMP
• Private tag for proprietary metadata from Raw


IFH
Byte Order
Version Number
First IFD offset
IFD
Tag Entry Count
Tag
Tag
Tag
Next IFD offset
Image
IFD
Tag Entry Count
Tag
IFH
IFH
IFH
Image
IFD
Tag Entry Count
Tag
Tag
Tag
Next IFD offset
Image
opcodelist
OP count
OP
OP
OP

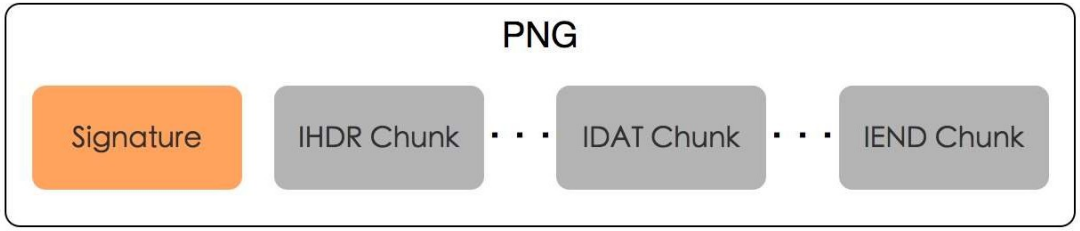


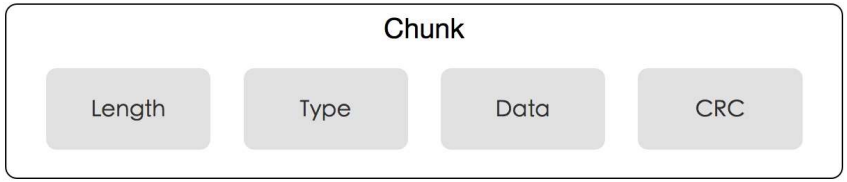
GIF


Header and Color Table Information
Header
Logical Screen Descriptor
Global Color Table
Image 1
Local Image Descriptor
Local Color Table
Image Data
Image 2
Local Image Descriptor
Local Color Table
Image Data
...
Image n
Local Image Descriptor
Local Color Table
Image Data
Trailer



PNG





PNG Header	89 50 4E 47 0D 0A 1A 0A			
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IDAT chunk	length	IDAT	pixel data	CRC
IDAT chunk	length	IDAT	pixel data	CRC
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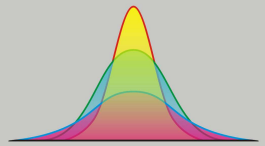
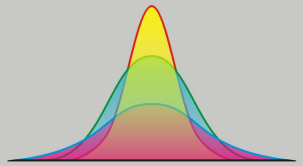
IEND chunk	0	IEND	CRC	

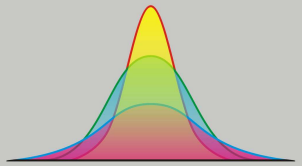


THANKS

本课程由 Eric Zhang 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
5. ISP 信号处理基础
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