

19/10/2018

Qualcomm session

Day 1 | An introduction

CDMA → LTE → 5g

Adaptive systems

- Qualcomm Snapdragon 820 - Cat 11 chipset | Capabilities

- Adreno GPU 530
- X16 LTE modem

- Domain covered -
- Auto
 - IoT
 - Mobile compute
 - Networking

MUX
Vector processor

Camera Overview

Expanding use cases e.g. - Pokemon Go

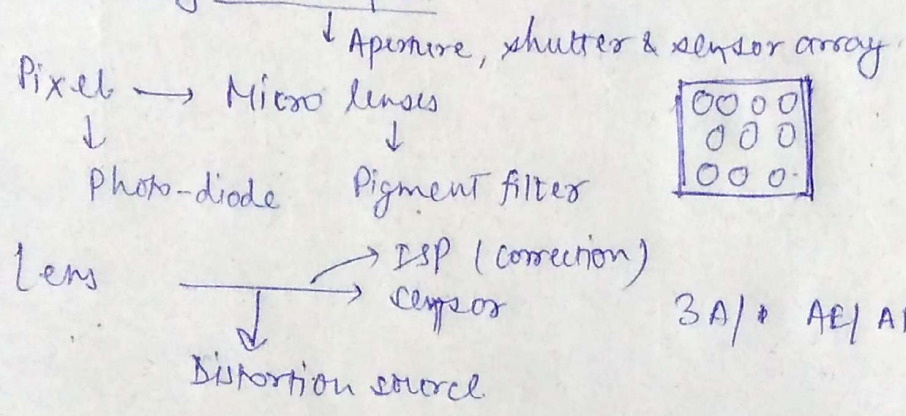
Jargons -

Filters → Noise → frequency → Transforms → interpolation → images

[F1s]
Selfie expert
GoPro Hero 3+

150 OEMs

Human eye vs. camera

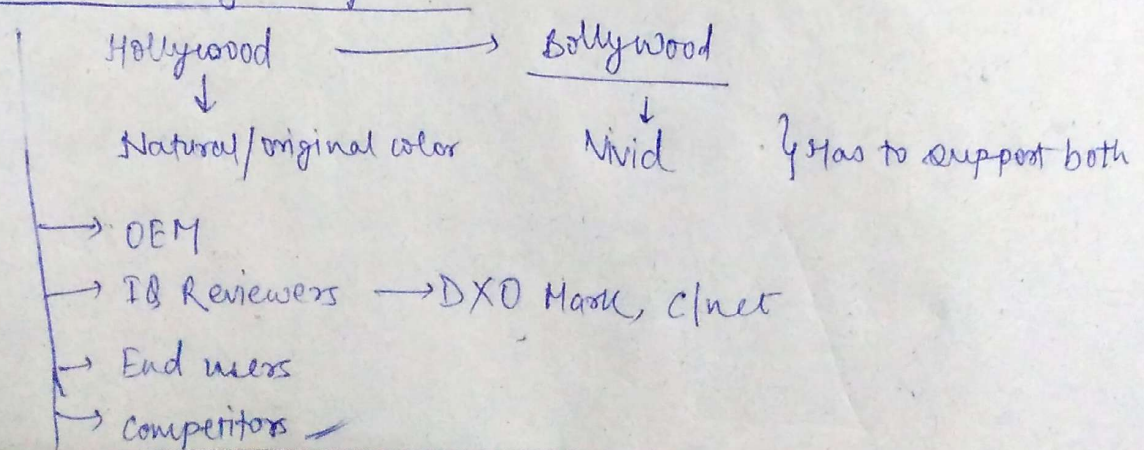


Photon rain
→ Pixel buckets

Components for Mobile Camera Image Quality -

Camera module → ISP → 3A + Tuning

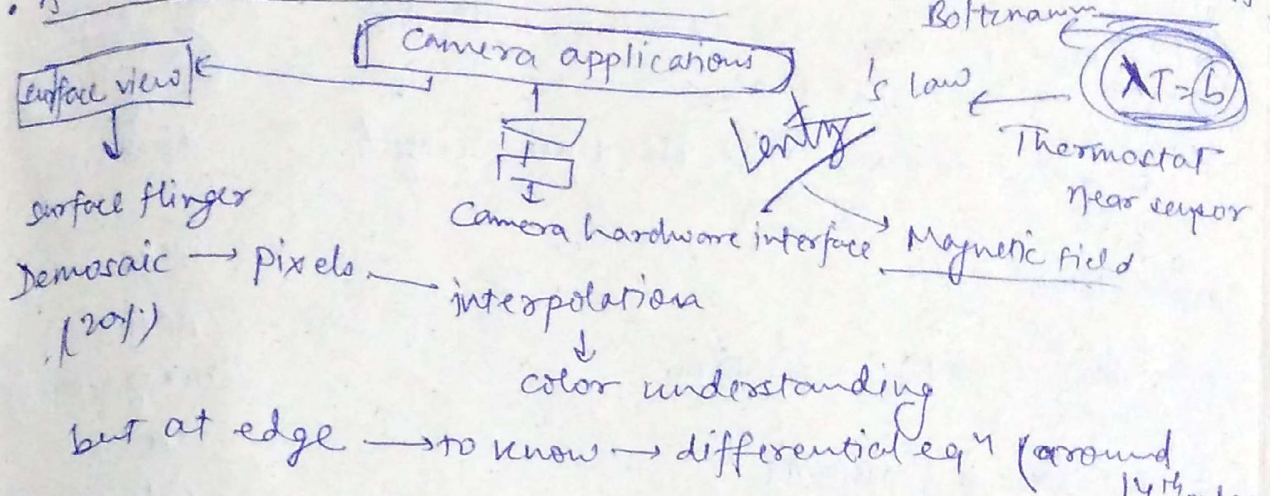
Image Quality ecosystem -



Distortions / Problems addressed -

- Noise, Demosaic, $\propto \frac{1}{\lambda^4}$
- WB Gain, Color correction, Noise reduction, sharpening
- Android camera software architecture -

GPU
CPU
DSP



• WB Gain -> white balance -> Grey world algorithm

- low-light noise problem -> pass through low-pass filter

- sharpening with unsharp masking -> edge mask (original image)

$$X + \alpha (F_H X) \rightarrow Y$$

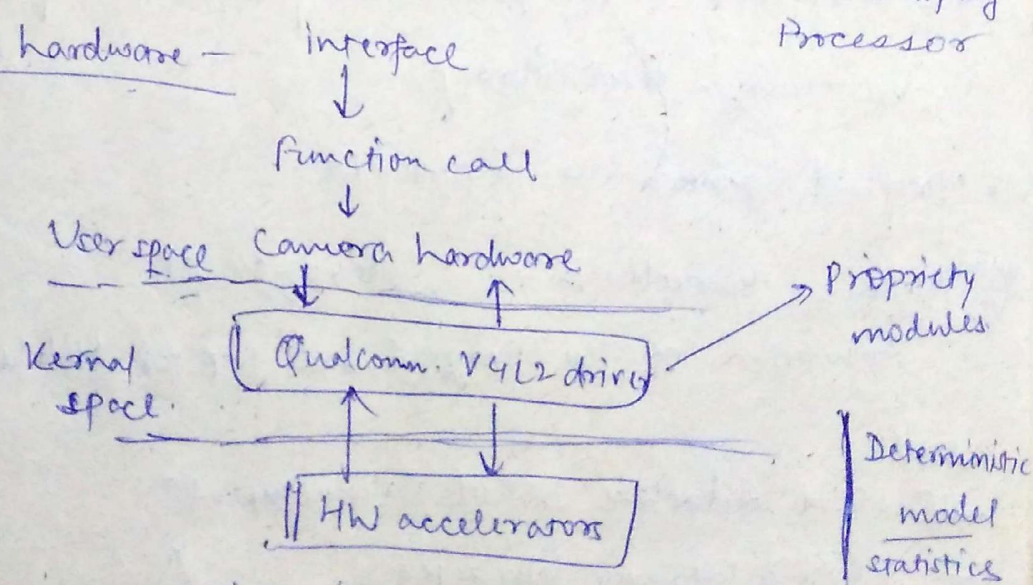
α -> sharpening strength.

ASF improvement

• Problem: temporal noise - Snapdragon 820

EIS -> Electronic Image stabilization
MDP -> Mobile Display Processor

Camera hardware



• white balance -> identify the source illumination
↓
Auto tougher than variable white balance

Tuning engineers

Advanced software technologies

Demo - 600 series

Ubi-focus → multiple snapshots with diff. focal levels
|
→ but what if you move bet. time delay?

segmentation

Auto focus → Fourier transform

Phase detection | disparity

Day 2 - FastCV computer Vision Library Overview

① By Krishna Murthy Balla -

Heterogenous computing

FastCV → Mobile optimized

- comparable to OpenGL ES in the rendering domain
- clean modular library
- provides clean hardware acceleration across the CPU, DSP and GPU in mobile devices with better performance.

Hardware → Kernel → Optimized framework → CV apps

Operation modes → CPU performance | Performance | Low Power |

SCVE → high level library

CPU offload

• Motorized Camera → Oppo N3

② Potesawar Karuchula - Hexagon DSP

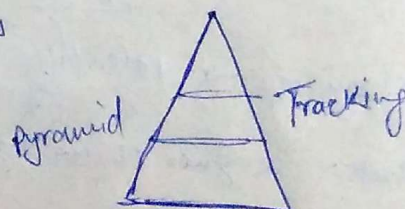
Architecture of the Hexagon 680 DSP for Mobile imaging & CV -

VLIW

- Content Adaptive Detail Enhancement

30 fps

- Static & dynamic libraries



Nokia Lumia
Canon
Nikon

chroma-flash

Opti-zoom

cell-more

disables CSC

mem

ARM

Hexagon (DSP)

max

aliasing