Computer Vision

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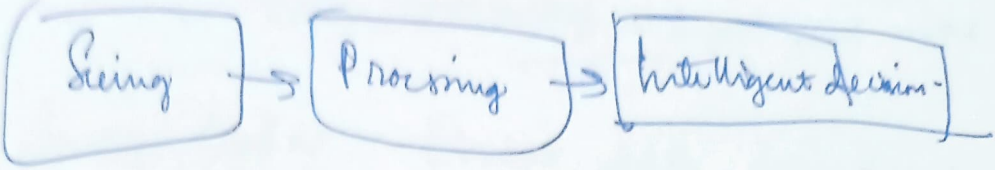
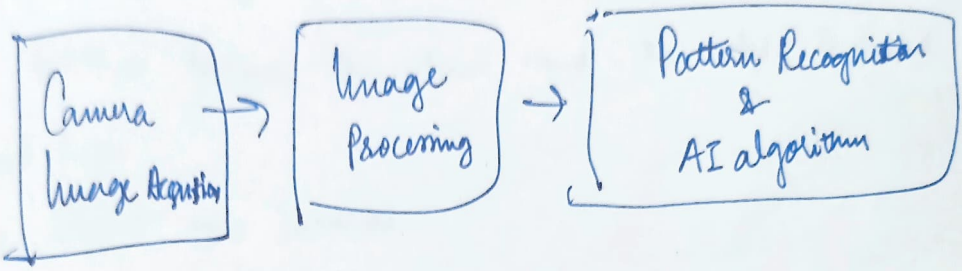
Faculty: Kavaya

→ Human Vision.



Computer Vision.



→ Mathematics in CV
- → Calculus
- → Linear Algebra.
- → Prob. & Stats.
- → Signal processing.
- → Projective geometry.
- → Optimization Theory.
- → Control Theory.

→ Uses & Applications:-

→ Medical image analysis, Document understanding, Aerial inspections, precision manufacturing, Content management, Product discovery, Damage assessment, agricultural crop/pest analysis, Environmental conservation, warehouse automation, content moderation, Geological analysis etc.

→ Low level Process — Mid level — High level.

Input: Image — Image Attributes — Attributes.

Output: Image — Segmentation — Understanding

Ex: Noise suppression — Autonomous car.

→ Analysis: From the image, if I do perform some interpretations the output is model.

Synthesis: Vision takes image as input and output.

→ Image stored as. [height, width, (color pixels channels)]

Ex: [640, 480, (100, 200)]

→ Distance between the lens and the object is called focal length.

→ Object gets inverted.

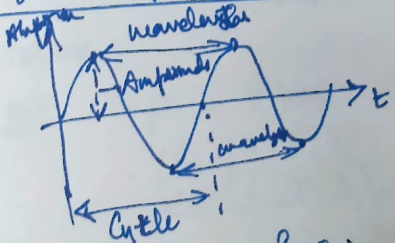
→ absorption, 1-ρ

Lamberts cosine law: Amount of reflected light proportional to cosine(θ).

→ Two types of projection.

① Perspective
② Parallel.

→ Image sampling and quantization:-



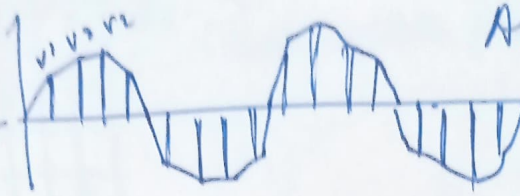
cycles/sec = freq.

Note:- If wavelength(λ) increases freq decreases

If freq increases λ decreases.

Sampling & Quantization.

Original.

① 

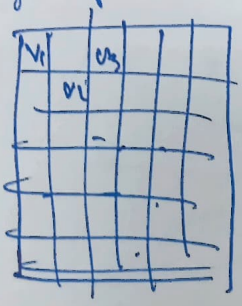
After sampling

Sample = 4.

After sampling reconstruction of the original image is not possible this is called aliasing
↳ since it is degraded.

② So $f_{sa} \geq 2$ (max. freq.) → the avoid aliasing
Ex:- $2 \geq 2(3)$ → Shannon sampling theorem.
$x \geq 6$.

③ Quantization- (Analog) /6
get the mapping the continuous range of values to finite range of values (Digital).



→ Bit range.
Ex:- 1 byte = 8 bits. $= 2^8$ 2 bytes = 16 bits. =

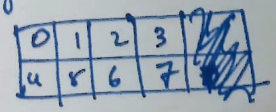


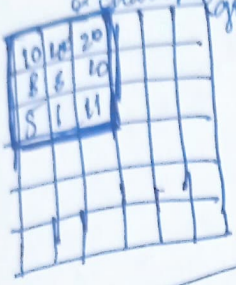
Image Enhancement Technique:

① Point processing → Changing of individual value of a single pixel is point processing.

↓ ↓

Local (Changing in group) Global (Changing all the pixels values.)

→ Intensity Transformation.



Intensity Transformation.

→① linear transformation.

→② log transformation.

→③ Power Law transformation.

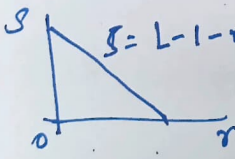
→ ~~Image enhance~~ Linear transformation.

$$S = T(r)$$

S → new image, T → function, r → old image.

$$= L - 1 - r.$$

L → Threshold value.



Ex:- if L = 10.

a pixel value in r = 3.

then S = 10-1-3 = 6