Image Sampling & Fourier. (49-71)

i). sampling — many samples good representation
too much storage.

ii). Nyquist's sampling theorem.

spectra repeat at sampling frequency

good → high sampling frequency spectra separate

perfect → med " " in touch

aliasing → low " " " collide

spectra touch when sampling frequency = $2 \times f_{max}$

↑ max frequency.

eg. speech f_{max} = 6 kHz f_{sample} = 12 kHz

pictures? video — 576 × 576

need 2 points for each point of interest.

ii). Discrete Fourier transform

sampled signals → sampled frequencies.

$$F(u,v) = \sum_{y} \sum_{x} e^{-j\frac{2\pi(ux+vy)}{N}} f(x,y)$$

implemented via Fast Fourier transform FFT

sampled points → frequencies

frequencies have magnitude & phase.

iv). properties

shift invariance of magnitude (transform)
rotation & scale with rotation, scale of
image.

v). applications

understand frequency
coding/filtering
texture & understanding
speeds algorithms using FFT