Image Sampling and 2D Discrete FT (DFT)

1. sampling?

   a). we want points to avoid <u>aliasing</u>
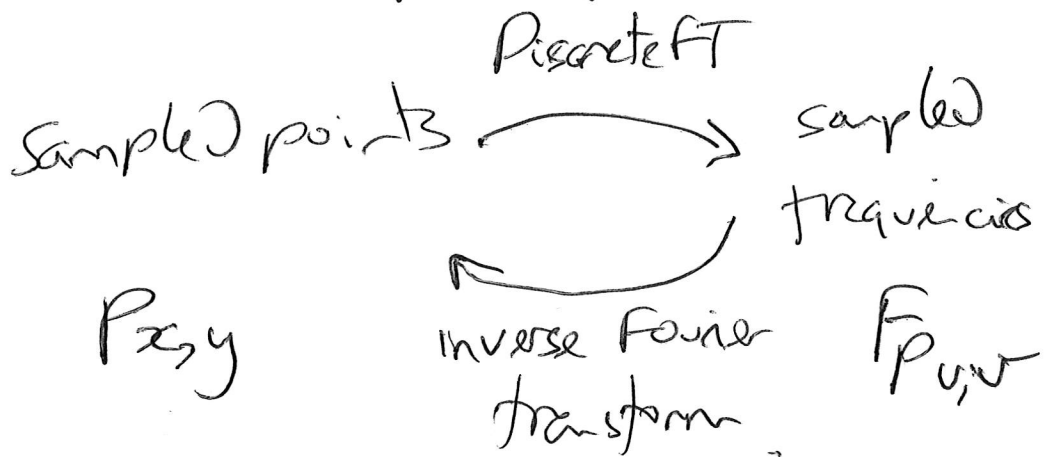
   b). how many points?

2. Nyquist's sampling criterion.

   a). in 1D take points at twice the highest frequency

   ii). for images no such criterion exists.

   Guideline: take two points for each point of interest.

3/. sampled points lead to
    sampled frequencies.

                Discrete FT
Sampled points $\longrightarrow$ sampled
                              frequencies

$P_{x,y}$ inverse Fourier $F_{P_{u,v}}$
            transform

2D DFT

$$F_{P_{u,v}} = \sum_x \sum_y P_{x,y} \, e^{-j(ux+vy)\frac{2\pi}{N}}$$

original image points

has magnitude & phase.

properties:

i). shift invariance — magnitude
    of transform does not depend
        on position.

ii). transform rotates & scales
with image.

iii). transform also allows access to
frequency components, e
filtering.

Applications?

a). speed up algorithms.
b). texture

c). coding

d/ recognition

e/. understanding