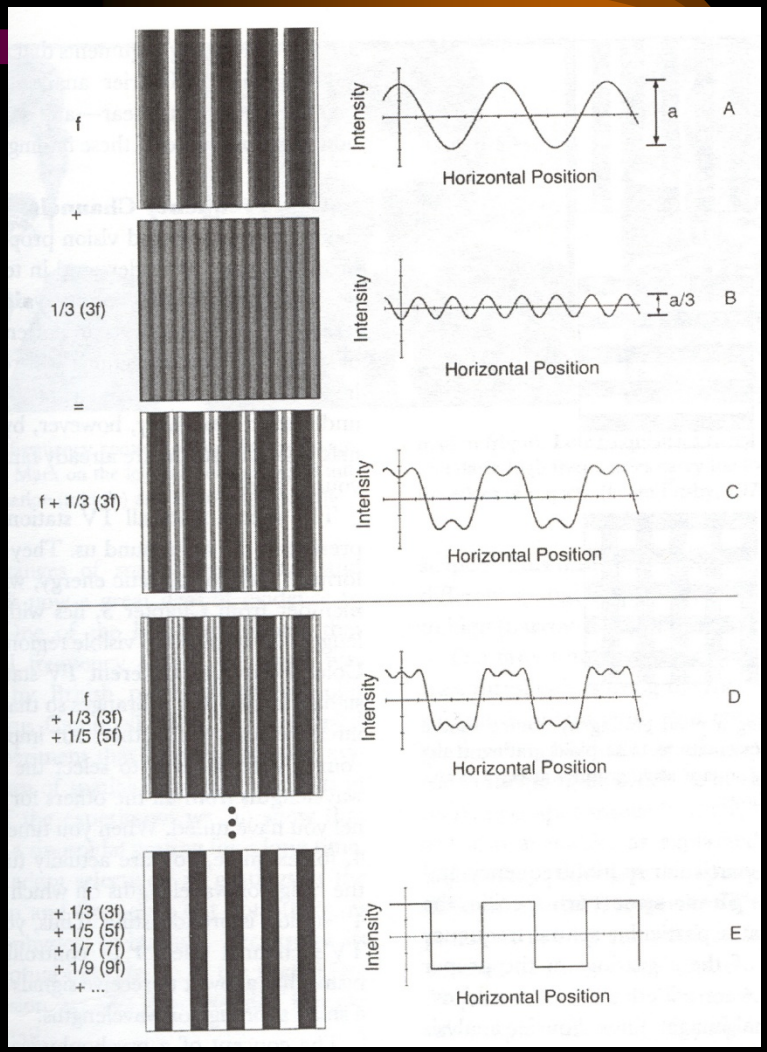
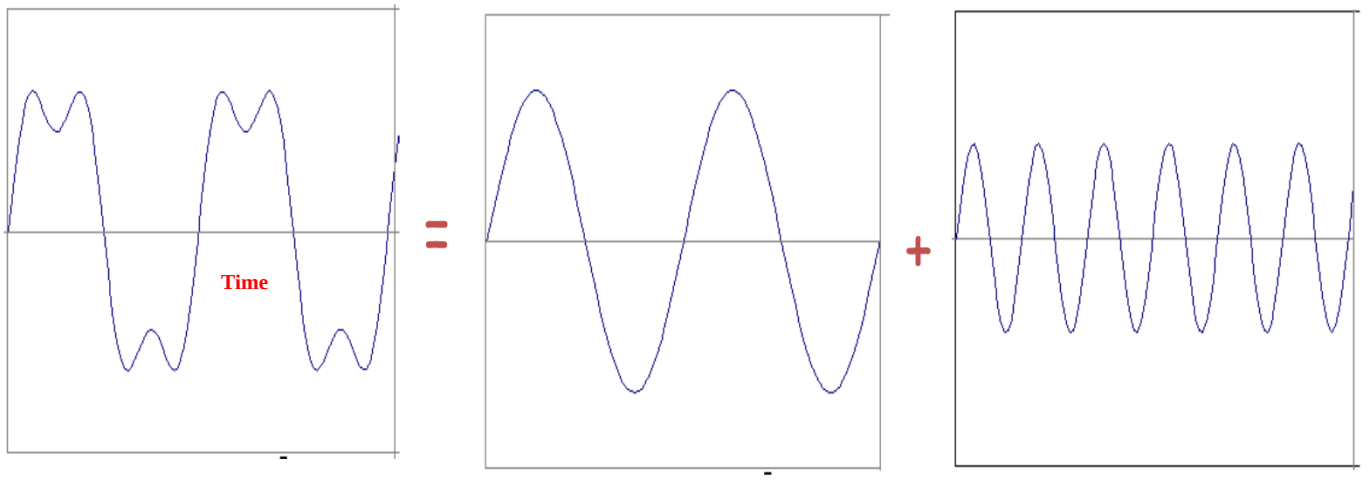
Fourier Transform

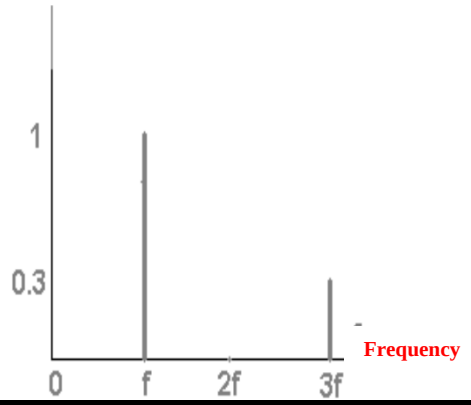
- Any image can be expressed as a linear combination of a bunch of sine gratings of different *frequency* and *orientation*
  - Amplitude
  - Phase



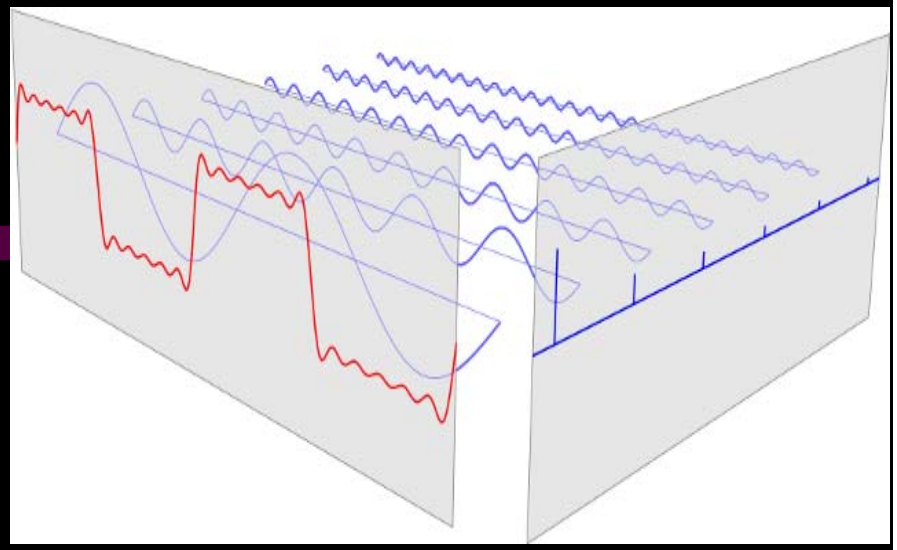
Fourier Transform in 1D

- example : $g(t) = \sin(2\pi f\, t) + (1/3)\sin(2\pi(3f)\, t)$

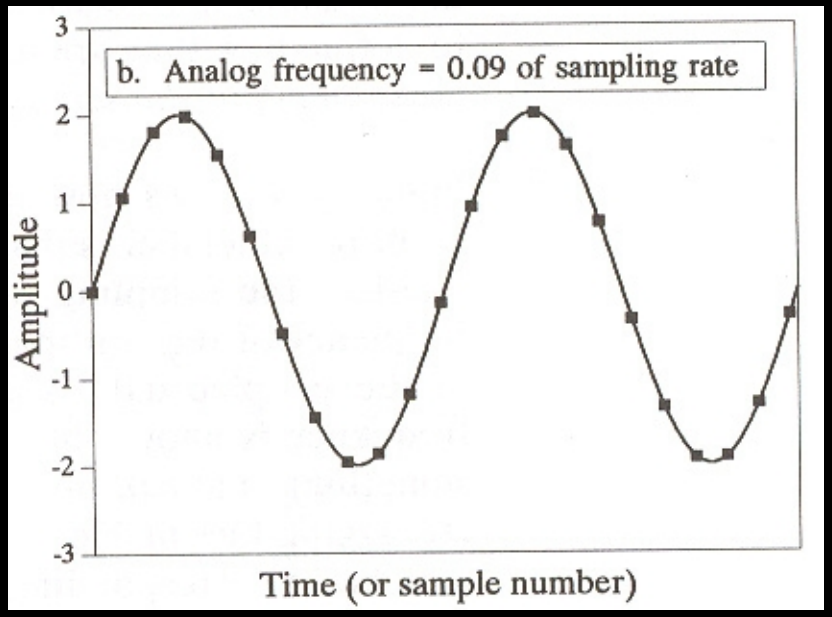




Fourier Transform in 1D

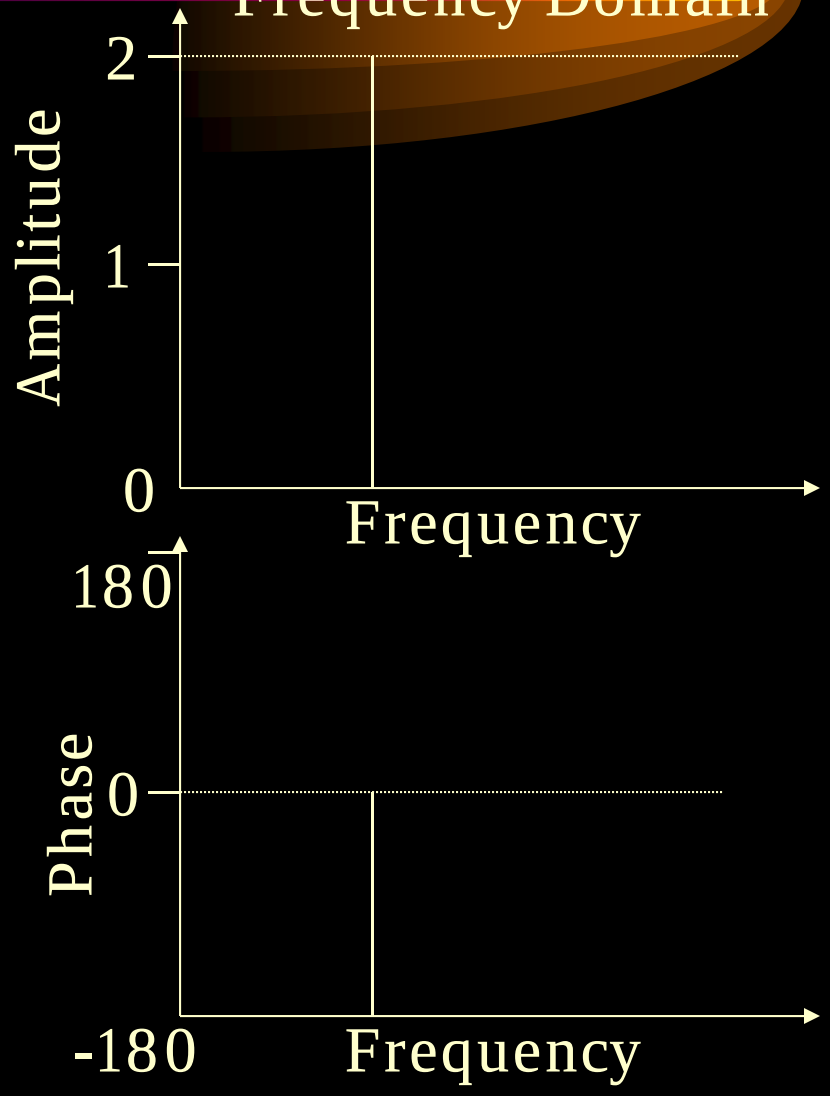


Representation in Both Domains

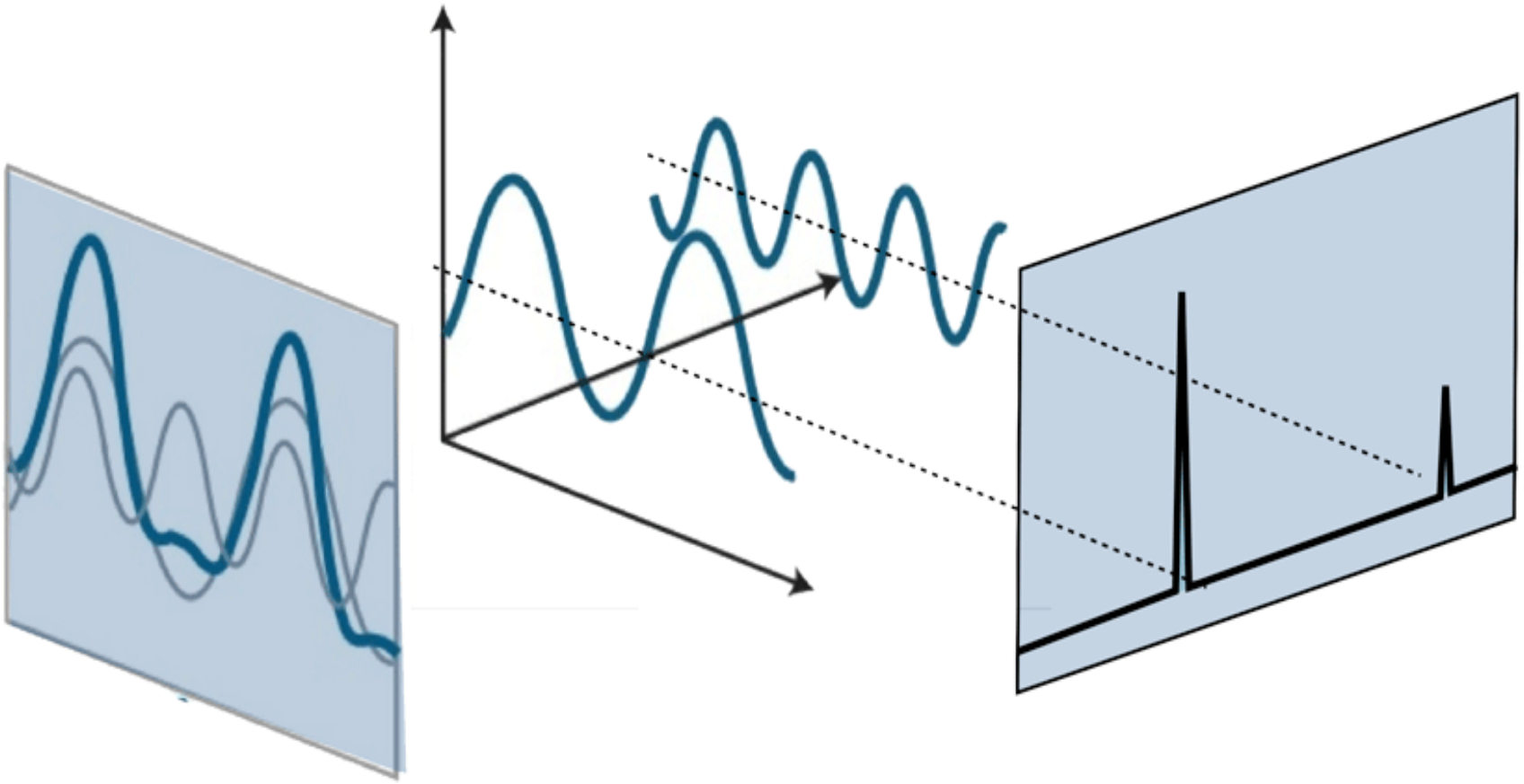


Time Domain

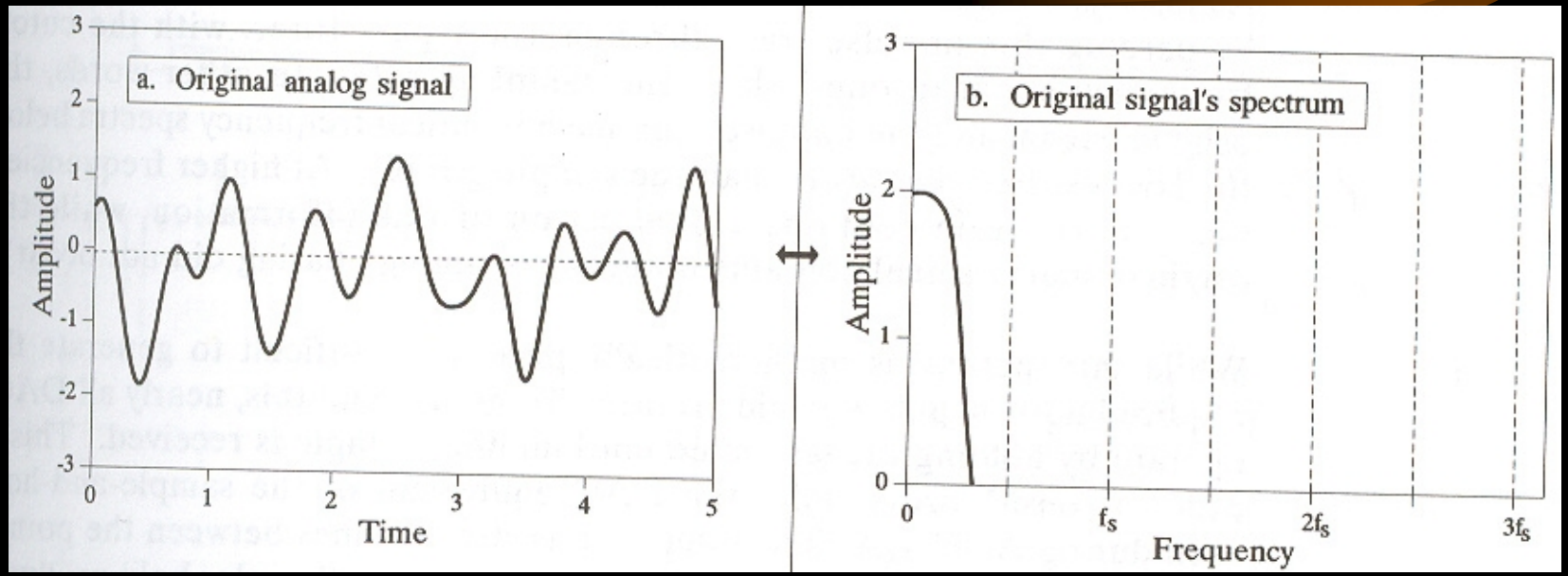
Frequency Domain



Fourier Transform in 1D



Representation in Both Domains

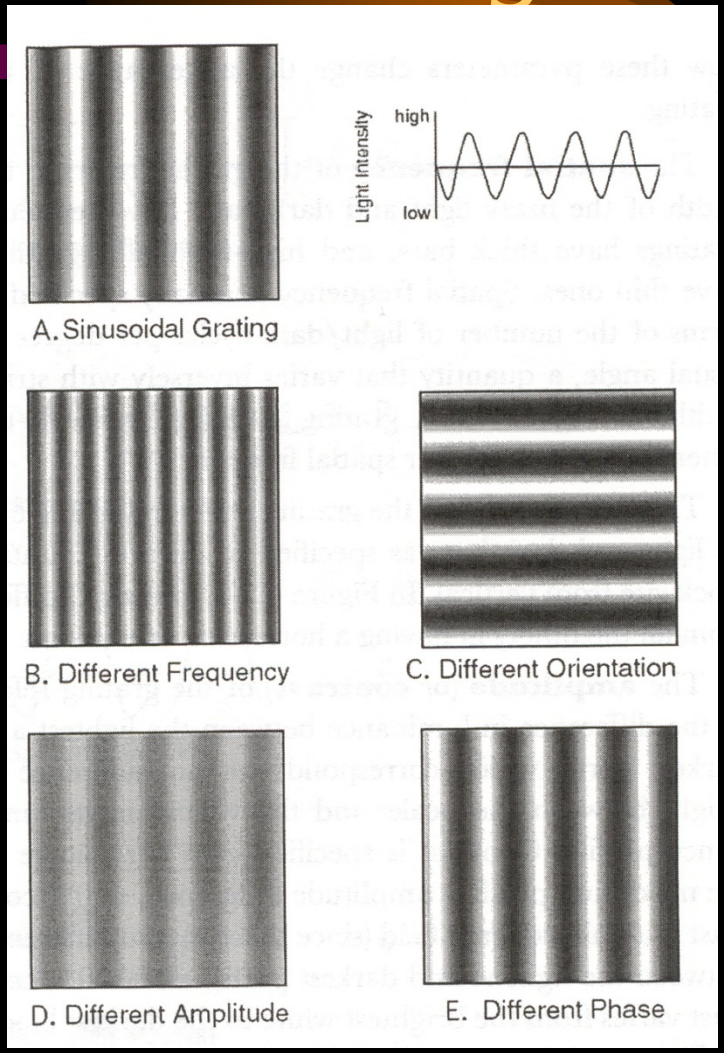


Time Domain

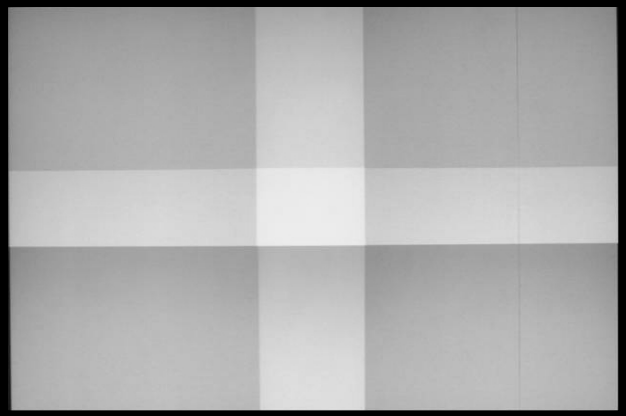
Frequency Domain

Images

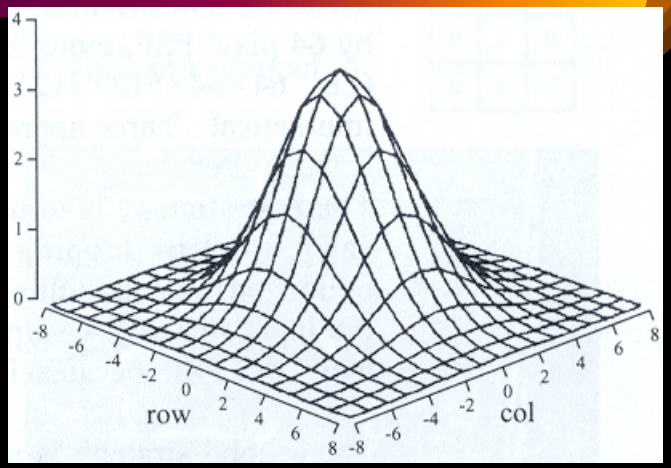
- Images representing sine waves
  - Frequency
  - Orientation
  - Amplitude
  - Phase

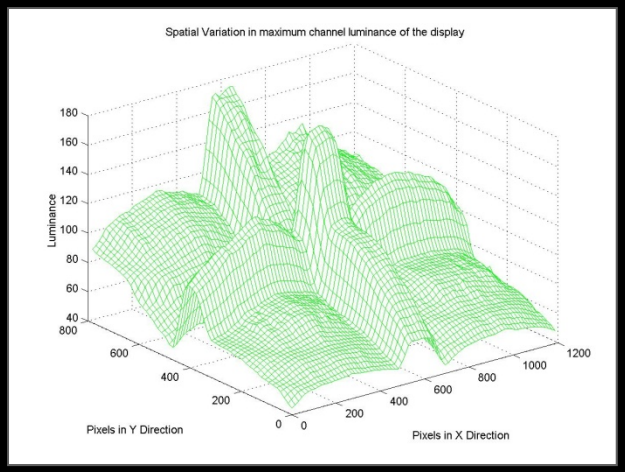


Extending it to 2D



Amplitude





Amplitude

- Amplitude
  - **How** much details?
  - Sharper details signify higher frequencies
  - Will deal with this mostly

Phase

- **Where** are the details?
- Though we do not use it much, it is important, especially for perception