Image Transforms

unit-II

* It is extensively used in Image processing and inge analy
* Transform is a mathematical tool => Move from one domain to another domain.
* Reason → perform the task at hand in an easier manner
* It is useful for fast Computation of convolution and Correla
* It change the representation of a signal by projecting it onto set of basis functions.
* It do not change the Inf content present in the signal.
* Most Image transforms give Inf about freq content in image.
* All the transforms will not give freq domain inf.
* Significant role

① Image procesing applns
- → Image analysis
- → Image enhancement
- → Image filtering
- → Image Compression.

Need for Transform

1) Mathematical Convenience.
2) Extract more Inf.

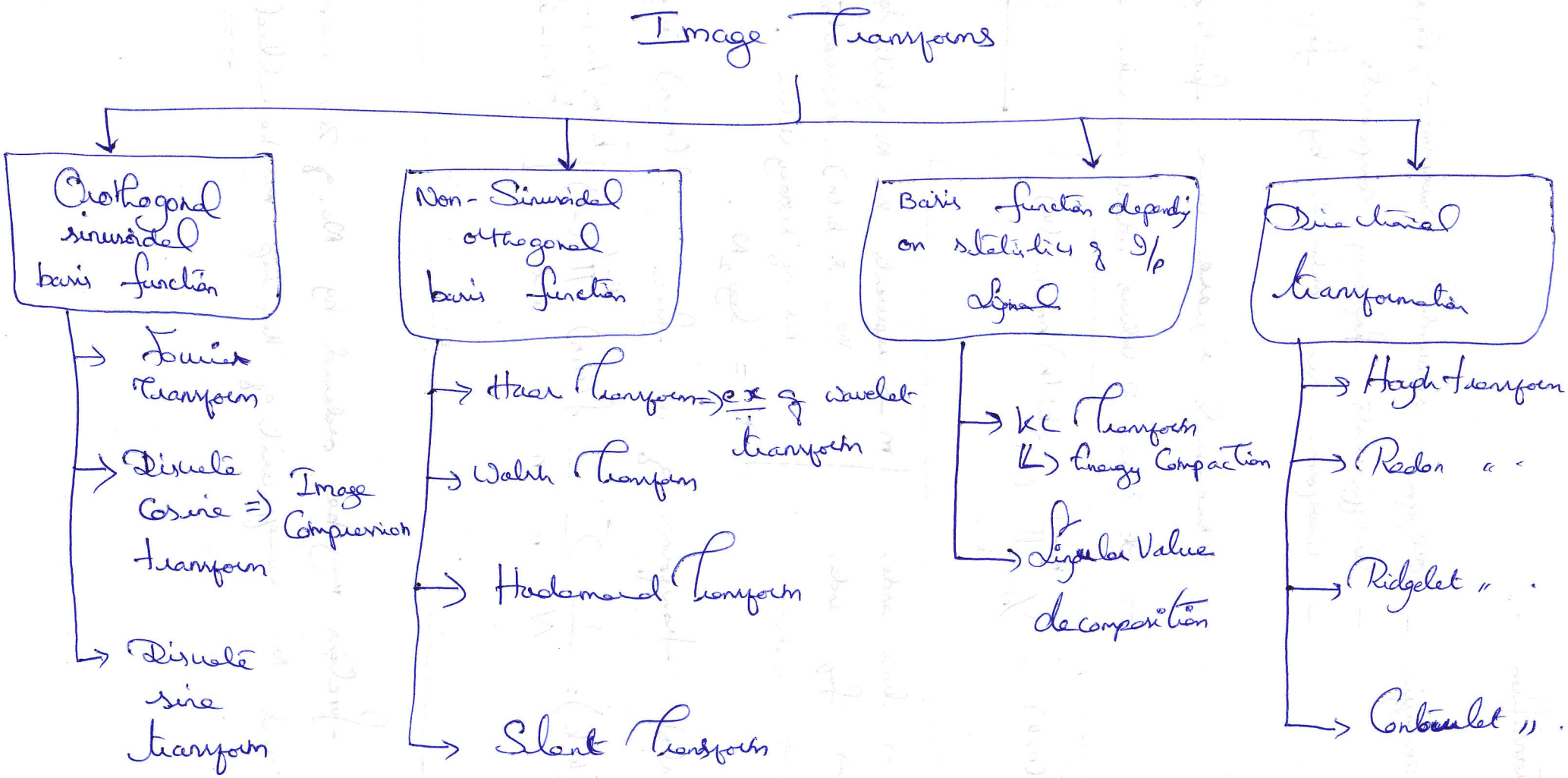
Image Transforms

* Basically a representation of an image.
* 2 reasons
  - Transformation may isolate critical components of the image pattern so that they are directly accessible for analysis.
  - And the transformation may place the image data in a more compact form so that they can be stored and transmitted efficiently.

Different types of Image Transforms

1) Fourier Transform
2) Walsh Transform
3) Hadamard Transform
4) Slant Transform
5) Discrete cosine Transform
6) KL Transform
7) Radon Transform
8) Wavelet Transform

Image Transforms



Walsh Transform

Fourier analysis – orthogonal sinusoidal waveforms => Represented
– Co-efficients frequency components
– Waveforms are ordered by freq.

Walsh → orthonormal square wave functions
→ It takes 2 values which are either +1 or -1

$$g(n,u) = \frac{1}{N} \prod_{i=0}^{m-1} (-1)^{bi(n)\, bm-1-i(u)} \quad \text{---(1)}$$

Here n → time index
u → freq index
N → order

m → represents the No of bits to represent
No. & bi(n) represents i^{th} (fr
bit of binary value.
$m = \log_2 N$.

2D Walsh transform of a func f(m,n) is given by

$$T(u,l) = \frac{1}{N} \sum_{m} \sum_{n} f(m,n) \prod_{i=0}^{p-1} (-1) \left[bi(m)\, bp-1-i(u) + bi(
bp-1-i(u)
$$

Sequency

Walsh functions may be ordered by No. of zero crossings called sequency and the co-efficients of this rep may be called seq Components.

Slant Transform

* It as an orthogonal transform ⇒ Sawtooth waveform (or) slant basis vectors.
* Slant basis vector is monotonically ↓ in constant steps from max to mini has sequency property & has fast Computational Algo.
* → It reproduces linear variations of brightness
  → Its performance at edges is not as optimal as the K (or) DCT.
  → ∴ Slant nature of lower order coefficients its effect is to smear the edges.