DSAA Endsems

- Basics 8:30 - 9:00
- Operations on Signals 9:00 - 9:15
- Characteristics of Signals 9:15 - 9:30
- Properties of a System 9:30 - 9:45
- Convolution 9:45 - 10:30
- 2 D Convolution
- Recursive Moving Average
- Recursive Mean
- Linear Regression
- Vector Algebra
- Discrete Fourier Transformation 11:00 - 11:30
- Continuous Fourier Transformation 11:30 - 12:00
- Fast Fourier Transformation 12:00 - 12:15
- 2D Fast Fourier Transformation 12:15 - 12:25
- Convolution Theorem 12:30 - 1:00
- Circular Convolution 1:00 - 1:15
- Moving Average Filter 1:15 - 1:30
- Leaky Integrator 1:30 - 1:45
- Short Time Fourier Transformation 1:45 - 2:00
- Run Length Encoding 7:30 - 7:40
- Huffman Coding 7:40 - 7:50
- Arithmetic Coding 7:50 - 8:00
- LZW Coding 8:00 - 8:10
- JPEG Compression 3:30 - 4:15 — 3:45
- MP3 Compression 4:20 - 4:50 — 4:00
- Amplitude Modulation 4:50 - 5:15 — 4:15
- Frequency Modulation 5:15 - 5:35 — 4:30
- Doppler and RADAR 5:45 - 6:30 — 5:00
- PCA 7:00 - 7:30 — 6:00

- ✅ Fourier Optics 6:30 - 7:00 — 5:30
- ✅ Dither and SPD

JPEG

- Take image, break in 8x8 patches.
- Forward transform each patch. (Cosine, because less error)
- Divide by quantisation matrix.
- Store linearly zig zag.
- Hoffman and RLE.

MP3

- Lossy compression done in ranges where human hearing is insensitive.
- Quantisation and dropping sounds where hearing is insensitive.
- Masking is done to manipulate the sensitivity to a sound in the presence of other interfering sounds.

Amplitude Modulation

- $y(t) = x(t).c(t)$ where $c(t) = \cos(\omega t)$
- Then transmitted.
- At receiver's end $\cos(\omega t)$ multiplied again.
- Fourier transform taken of this.
- Peak in centre of amplitude/2
- Band pass filter isolates it.
- A lot of noise because of dependence on amplitude.

Frequency Modulation

- $x(t) = A \cos(\omega t)$
- $c(t) = Ac \sin(2\pi t)$
- $y(t) = Ac \sin (2\pi (f+x(t))t)$
- Clipper clips the added noise on edges.
- Hetrodyn principle important. ($2\cos A\cos B = \cos(A+B)+\cos(A-B)$)

RADAR

- Resolution issue in normal radar.
- Dopper Radar formula.
- Approximation for ∂f.
- Derivation. $\partial f = (2v / c) * f$
- Hetrodyn and low pass filter to measure.
- Chirp signal and Distance calculation.

Fourier Optics

- Huygen's Principle.
- Fresnel diffraction
- Fraunhofer diffraction
- Fraunhofer's Approximation
  $r = r^{\circ} - x \sin ø$

Dither and Spectral Power Density

- Noise added to retain information while quantising it.
- SPD used to discuss random signals in the frequency domain.
- Power tells us a lot, Energy doesn't really.

Vector Algebra

- Vector Spaces
- Spanning Set
- Linear Independence
- Basis
- Inner Product
- Norm
- Orthogonal
- Orthonormal
- Theorem of Orthogonal Decomposition