Lecture 17: The Uncertainty Principle

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Self Evaluation Quizzes

Q 1. What is the difference between $|x(t)|^2$ and $\|x(t)\|_2^2$?
Ans. $\|x(t)\|_2^2$ is the $\mathcal{L}_2$ norm of function $x(t)$ and it is given as,

$$\|x(t)\|_2^2 = \int_{-\infty}^{\infty} |x(t)|^2 dt$$

$\|x(t)\|_2^2$ is the scalar quantity, whereas $|x(t)|^2$ is squared magnitude of function $x(t)$.

Q 2. Why the frequency centre for real function is zero?
Ans. For real functions, its fourier transform is magnitude symmetric. Therefore, frequency centre is zero for real function.

Q 3. What operations are needed to shift the time centre and frequency centre without affecting its shape?
Ans.

1. Time translation(Frequency domain modulation)

2. Frequency translation(Time domain modulation)

With these operations, we can shift the time centre and frequency centre without affecting the time and frequency variance, i.e. without affecting its shape.