Define Hilbert Transform mathematically in time domain. Briefly explain its properties and applications

Hilbert transform is obtained by phase shifting every frequency component of x(t) by 90 degrees or (pi/2) radians

The Hilbert transform of is represented by .

i.e. is the convolution of and .

Using convolution formula, we will get

Properties:

* A signal and its Hilbert Transform have same autocorrelation function.
* A signal and its Hilbert transform have same Energy density Spectrum.
* A signal and its Hilbert transform are orthogonal to each other.
* If Hilbert Transform of is , then the Hilbert Transform of is -.
* It is used to find pre-envelope of a signal in Analog Communication.

, where is the pre-envelope of a signal and is the Hilbert Transform of .

Applications:

* It is used in the generation of SSB (single side band) signal in Analog Communication.
* It is used in the design of minimum phase shift filters.
* It is used to represent Band Pass signals in Analog Communication.