Digital Signal Processing

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Lecture 3 - Topics
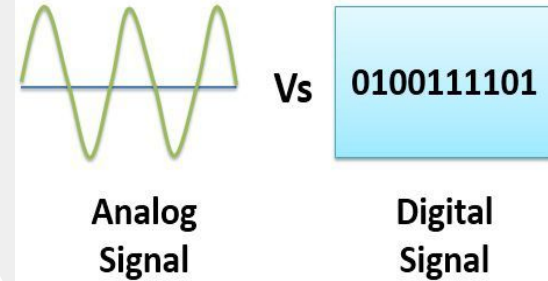
Operation on Signals:

a.   **Based on Amplitude**

- **Scaling**

- **Addition**

- **Multiplication**

- **Subtraction**

a.   **Based on Time**

- **Scaling**

- **Shifting**

- **Reversal**

Analog Signal   Vs   0100111101   Digital Signal

Introduction

- Generally, we there are two parameters of any continous signal - Amplitude and Time.

- What is amplitude?

- How far the signal travels from zero, is the amplitude of the signal.

- What is time?

- How much time does it take to change its amplitude from current position to other, is the time of the signal.

- Ex - if a wave is : A Sin t

- then A is the coefficient of amplitude and Sin t is the time.

Amplitude Operations

Based on Amplitude following operations can be performed:

- Scaling

y(t) = C x(t) where C is the scaled amplitude of signal.

Ex: if x(t) = 4 cos t, C = 2 then y(t) = 2 * 4 cos t = 8 cos t.

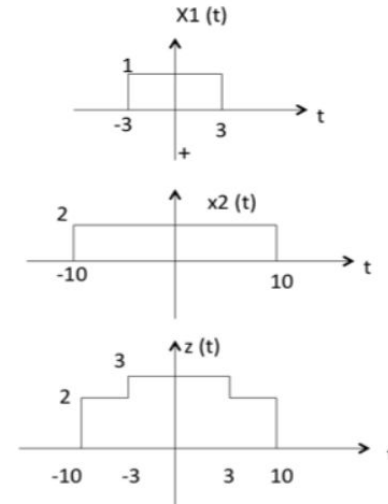Thus 8 is the scaled amplitude of the signal 4 cos t

Amplitude Operations

Based on Amplitude following operations can be performed:

- Addition

Adding only amplitudes of two signals.

Like here in diagram amplitude of first signal is 1

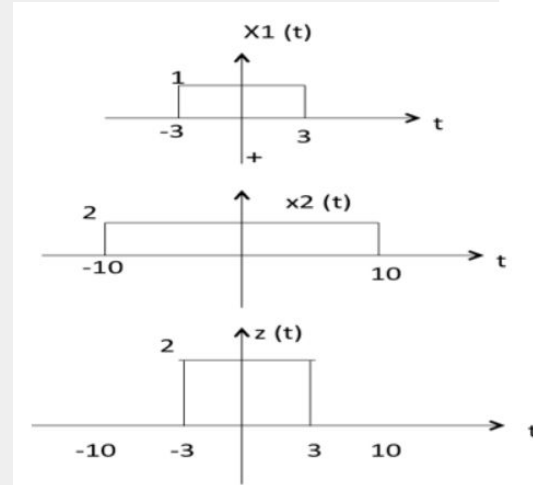and second is 2, so resultant signal is 1+2 = 3

Amplitude Operations

Based on Amplitude following operations can be performed:

- Multiplication

Similar to scaling, but cannot have negative values

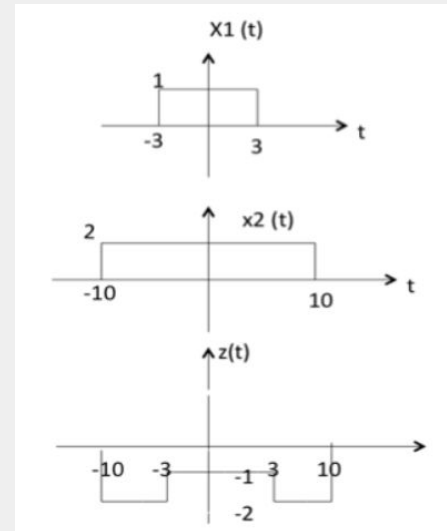Multiplies the amplitudes of two signals.

Amplitude Operations

Based on Amplitude following operations can be performed:

- Subtraction

Minusing only amplitudes of two signals.

Like here in diagram amplitude of first signal is 1
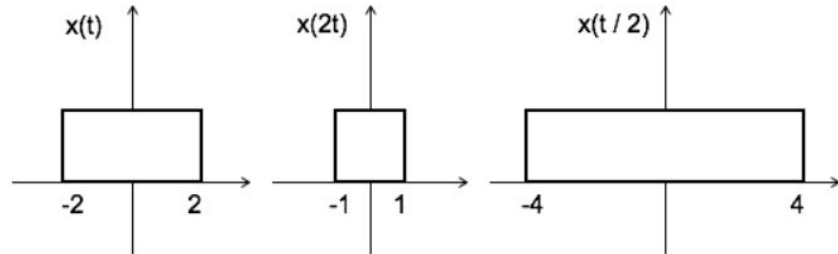
and second is 2, so resultant signal is 1-2 = -1

Time Operations

Based on Time following operations can be performed:
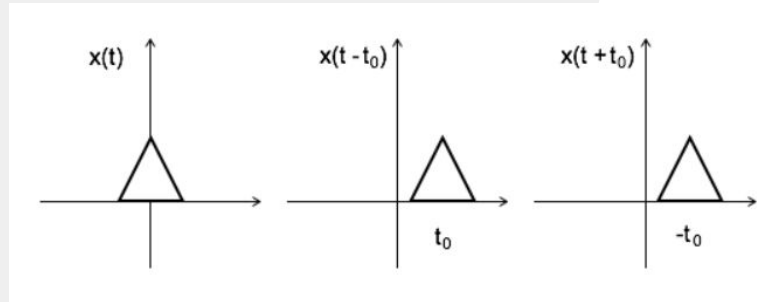
- Scaling

x(At) is time scaled version of the signal x(t).

Time Operations

Based on Time following operations can be performed:

- Shifting

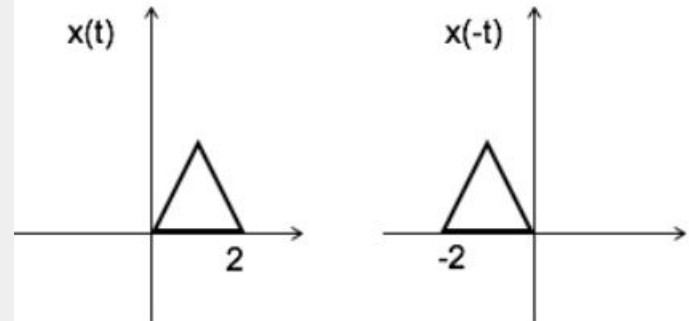$x(t \pm t0)$ is time shifted version of the signal $x(t)$.

Time Operations

Based on Time following operations can be performed:

- Reversal

x(-t) is the time reversal of the signal x(t).

Thank you