

Read: Ch. 1, Sect. 1-4, 6-8 in *Linear Signals & Systems, 2nd Ed.* by Lathi

Classification of Signals

Several classes of signals are considered in this course:

- Continuous-time and discrete-time signals
- Analog and digital signals
- Periodic and aperiodic signals
- Energy and power signals
- Deterministic and probabilistic signals

Continuous-time and discrete-time signals

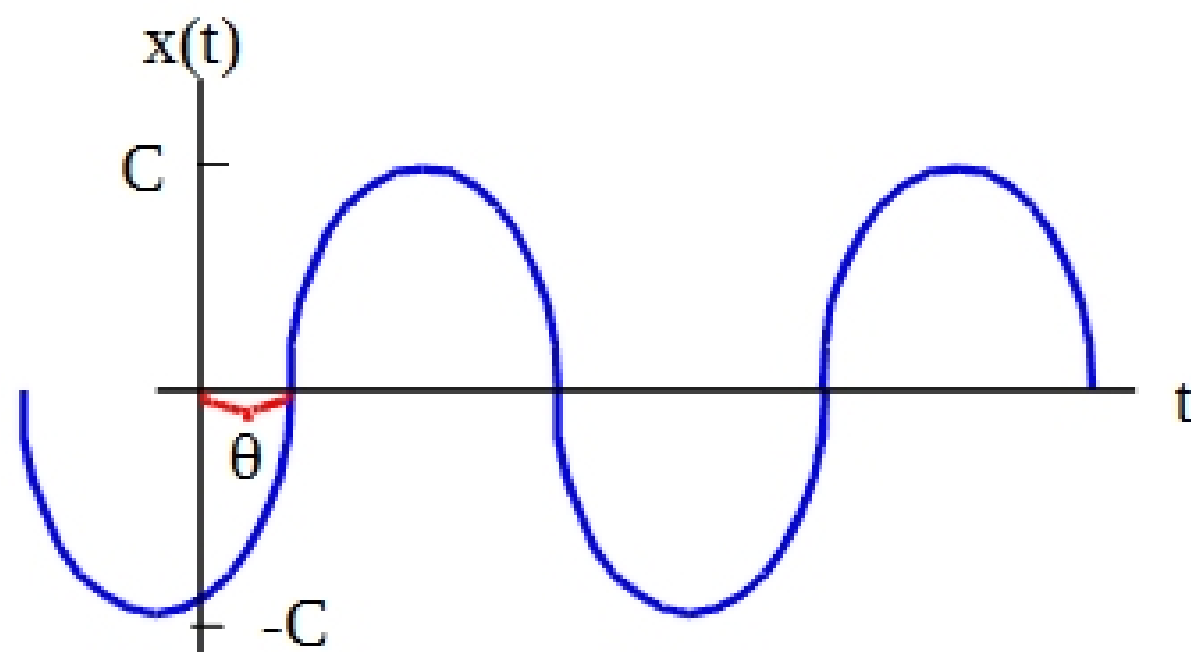
Continuous-time signals are signals that are specified for a continuum of time values (i.e., all values of time over a specified range).

Discrete-time signals are signals that are only defined at discrete times (i.e., for a specific set of time values.) For example, a discrete-time signal may have values defined once per millisecond.

A discrete-time signal might be a set of data point measured at specific time intervals, such as annual population figures.

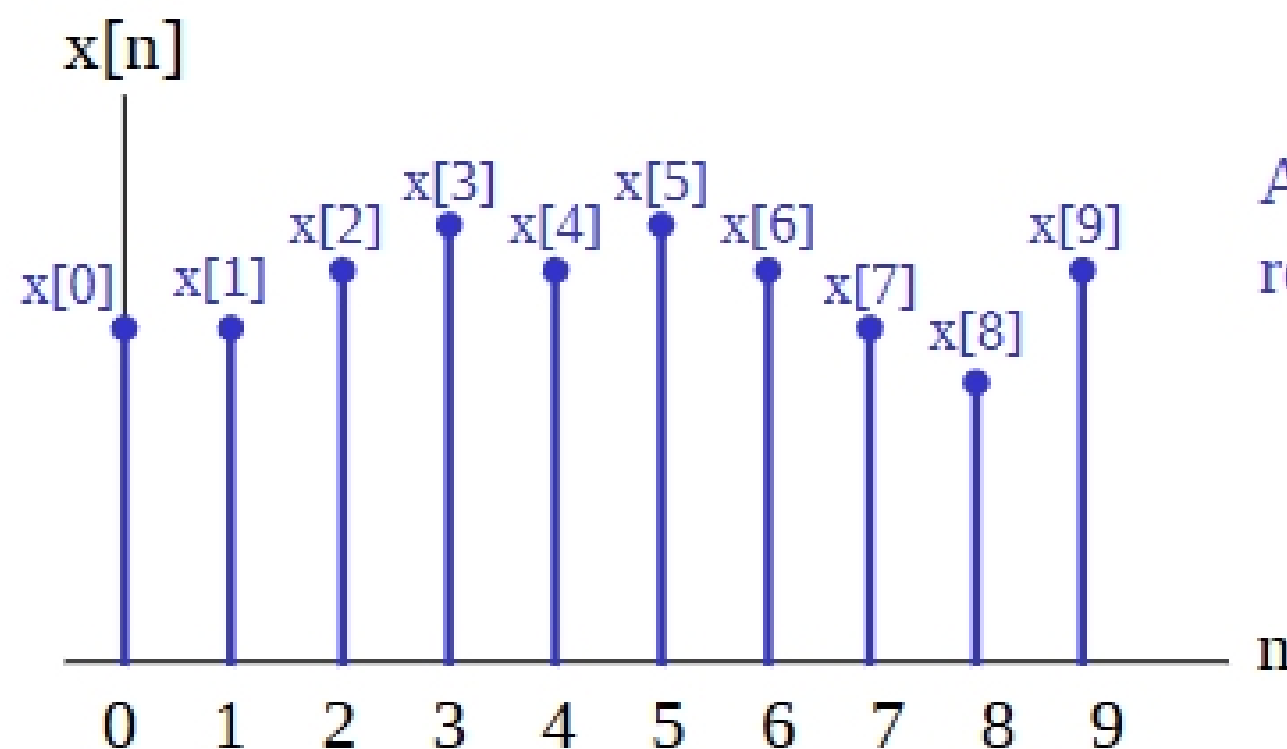
A discrete-time signal might also be formed by “sampling” a continuous-time signal (measuring its value at specific time intervals to produce a sequence of data points).

Example: Continuous-time signal



$x(t)$ is defined for any value of t . In this case a function $x(t) = C\sin(\omega t - \theta)$ describes the signal.

Example: Discrete-time signal



A series of data points ($x[0], x[1], x[2], \dots$) represents the signal.

Analog and Digital Signals

Analog signals are signals that can have any amplitude.

Digital signals are signals that can only have specific amplitudes (such as binary signals that can only have values 0 or 1).

Analog and digital signals are sometimes confused with continuous-time and discrete-time signals. The difference can be summarized by the following:

- Continuous-time signals can have any value of time (any x value).
- Discrete-time signals can have only specific values of time (only a set of x values).
- Analog signals can have any amplitude (any y value).
- Digital signals can have only specific amplitudes (only a set of y values).