Digital Signal Processing

Lecture (2): Applications, and Continuous vs. Discrete time signals

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نظام المحاضرات الالكتروني

Applications of DSP

- Military Applications (target tracking, radar, sonar, secure communications, sensors, imagery).
- Telecommunications (cellular, channel equalization, vocoders, software radio etc.).
- PC and Multimedia Applications (audio/video on demand, streaming data applications, voice synthesis/recognition).
- Entertainment (digital audio/video compression, MPEG, CD, MD, DVD, MP3).
- Automotive (Active noise cancellation, hands-free communications, navigation-GPS, IVHS).
- Manufacturing, instrumentation, biomedical, oil exploration, robotics Remote sensing, security.

Continuous vs Discrete time signals

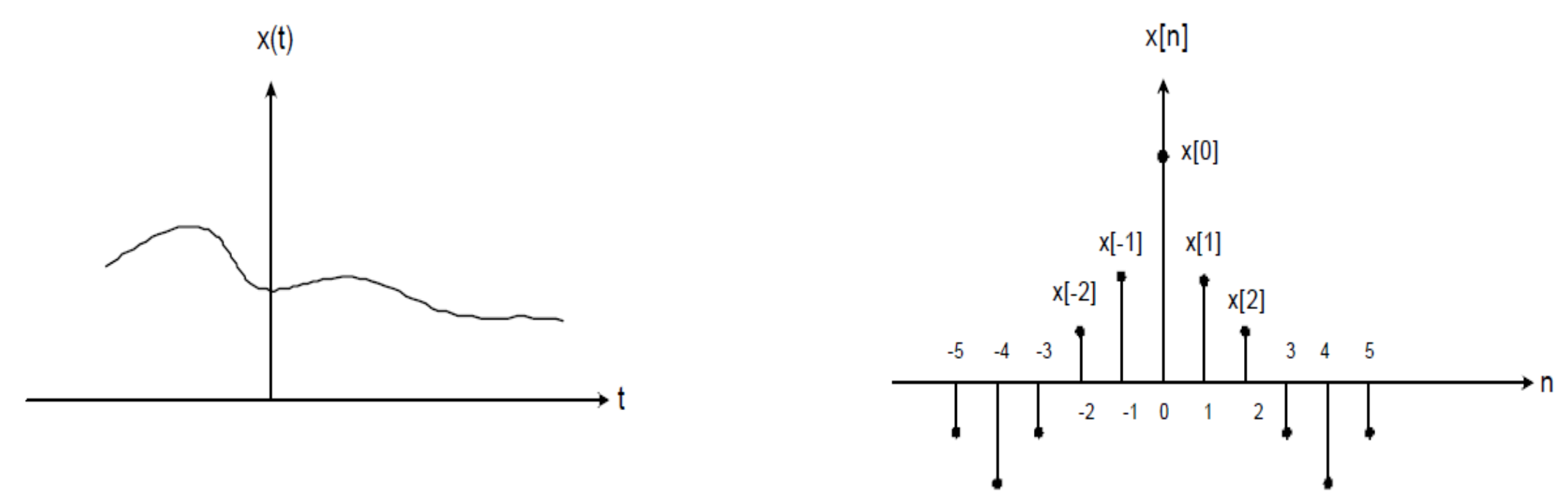
Signals are represented mathematically as functions of one or more independent variables. Here we focus attention on signals involving a single independent variable. For convenience, this will generally refer to the independent variable as time.

There are two types of signals: continuous-time signals and discrete-time signals.

- Continuous-time signal: the variable of time is continuous. A speech signal as a function of time is a continuous-time signal.

- Discrete-time signal: the variable of time is discrete. The weekly Dow Jones stock market index is an example of discrete-time signal.

Continuous vs Discrete time signals



Graphical representation of continuous and discrete time signals.

Continuous vs Discrete time signals

To distinguish between continuous-time and discrete-time signals we use symbol t to denote the continuous variable and n to denote the discrete-time variable. And for continuous-time signals we will enclose the independent variable in parentheses (·), for discrete-time signals we will enclose the independent variable in bracket [·].

Continuous vs Discrete time signals

A discrete-time signal x[n] may represent a phenomenon for which the independent variable is inherently discrete.

A discrete-time signal x[n] may represent successive samples of an underlying phenomenon for which the independent variable is continuous. For example, the processing of speech on a digital computer requires the use of a discrete time sequence representing the values of the continuous-time speech signal at discrete points of time.

A **continuous signal** is a varying quantity (a **signal**) whose domain, which is often **time**, is a continuum (e.g., a connected interval of the reals). That is, the function's domain is an uncountable set. ...

A discrete signal is a varying quantity (a **signal**) whose domain, which is often **time**, is discrete (i.e. a countable domain)