FACULTY OF ENGINEERING & TECHNOLOGY

BCS -504 Computer Graphics & Multimedia

Lecture-32

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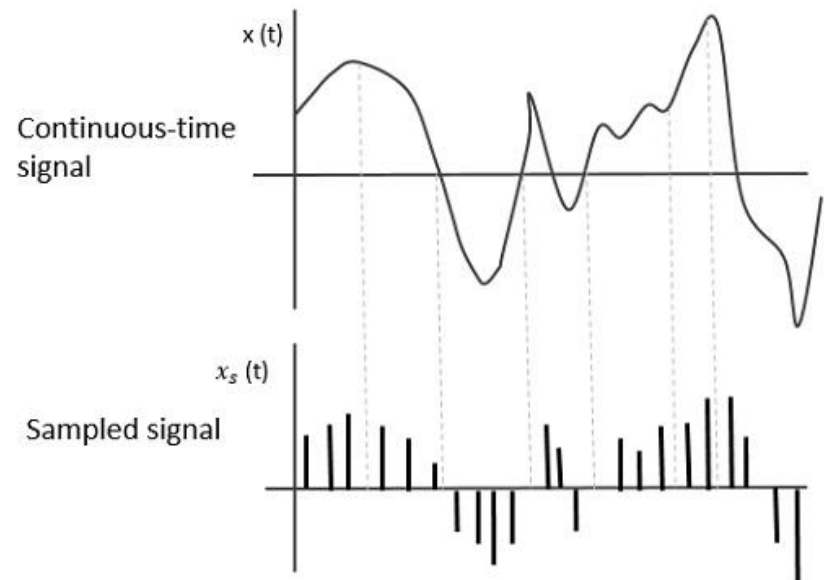
➢ **Sampling & Compression**

Sampling

Sampling is defined as, "The process of measuring the instantaneous values of continuous-time signal in a discrete form."

Sample is a piece of data taken from the whole data which is continuous in the time domain.

When a source generates an analog signal and if that has to be digitized, having **1s** and **0s** i.e., High or Low, the signal has to be discretized in time. This discretization of analog signal is called as Sampling.

The following figure indicates a continuous-time signal **x** t and a sampled signal **x$_s$** t. When **x** t is multiplied by a periodic impulse train, the sampled signal **x$_s$** t is obtained.

Sampling Rate

To discretize the signals, the gap between the samples should be fixed. That gap can be termed as a **sampling period T_s**.

$$Sampling\ Frequency = \frac{1}{T_s} = f_s$$

Where,

• T_s is the sampling time

• f_s is the sampling frequency or the sampling rate

Sampling frequency is the reciprocal of the sampling period. This sampling frequency, can be simply called as Sampling rate. The sampling rate denotes the number of samples taken per second, or for a finite set of values.

For an analog signal to be reconstructed from the digitized signal, the sampling rate should be highly considered. The rate of sampling should be such that the data in the message signal should neither be lost nor it should get over-lapped. Hence, a rate was fixed for this, called as Nyquist rate.
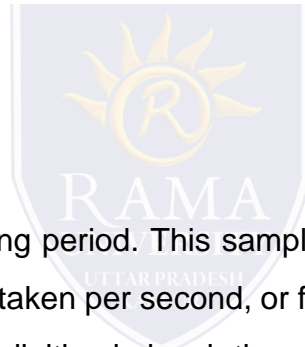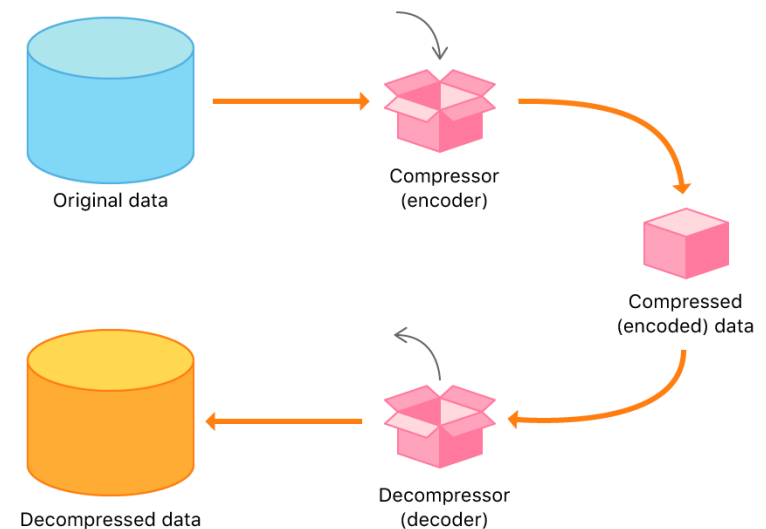
Compression

In signal processing, data compression, source coding, or bit-rate reduction is the process of encoding information using fewer bits than the original representation. Any particular compression is either loss or lossless. Lossless compression reduces bits by identifying and eliminating statistical redundancy. No information is lost in lossless compression. Lossy compression reduces bits by removing unnecessary or less important information. Typically, a device that performs data compression is referred to as an encoder, and one that performs the reversal of the process (decompression) as a decoder.

The process of reducing the size of a data file is often referred to as data compression. In the context of data transmission, it is called source coding; encoding done at the source of the data before it is stored or transmitted. Source coding should not be confused with channel coding, for error detection and correction or line coding, the means for mapping data onto a signal.

Original data

Compressor
(encoder)

Compressed
(encoded) data

Decompressed data

Decompressor
(decoder)

Compression

Data compression is the process of modifying, encoding or converting the bits structure of data in such a way that it consumes less space on disk.

It enables reducing the storage size of one or more data instances or elements. Data compression is also known as source coding or bit-rate reduction.

Data compression enables sending a data object or file quickly over a network or the Internet and in optimizing physical storage resources. Data compression has wide implementation in computing services and solutions, specifically data communications. Data compression works through several compressing techniques and software solutions that utilize data compression algorithms to reduce the data size.

A common data compression technique removes and replaces repetitive data elements and symbols to reduce the data size. Data compression for graphical data can be lossless compression or lossy compression, where the former saves all replaces but save all repetitive data and the latter deletes all repetitive data.

Data Compression Ratio

Data compression ratio, also known as compression power, is a measurement of the relative reduction in size of data representation produced by a data compression algorithm. It is typically expressed as the division of uncompressed size by compressed size. Data compression ratio is defined as the ratio between the uncompressed size and compressed size

$$\text{Compression Ratio} = \frac{\text{Uncompressed Size}}{\text{Compressed Size}}$$

Thus, a representation that compresses a file's storage size from 10 MB to 2 MB has a compression ratio of 10/2 = 5, often notated as an explicit ratio, 5:1 (read "five" to "one"), or as an implicit ratio, 5/1. This formulation applies equally for compression, where the uncompressed size is that of the original; and for decompression, where the uncompressed size is that of the reproduction.

Sometimes the space savings is given instead, which is defined as the reduction in size relative to the uncompressed size

$$\text{Space Savings} = 1 - \frac{\text{Compressed Size}}{\text{Uncompressed Size}}$$

Thus, a representation that compresses the storage size of a file from 10MB to 2MB yields a space savings of 1 - 2/10 = 0.8, often notated as a percentage, 80%.

MUTIPLE CHOICE QUESTIONS:

Sr no	Question	Option A	Option B	OptionC	OptionD
1	In many applications, changes in orientations, size, and shape are accomplished with geometric transformations that………. the coordinate descriptions of objects.-2D	alter	modify	remove	delete
2	Basic geometric transformations translation are…….	Scaling	Rotation	both a & b	none of these
3	Which transformation is when two or more transformations are performed on a figure is called preimage?	composite	image	clipping	shaped
4	In geometry, a transformation is an operation that moves, …………….to create a new shape	flips	changes a shape	both a & b	none of these
5	A composite transformation is when two or more transformations are performed on a figure is called the ………….	preimage	scene	image	All of these

- http://www.engppt.com/search/label/Computer%20Graphics