Chapter 6

**Digital Speech Compression**

Introduction

- Speech compression - speech coding - is a process of analyzing and compressing a digitized audio signal, transmitting that compressed digital signal to another point, and decoding the compressed signal to recreate the original (or approximate of the original) signal.
- The GSM digital speech compression process works by grouping the digital audio signals into 20 msec speech frames. These speech frames are analyzed and characterized (e.g. volume, pitch) by the speech coder. The speech coder removes redundancy in the digital signal (such as silence periods) and characterizes digital patterns that can be made by the human voice using code book tables. The code book table codes are transmitted instead of the original digitized audio signal. This results in the transmission of a 13 kbps compressed digital audio instead of the 64 kbps digitized audio signal.
- This figure shows the basic speech data compression process used for the GSM speech coder. This diagram shows that the analog voice signal is sampled 8,000 times each second and digitized into a 64 kbps digital signal. The digitized signal is grouped into 20 msec speech frames. The speech frames are analyzed and compressed into a new 13 kbps digital signal.
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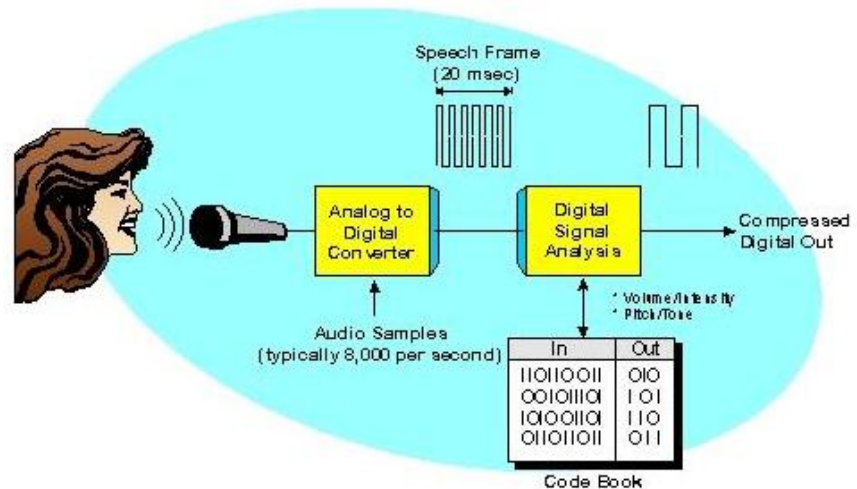
WHAT IS COMPRESSION?

➤ Compression is a reduction in the number of bits needed to represent data.

➤ Compressing data can save storage capacity, speed file transfer, and decrease costs for storage hardware and network bandwidth.

➤ Compression is performed by a program that uses a formula or algorithm to determine how to shrink the size of the data.

COMPRESSION

Audio Compression

1. Audio data compression:
   - Lossless Audio Compression.
   - Lossy Audio Compression.
2. Audio level compression

Video Compression

1. Lossy Video Compression
2. Lossless Video Compression

AUDIO COMPRESSION

➢ Audio compression is a form of data compression designed to reduce the size of audio data files.

➢ **Audio compression can mean Two things:**
- Audio data compression
- Audio level compression

AUDIO DATA COMPRESSION

➢ Audio data compression in which the amount of data in a recorded waveform is reduced for transmission.

➢ This is used in MP3 encoding, internet radio, and the like.

➢ **Audio Data Compression can be either:**
- Lossless Audio Compression.
- Lossy Audio Compression.

AUDIO DATA COMPRESSION

➤ **Lossless Audio Compression**
- ▪ Removes redundant data
- ▪ Resulting signal is same as original – perfect reconstruction

➤ **Lossy Audio Encoding**
- ▪ Removes irrelevant data
- ▪ Resulting signal is similar to original

AUDIO LEVEL COMPRESSION

➤ Audio Level Compression Is also Called as Dynamic Range Compression.
➤ Audio level compression in which the dynamic range (difference between loud and quiet) of an audio waveform is reduced.
➤ This is used in guitar effects racks, recording studios, etc.
➤ **Types of Dynamic Rage Compression:**
- ▪ Downward compression
- ▪ Upward compression

AUDIO LEVEL COMPRESSION

- **Downward compression** reduces loud sounds over a certain threshold while quiet sounds remain unaffected.
- **Upward compression** increases the loudness of sounds below a certain threshold while leaving louder sounds unaffected.

ADVANTAGES OF AUDIO COMPRESSION

➢ Faster transmission time.

➢ Reduced transmission costs.

➢ Smaller size.

➢ Reduced bandwidth due to Smaller Size

DISADVANTAGES OF AUDIO COMPRESSION

➢ Compression can only be used if both the transmitting and receiving modems support the same compression procedure.

➢ Needs processing both for encoding and decoding.

➢ if a lossy compression method is used, the quality is reduced.

➢ Lossless compression methods exist and they achieve about 50% reduction in size.

VIDEO COMPRESSION

➢ Video compression uses modern coding techniques to reduce redundancy in video data.

➢ Video takes up a lot of space. Uncompressed footage from a camcorder takes up about 17MB per second of video.

➢ Because it takes up so much space, video must be compressed before it is put on the web. "Compressed" just means that the information is packed into a smaller space.

➢ There are two kinds of compression:

▪ Lossy Video Compression

▪ Lossless Video Compression

LOSSY VIDEO COMPRESSION

➢ Lossy compression means that the compressed file has less data in it than the original file.

➢ Lossy compression makes up for the loss in quality by producing comparatively small files.

➢ For example:

▪ DVDs are compressed using the MPEG-2 format, which can make files 15 to 30 times smaller, but we still tend to perceive DVDs as having high-quality picture.

LOSSLESS VIDEO COMPRESSION

➢ Lossless compression is exactly what it sounds like, compression where none of the information is lost.

➢ lossless compression will result in a perfect-quality picture even if file size is not an issue.

➢ For example:

▪ A video editor transferring files from one computer to another using a hard drive might choose to use lossless compression to preserve quality while he or she is working.

ADVANTAGES OF VIDEO COMPRESSION

➢ Occupies less disk space.

➢ Reading and writing is faster.

➢ File transferring is faster.

➢ The order of bytes is independent.

DISADVANTAGES OF VIDEO COMPRESSION

➢ Compilation need to be done again for compression.

➢ Errors may occur while transmitting data.

➢ The byte / pixel relationship is unknown

➢ Has to decompress the previous data.