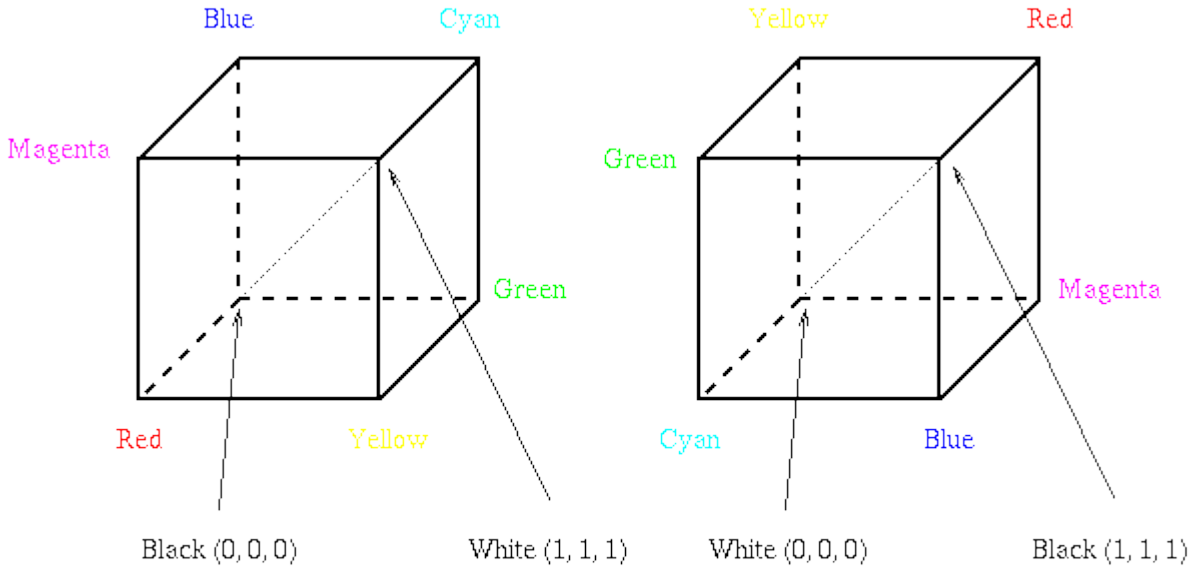
The CMY Colour Model

- Cyan, Magenta, and Yellow (CMY) are complementary colours of RGB (Fig. 6.26). They can be used as ***Subtractive Primaries*.**
- CMY model is mostly used in printing devices where the colour pigments on the paper absorb certain colours (e.g., no red light reflected from cyan ink).



The RGB Cube The CMY Cube

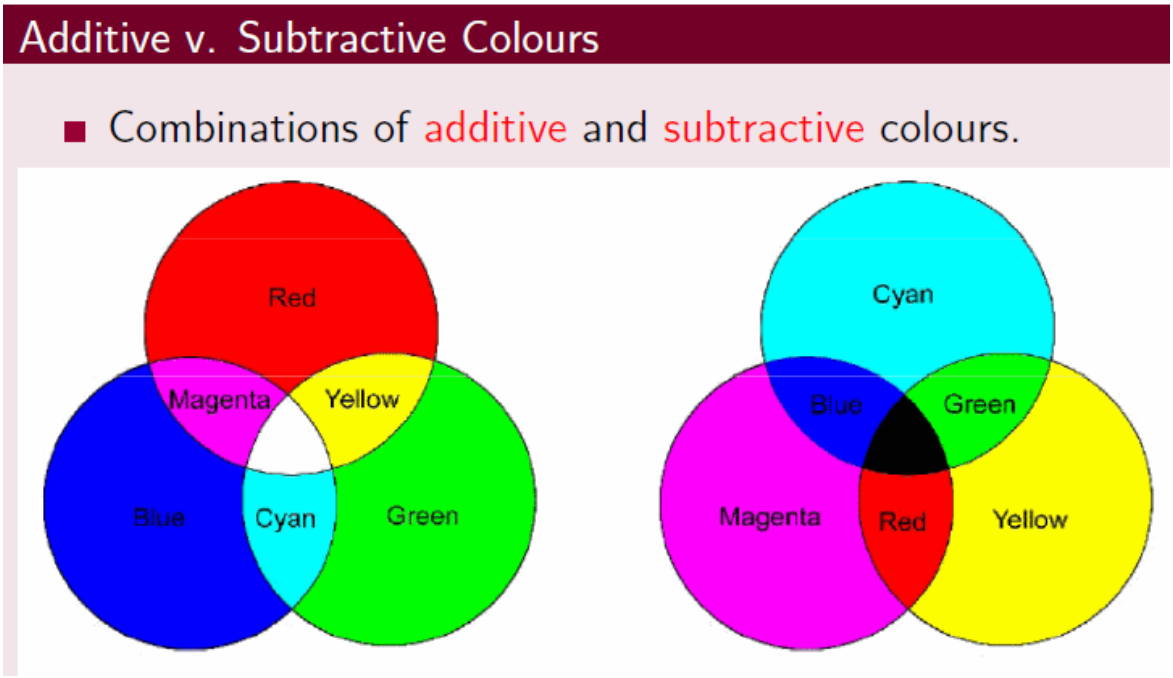
The RGB and CMY Cubes

Conversion between RGB and CMY:
- e.g., convert **White** from (1, 1, 1) in RGB to (0, 0, 0) in CMY.

$$\begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} C \\ M \\ Y \end{bmatrix}$$

- Sometimes, an alternative CMYK model (K stands for *Black*) is used in colour printing (e.g., to produce darker black than simply mixing CMY). Where



Summary of Colour

- Colour images are encoded as triplets of values.
- Three common systems of encoding in video are RGB, YIQ, and YCrCb.
- Besides the hardware-oriented colour models (i.e., RGB, CMY, YIQ, YUV), HSB (Hue, Saturation, and Brightness, e.g., used in Photoshop) and HLS (Hue, Lightness, and Saturation) are also commonly used.
- YIQ uses properties of the human eye to prioritize information. Y is the black and white (luminance) image, I and Q are the colour (chrominance) images. YUV uses similar idea.
- CCIR 601 is a standard for digital video that specifies image size, and decimates the chrominance images (for 4:2:2 video).

Audio Files

What is SOUND? • Sound comprises the spoken word, voices, music and even noise. • It is a complex relationship involving: – a vibrating object (sound source) – a transmission medium (usually air) – a receiver (ear) and; – a preceptor (brain).

The Power of Sound

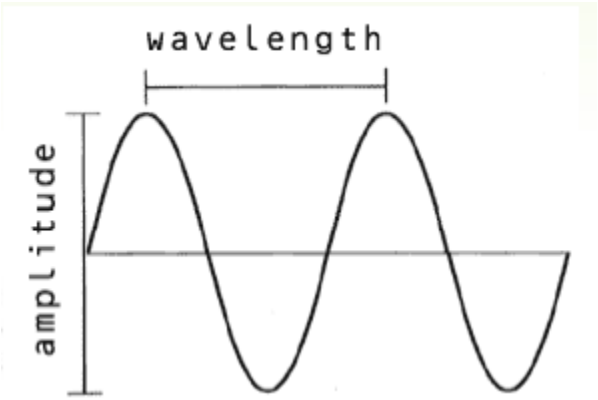
•Sound pressure is measured in ◊ dB (decibel) • Sound waves are known as **waveforms.** Something vibrates in the air Waves of pressure Ear drums will translate these changes in wave Forms as sound

Example of Waveforms PianoPiano Pan flutePan flute Snare drumSnare drum

Sound • A pleasant sound has a regular wave pattern. The pattern is repeated over and over. But the waves of noise are irregular. They do not have a repeated pattern.

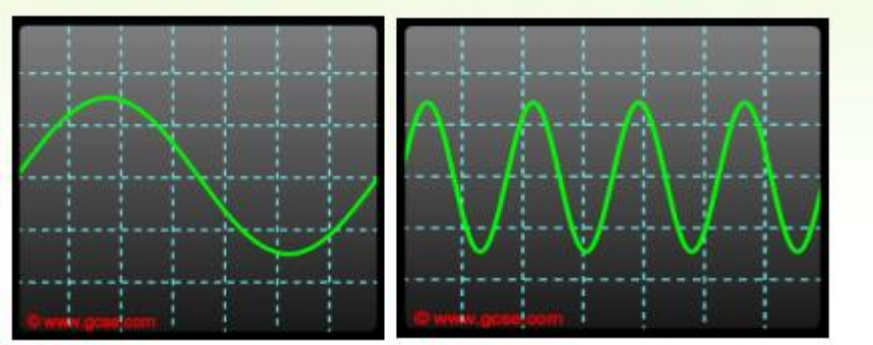
Characteristic of Sound Waves • Sound is described in terms of two characteristics: – Frequency (or pitch)

– Amplitude (or loudness)



Frequency: Frequency is a measure of how many vibrations occur in one second. This is measured in Hertz (abbreviation Hz) and directly corresponds to the pitch of a sound.

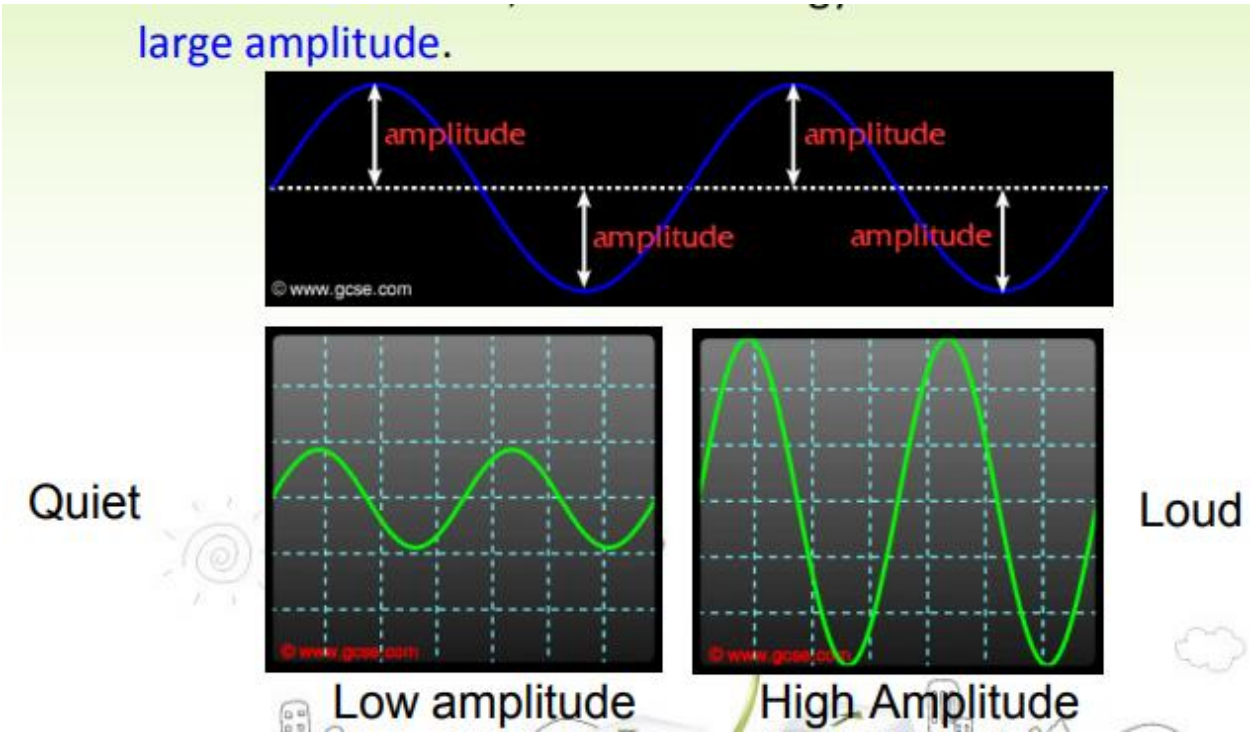
– The more frequent vibration occurs the higher the pitch of the sound.



people can hear from 20 Hz to 20,000 Hz (20 kHz) λ Sounds below 20 Hz are infrasonic λ sounds above 20 kHz are ultrasonic. Low pitch High pitch.

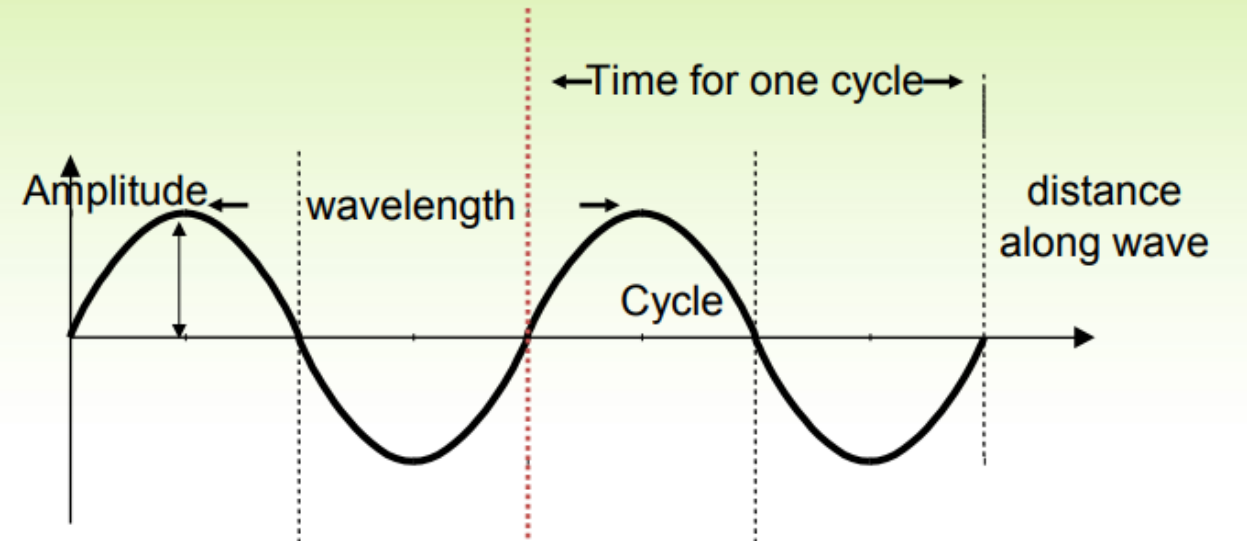
Amplitude: Amplitude is the maximum displacement of a wave from an equilibrium position.

– The louder a sound, the more energy it has. This means loud sounds have a large amplitude.



The amplitude relates to how loud a sound is. Low amplitude High Amplitude Quiet Loud.

- Characteristic of Sound Waves



- distance along wave Cycle Time for one cycle Amplitude wavelength
- The Power of Sound • Audio in Macintosh and Windows – Both Macintosh and Windows PC platform, have the default system sounds – MACINTOSH ◊ Chu Toy, Glass, indigo, Laugh, Simple Beep – WINDOWS PC ◊ ding.wav, chimes.wav, logoff.wav,start.wav
- Basic Recording Software – Both MACINTOSH and WINDOWS have basic recording software.

Basic Sound Recorder Sound conversion Basic Effects

- Analogue to Digital Audio Analogue audio The name for an electronic signal that carries its information of sound as continuous fluctuating voltage value.

• non digital tape or audio tape recording of sound. Digitizing
• the process of converting an analog signal to a digital one.
• A sound is recorded by making a measurement of the amplitude of the sound at regular intervals which are defined by the "sample rate".
• The act of taking the measurement is often called "sampling" and each measurement is called a "sample point".

- Capture & Playback of Digital Audio Air pressure variations Captured via microphone Air pressure variations ADC Signal is converted into binary (discrete form) 0101001101 0110101111 Analogue to Digital Converter DAC Convert s back into voltage Digital to Analogue Converter

Digital Audio

• Digital audio data is the representation of sound, stored in the form of samples point. • Quality of digital recording depends on the sampling rate, that is, the number of samples point taken per second (Hz). High Sampling Rate Low Sampling Rate Samples stored in digital form waveform

Digital Audio (Low Sampling Rate High Sampling Rate)

• The three sampling frequencies most often used in multimedia are 44.1 kHz, 22.05 kHz and 11.025 kHz. – The higher the sampling rate, the more the measurements are taken (better quality). – The lower the sampling rate, the lesser the measurements are taken (low quality).

Digital Audio (Sampling Rate Sample size)

• Quality factors for digital audio file :

1. Sampling Rate

2. Sample Size (resolution) • the number of bits used to record the value of a sample in a digitized signal.

Digital Audio • Other than that, it also depends on: – The quality of original audio source. – The quality of capture device & supporting hardware. – The characteristics used for capture. – The capability of the playback environment.