

Sound in Multimedia

- ◆ Psychology of sound
 - what do you use it for?
 - what techniques for its communication exist?
- ◆ Science of sound
 - why does it exist?
 - how it works?
- ◆ Technology of sound
 - how do we capture it?
 - how do we edit it?
 - how do we use it?

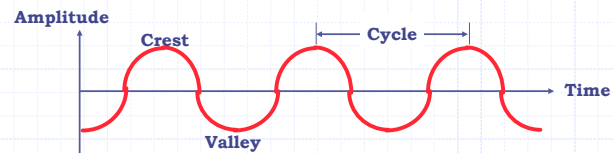
Psychology of Sound

Give Examples:

- ◆ Sets the mood
 -
- ◆ Reinforces a message
 -
- ◆ Creates curiosity and interest
 -
- ◆ Enhances learning
 -
- ◆ Gives feedback
 -
- ◆ Other use you can think of:
 -
- ◆ Wakes up!
- ◆ Check out "You Don't Know Jack!"

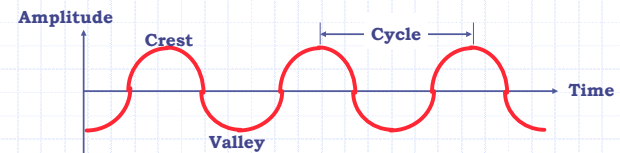
Science of Sound

- ◆ Produced by **vibration** of object in air, liquid
- ◆ Moves through **waves** of pressure
 - Is fast: in air, 340 m/sec = 750 miles per hour
 - But not very fast (echo)
- ◆ Characteristics of sound wave

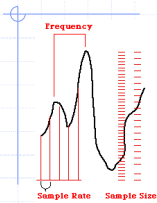


Units

- ◆ **Frequency** (aka pitch): #cycles/time
 - Unit: Hz = cycles/sec
 - Detectible frequency between 20 Hz and 20KHz
- ◆ **Amplitude** (aka loudness): height of wave
 - Unit: deciBell



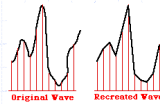
Digitizing Sound



Sampling Rate:
Sample the sound amplitude often enough
So that you get a close measurement.

Bit-resolution:
Use a detailed "ruler"
So that you get a more accurate reading

The reproduced signal
might not be identical to the original
But might be "good enough"



From Analog to Digital



◆ Sampling Rate

- Unit: Hz = samples/sec
- Usually between 11.0, 22.0 or 44.1 KHz

◆ Bit-resolution (Recording resolution)

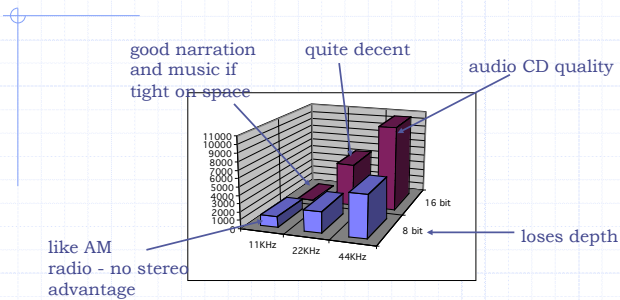
- # of bits devoted to record each sample
- Usually between 8, 16 or 24 bits

◆ Space Requirements for mono

- sampling rate * bit-resolution/8 * recording time
- 44.1 KHz * 24/8 Bytes = 132.3 KB/sec!
- 1 hour of uncompressed stereo =

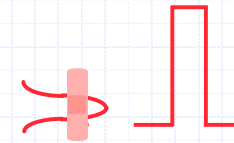
$$44.1 \text{ samples/sec} * 3 \text{ B} * 60 \text{ sec/min} * 60 \text{ min/hour} * 2 = 930\text{MB}$$

Space Requirements



These are for **stereo**. For mono, half the space is needed.

Digital beats Analog



◆ Analog sound is stored in

- magnetic tapes,
- LP disks

◆ Digital sound

- is of higher quality (hiss-less)
- transfers recording without loss of quality
- does not wear with multiple playings
- can access recorded data randomly (not serially)
- allows easy and accurate synchronization

◆ Digital is better. Period.

Audio File Formats

◆ AIFF — “audio interchange file format”

- Consistency in audio quality
- The old standard - Can keep track of audio markers!



◆ MP3 -- highly compressed audio

- The new standard – cannot keep track of audio markers!

◆ Other formats:

- WAV — Microsoft; 8-bit and 16-bit
- AU — Sun; 16-bit compressed

◆ MIDI — descriptive for musical instruments

- compatibility with available hardware
- low standards for processor speeds
- very low file size: 1 min = 6K



Technology of Sound: Amadeus II

◆ Recording options

- Microphone (internal)
- External Audio
- Internal CD

◆ Editing Options

- Splicing and Assembling
- Echo
- Amplify
- Filter
- Fade in / Fade out (enveloping)
- Normalize
- Reverse
- Downsampling
- etc, etc.
- Use Help > Manual to find out!

◆ Sound Format

- If you use audio markers, use AIFF, else MP3 is better