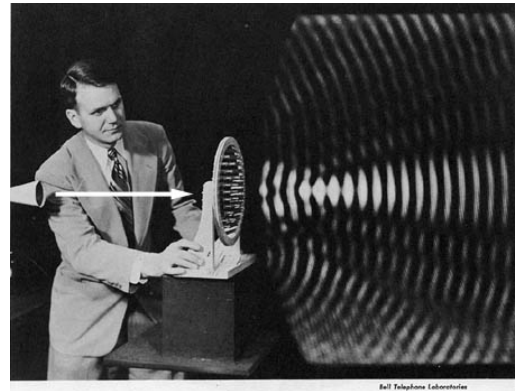


CGT 353: Principles of Interactive and Dynamic Media Sound in Flash

- No surprise that sound is used poorly in Flash
- Important to understand the basics of sound to incorporate them adequately
- Sound files can **sound horrible or be far too large**
- Can use sound for a variety of things including **interactive navigational objects, sound tracks, and voiced narrative**
- In addition to the “drag-and-drop” functionality, you can also control sound with Actionscript

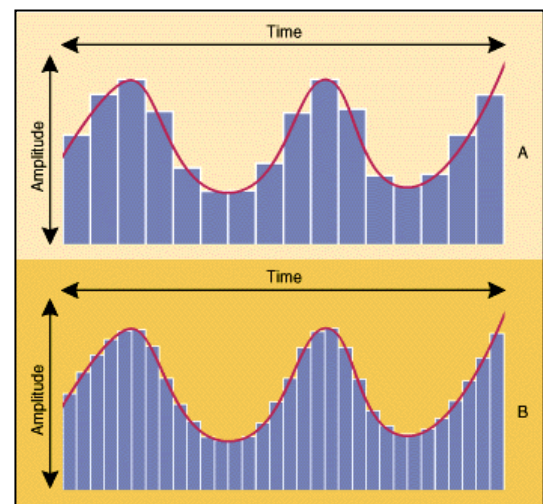


Understanding Computer Audio:

- Although we will touch on the fundamentals of sound in lecture, there is much more coverage in the ActionScript text
- As a matter of fact, audio engineering is a highly specialized area that some people build entire careers upon and spend a lifetime learning
- As such, it is beyond the scope of this lecture, text, class, and field to learn it in its entirety
- Audio can be either **sampled** or **synthesized**

Sampled Audio:

- **Sampled audio** - captured analog data that's been converted into digital form
- **Samples** refer to instances of time captured then described digitally
- A digital audio file is an approximated description of multiple samples over a given period of time
- Although not as detailed as analog, its still good enough for humans

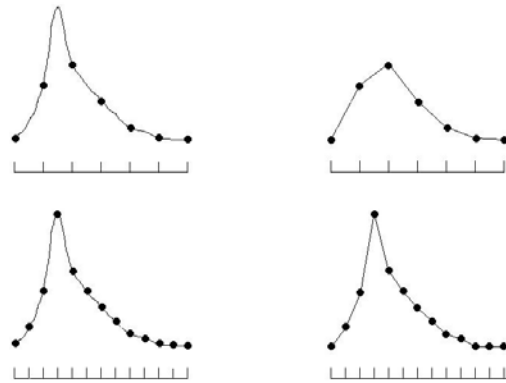


Synthesized Audio:

- Typically refers to MIDI files in multimedia
- Flash cannot use MIDI's, but its important to understand the distinction
- Describes various notes and sounds using a synthesis chip on a computer's sound card
- Because it is recreating rather than replaying sound, synthesized sound sounds "fake"

Sampling Rate:

- When sound is recorded, samples are captured at a specific, consistent interval
- How close or far apart these intervals are is called the **sampling rate**
- **Greater sampling rate = more samples captured = increased description of audio**
- So, **higher sampling rate = better audio clarity**



Measuring and Using Sound:

- Audio usually measured in kHz (kilohertz)
- Sounds with a sampling rate of 44 kHz are "CD quality"
- Human ear can hear up to 20-22 kHz, so its usually not necessary to have 44 kHz on a multimedia file
- Should never go lower than 11 kHz, which is adequate for voice but not for music
- In Flash, its best to start with high quality files then use Flash to downsample them



Bit Depth:

- At each captured sample, the computer has to represent the audio amplitude with a certain number of bits, described as **bit depth**
- Bit depth controls audio **fidelity or dynamic range**

Sampling for Flash Multimedia:

- For Flash, sampling at 22kHz, 16 bit depth is usually fine
- Again, it depends on what you want to do with the audio
- Avoid using multichanneled sound whenever you can in Flash

For this Class...

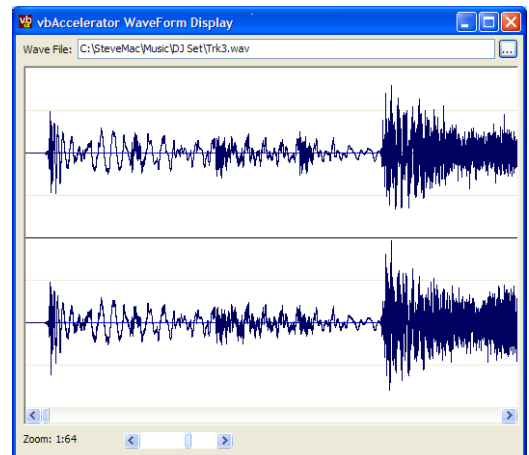
- You will not be expected to become experts in sound sampling or editing
- However, you will have to show proficiency at incorporating sound into Flash

Importing Sound:

- Can either import or drag sound into the Flash library
- You can then assign a sound to any frame in Flash
- These frames can be in any timeline (main, movie clip, etc) but will not work in a graphic symbol

Import Formats:

- Each audio format uses a variety of compression/ decompression schemes known as **codecs**
- Must usually have a particular codec to play a particular format
- Once Flash imports a file, the codec "wrapper" is stripped and the file is stored as a generic **PCM (Pulse Code Modulation)** file
 - **MP3** - cross-platform files with extremely good compression and general availability
 - Created by the Motion Picture Experts Group
 - Strips files of excess data that humans cannot hear
 - As a result, files can be reduced to nearly 1/12 of their original size with no loss in quality
 - **WAV** - the reigning PC Windows audio standard for nearly two decades, still the primary PC acquisition format



- **AIFF** - (Audio Interchange File Format) primary Mac acquisition format
- **Quicktime** - audio files (.qta or .mov)
- **Sun AU** - the native sound format for many Solaris and Unix systems

Sound Settings:

- Can control any sounds sampling rate and compression scheme
- Use either the Publish Settings or individual file settings in library
- **Publish settings will override library settings unless individual sound settings have been applied**
- However, **Publish settings can be made to override indiv. settings**

Compression:

- Flash can use either
 - **linear (RAW)**
 - **speech (ADPCM)**
 - **MP3 compression**
- Default uses no compression (linear)
- Speech is designed for the human voice with several sampling rates, but typically use 11 kHz - converts all sounds to mono
- MP3 typically offers the best compression although ADPCM is not bad
- Both are lossy compression schemes
- Amount of data lost depends on
 - Size of the averaged data chunks - **subsampling**
 - Amount of averaging that occurs – **quantization**
- **Bit rate** setting allows you to control the size of the compressed chunks
- **Quality** controls the quantization amounts



What the Heck Does This Mean to Me?

- With low bit rate settings, the sound will stream faster, but the overall file size will be bigger as compression is not as effective
- With high bit rate settings, the sound will stream slower, but overall file size will decrease as compression is enhanced
- **Fast quantization** means that compression is increased and files are smaller, but quality is poorer
- **Best quantization** means that compression is decreased and files are bigger, but sound quality is better

Sync'ing Sound....

- Not as precise as we would like with Flash due to the dependence on variations in the end users computer
- Sound is time based, where animations are frame based
- Unlike AVI, Flash will not drop sound fragments if the end-computer is slow
- So the machine affects the animations, but not the sound
- So graphics may occur too fast or too slow to keep pace with the audio
- Flash DOES offer some synchronization controls, but there are many “workarounds” that developers have had to utilize

The Properties Panel: Event and Streaming Sounds:

- Basic difference is that event sounds have to be downloaded before they can play, whereas streaming sounds can begin immediately
- Events sounds also play independently of the timeline, where streaming can be sync'd to the timeline

Event Sounds:

- An event sound will play even if the main timeline is stopped
- The problem with event sounds is that if the frame they're in is “hit” more than once, you can get multiple instances of the same sound playing

- Using “**start sync**” (which is actually a modified event sound), the sound will play only once, even if the frame is “hit” more than once
- “**stop sync**” will stop all other instances of that sound playing before it plays

Streaming Sounds

- Can play almost immediately because they are chopped up into chunks of sound in a process called **interleaving**
- Problem with streaming sounds is that if the downstream slows the sound may cut

Other Differences...

- Event sounds work just like symbols in Flash in that multiple instances work like copies that do NOT add to the overall file size.
- Streaming sounds however, do not and will increase the size for each time they are added to the movie
- Streaming sounds can be scrubbed through on the timeline

Sound Effects and Looping

- Flash can do a limited number of sound effects in the Properties panel
- However, these edits do not manipulate the sound in the .swf, so you should do some edits beforehand in a program like SoundForge
- Can also loop sounds a maximum number of 999 times

Stop All Sounds - stopAllSounds() – (AS 2.0)

- ActionScript function that will cancel out any existing sounds



AS 3.0

- [flash.media.SoundMixer.stopAll\(\)](#) is the basic equivalent of stopAllSounds()
- Many more options for sound in AS 3.0
 - Sound Class
 - SoundEvent Class
 - SoundChannel Class
 - SoundLoader Class
 - SoundTransform Class
 - SoundMixer Class
 - Microphone Class