Chapter 5

Sound

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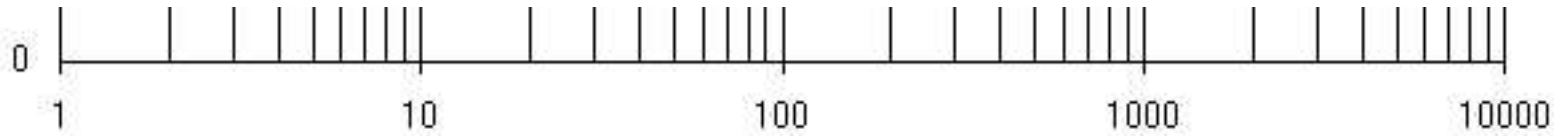
.: Introduction to Sound

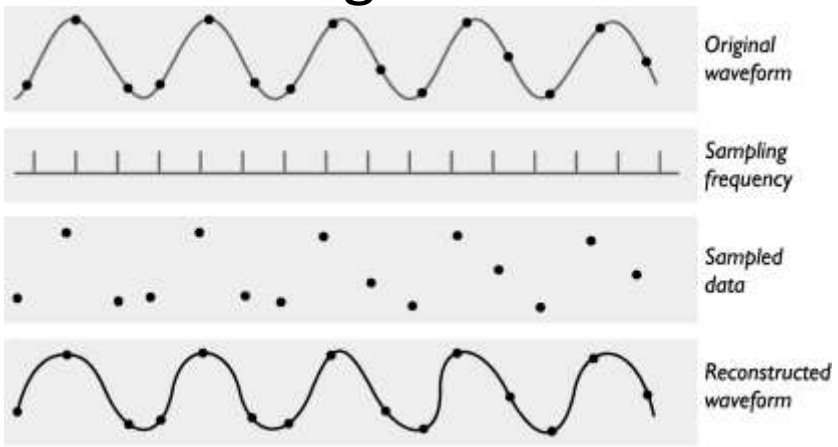
- Vibrations in the air create waves of pressure that are perceived as sound.
- Sound waves vary in sound pressure level (amplitude) and in frequency or pitch.
- “Acoustics” is the branch of physics that studies sound.
- Sound pressure levels (loudness or volume) are measured in decibels (dB).

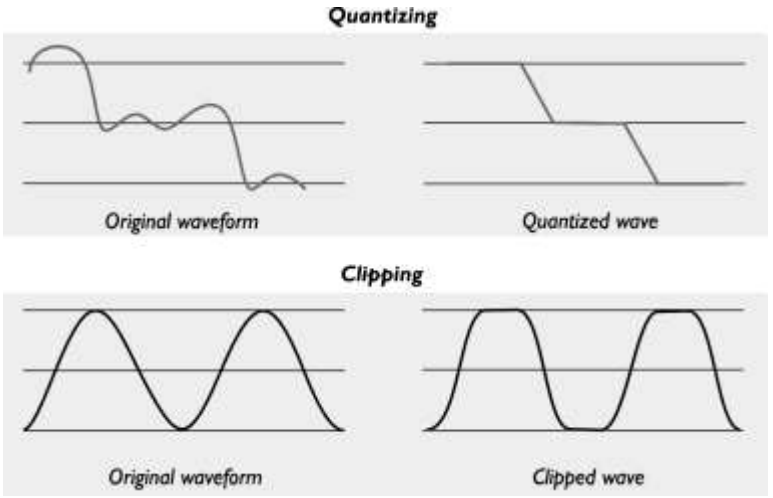


.: Digital Audio and MIDI Audio

- Digital audio data is the actual representation of sound, stored in the form of samples.
- Samples represent the amplitude (or loudness) of sound at a discrete point in time.
- The quality of digital recording depends on the sampling rate (or frequency), that is, the number of samples taken per second.
- The three sampling frequencies most often used in multimedia are CD-quality 44.1 kHz, 22.05 kHz, and 11.025 kHz.
- The number of bits used to describe the amplitude of a sound wave when sampled determines the sample size.

- Digital audio is device independent.
- The value of each sample is rounded off to the nearest integer (quantization).
- Crucial aspects of preparing digital audio files are:
  - Balancing the need for sound quality against available RAM and hard disk resources
  - Setting appropriate recording levels to get a high-quality and clean recording



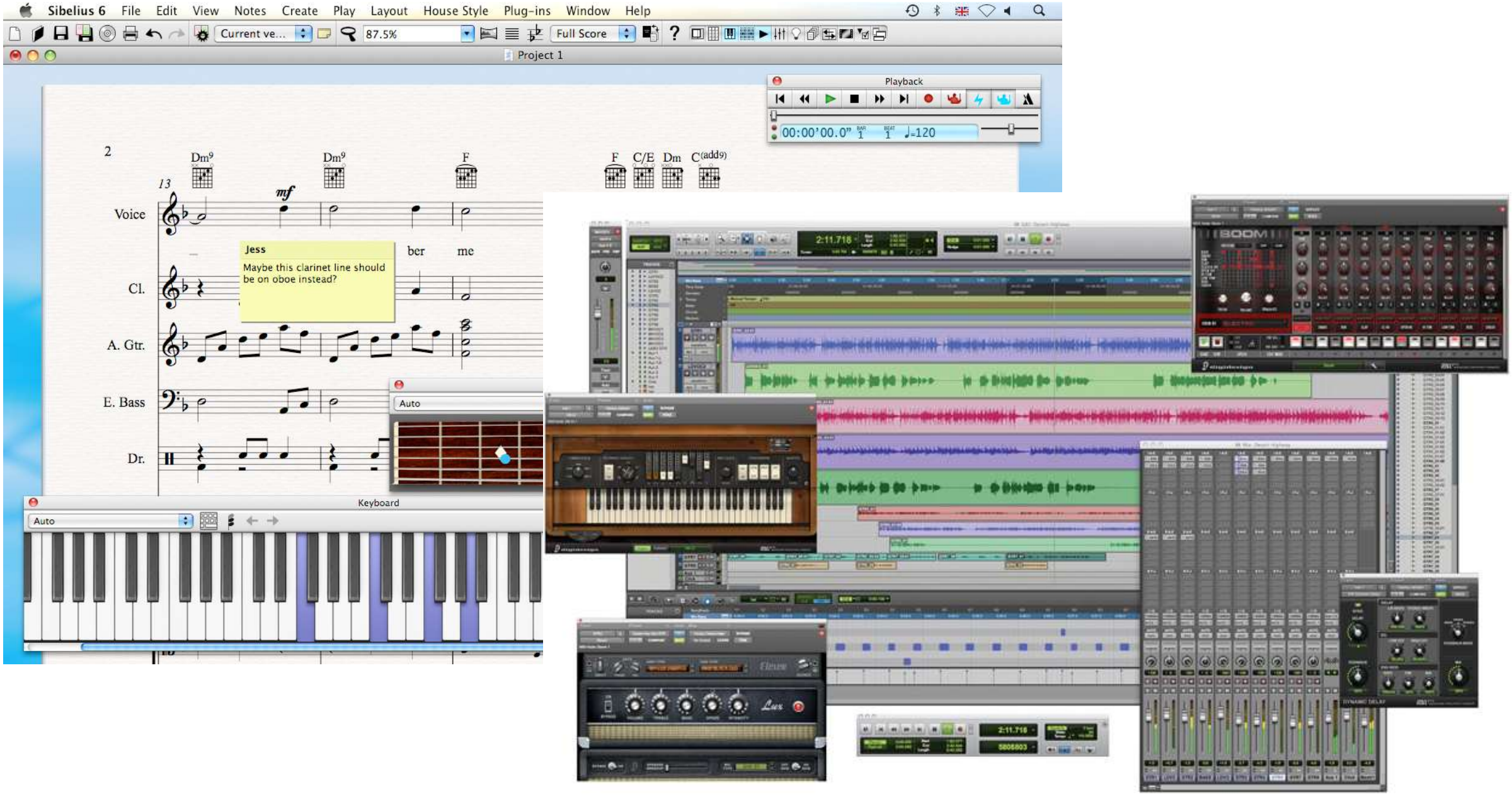


- Once a recording has been completed, it almost always needs to be edited.
- Basic sound editing operations include trimming, splicing and assembly, volume adjustments, fade-ins and fade-outs, equalization, time stretching and working on multiple tracks.
- Audio resolution determines the accuracy with which sound can be digitized.
- Size of a monophonic digital recording = sampling rate x duration of recording in seconds X (bit resolution/8).
- Size of stereo digital recording = sampling rate x duration of recording in seconds x (bit resolution/8) x 2.

(size in byte, divide by 1024 to become Kb)

.: Digital Audio and MIDI Audio (cont.)

- MIDI (Musical Instrumental Digital Interface) is a shorthand representation of music stored in numeric form
- A sequencer software and sound synthesizer is required in order to create MIDI scores.
- It is not digitized sound.
- Since they are small, MIDI files embedded in web pages load and play promptly.
- The length of a MIDI file can be changed without affecting the pitch of the music or degrading audio quality.
- Working with MIDI requires knowledge of music theory.
- MIDI is device dependent.


Sibelius 6 File Edit View Notes Create Play Layout House Style Plug-ins Window Help
Project 1
Playback
00:00'00.0" BAR 1 BEAT 1 ♩=120
Dm9 Dm9 F F C/E Dm C(add9)
Voice
Cl.
A. Gtr.
E. Bass
Dr.
Jess
Maybe this clarinet line should be on oboe instead?
ber me
Auto
Keyboard
Auto
BOOM

.: MIDI vs Digital Audio

- MIDI is analogous to structured or vector graphics, while digitized audio is analogous to bitmapped images.
- MIDI is device dependent, while digitized audio is device independent.
- MIDI files are much smaller than digitized audio.
- MIDI files sound better than digital audio files when played on a high-quality MIDI device.
- MIDI is difficult to play back spoken dialog, while digitized audio can do so with ease.
- MIDI does not have consistent playback quality, while digital audio provides consistent playback quality.
- One requires knowledge of music theory in order to run MIDI, while digital audio does not have this requirement

.: Multimedia System Sounds

.: Audio File Formats

- A sound file's format is a recognized methodology for organizing data bits of digitized sound into a data file.
- On the Macintosh, digitized sounds may be stored as data files, resources, or applications such as AIFF or AIFC.
- In Windows, digitized sounds are usually stored as WAV files.
- The CD-ROM/XA (Extended Architecture) format enables several recording sessions to be placed on a single CD-R (recordable) disc.
- Linear Pulse Code Modulation is used for Red Book Audio data files on consumer-grade music CDs.
- MP3 compression is a space saver.
- MP4 is used when audio and video are streamed together.
- ACC (Advanced Audio Coding) is used by Apple's iTunes store.

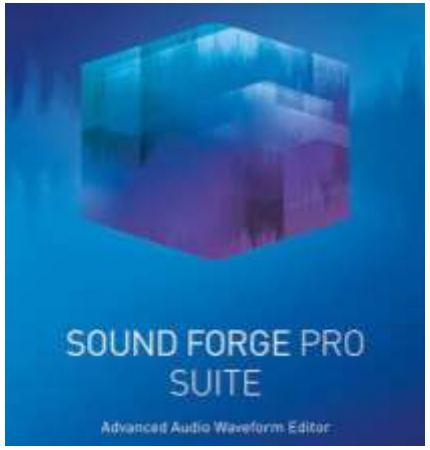
.: Adding Sound to Multimedia Project

- File formats compatible with multimedia authoring software being used, along with delivery mediums, must be determined.
- Sound playback capabilities offered by end users' systems must be studied.
- The type of sound, whether background music, special sound effects, or spoken dialog, must be decided.
- Digital audio or MIDI data should be selected on the basis of the location and time of use.
- Create or purchase source material.
- Edit the sounds to fit your project.
- Test the sounds to be sure they are timed properly with your project.

- Recording on inexpensive media rather than directly to disk prevents the hard disk from being overloaded with unnecessary data.
- The project’s equipment and standards must be in accordance with the requirements.
- It is vital to maintain a high-quality database that stores the original sound material.
- Keeping track of your sounds (for mobile/web)
- Sound and image synchronization must be tested at regular intervals.
- The speed at which most animations and computer-based videos play depends on the user’s CPU
- The sound’s RAM requirements as well as the user’s playback setup must be evaluated.
- Copyrighted material should not be recorded or used without securing appropriate rights from the owner or publisher

.: Sound Editing Tools

- Adobe Audition.
- GarageBand.
- Logic Pro X.
- Ableton Live.
- Descript.
- Audacity.
- Studio One.
- Sound Forge.
- WavePad




Thank
you!


Q&A