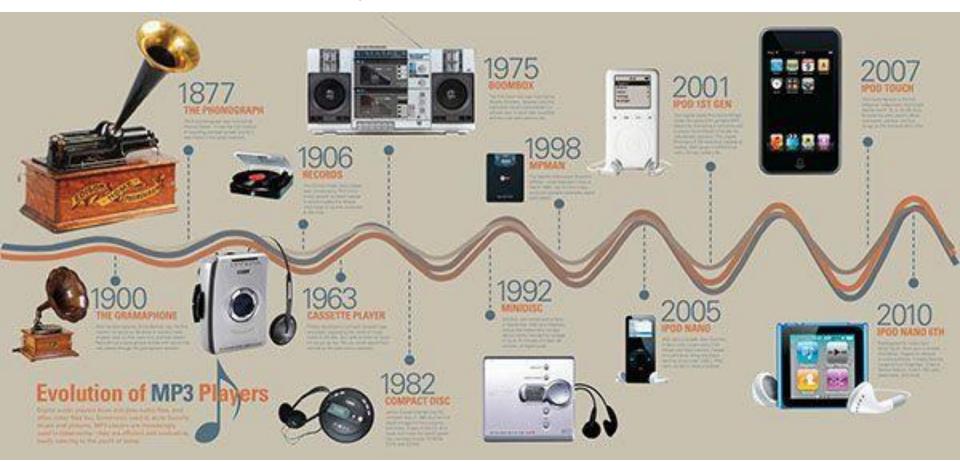
MUS 7: Music Technology Pt.2

Instructor: Jingwei Liu

S124 UC San Diego

Evolution of Music Players



Jukebox

- A jukebox is a partially automated music-playing device, usually a coin-operated machine, that plays a patron's selection from self-contained media.
- The classic jukebox has buttons with letters and numbers on them, which are used to select specific records/vinyls.
- Traditional jukeboxes once were an important source of income for record publishers. Jukeboxes received the newest recordings first. They became an important market-testing device for new music, since they tallied the number of plays for each title. They let listeners control the music outside of their home, before audio technology became portable.



Radio (1893)

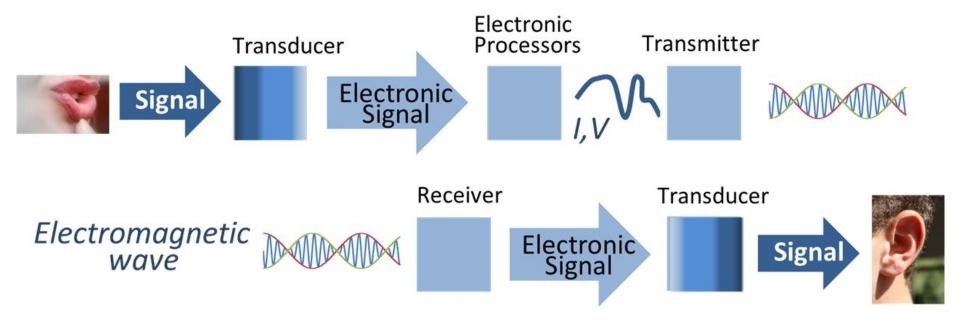
- Radio is the technology of communicating using radio waves.
- Radio waves are electromagnetic waves of frequency between 3 hertz (Hz) and 300 gigahertz (GHz).
- They are generated by an electronic device called a transmitter connected to an antenna which radiates the waves.





Radio communication

- In radio communication systems, information is carried across space using radio waves.
- At the sending end, the information to be sent is converted by some type of transducer to a time-varying electrical signal called the modulation signal.
- The modulation signal is applied to a radio transmitter. In the transmitter, an electronic oscillator generates an alternating current oscillating at a radio frequency, called the carrier wave because it serves to "carry" the information through the air. The information signal is used to modulate the carrier, varying some aspect of the carrier wave, impressing the information on the carrier.



Radio communication. Information such as sound is converted by a transducer such as a microphone to an electrical signal, which modulates a radio wave produced by the transmitter. A receiver intercepts the radio wave and extracts the information-bearing modulation signal, which is converted back to a human usable form with another transducer such as a loudspeaker.

Modulation Methods

Let's say the sinusoidal carrier is

$$x_c(t) = A_c \cos(2\pi f_c t)$$

fc is the carrier's base frequency, and Ac is the carrier's amplitude.

Amplitude Modulation (AM) gives

$$x(t) = [A_c + \cos(2\pi f_m t)]\cos(2\pi f_c t)$$

Frequency Modulation (FM) gives

$$x(t) = A_c \cos[2\pi f_c t + \frac{f_\delta}{f_m} \sin(2\pi f_m t)]$$

AM TRANSMITTER

#TORO

图一世

....

10.00

ARREST FINE

MODULATOR

Why Modulation?

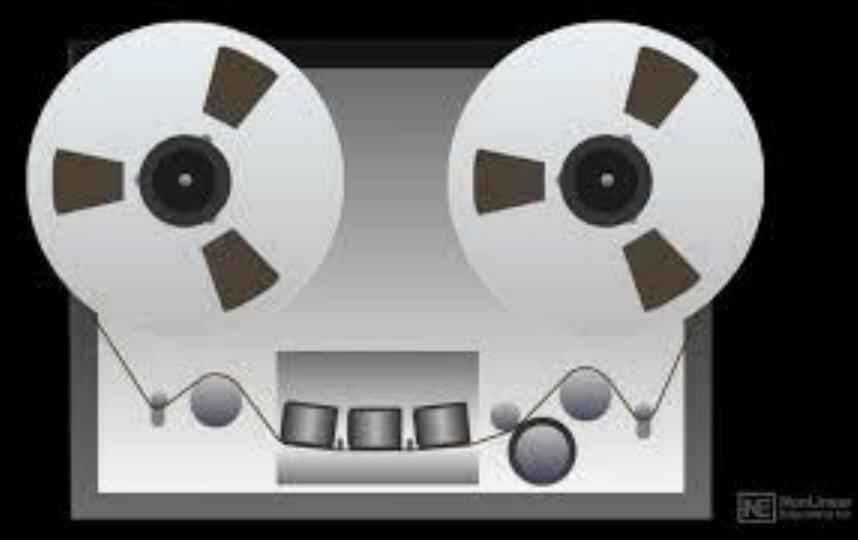
- This carrier wave usually has a much higher frequency than the message signal does. This is because it is impractical to transmit signals with low frequencies. Generally, to receive a radio wave one needs a radio antenna with length that is one-fourth of wavelength.
- Another purpose of modulation is to transmit multiple channels of information through a single communication medium. The radio waves from many transmitters pass through the air simultaneously without interfering with each other because each transmitter radio waves oscillate at a different rate, , in other words, each transmitter has a different frequency.

Tapes (1958)

- Tape recording uses electromagnetic induction to convert an electric audio signal into magnetism which is then used to realign magnetic particles on a reel of recording tape creating a magnetic representation of the audio waveform.
- The playback of the recorded signal is the reverse process where the magnetic signal on the tape is converted back into an electrical waveform which is then sent to the audio console for mixing and processing.

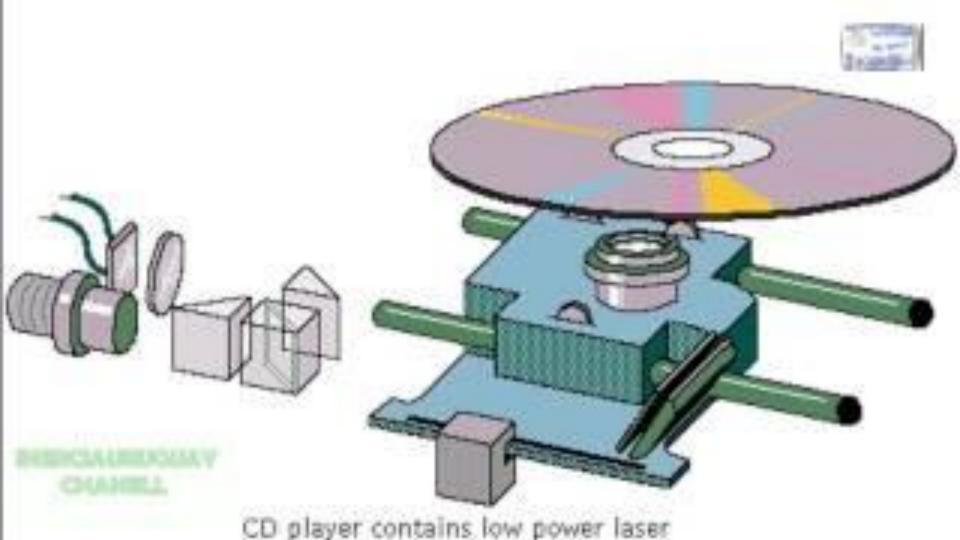
HOW DOES A CASSETTE TAPE WORK?

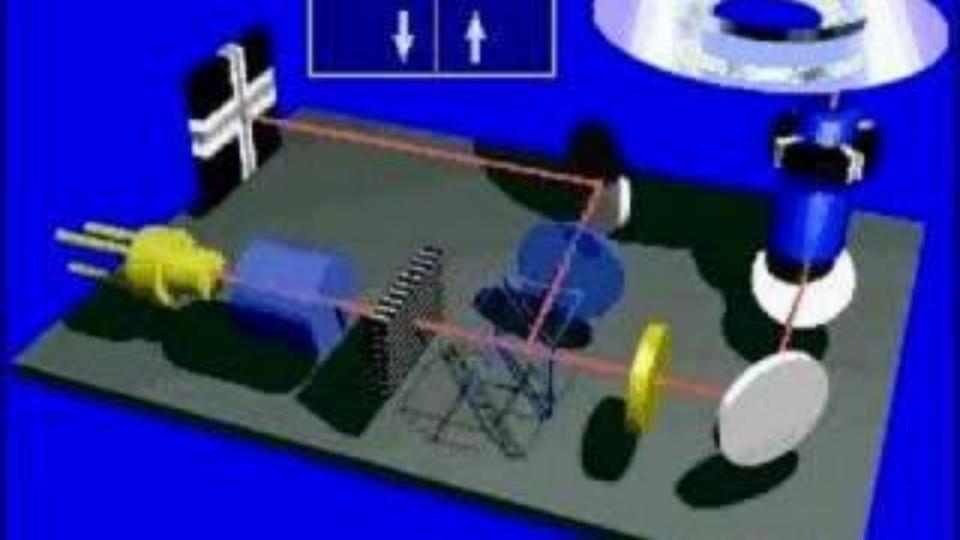


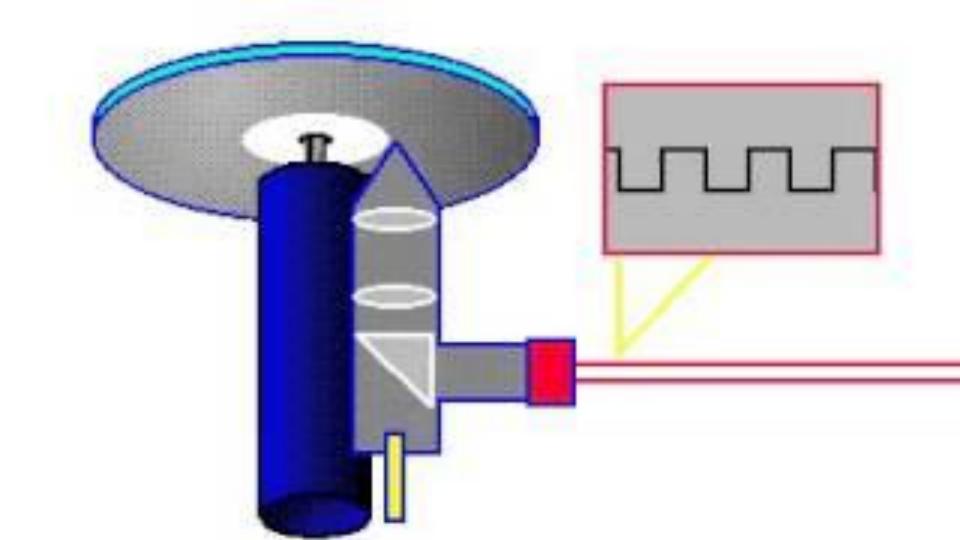


Compact Disc

- The compact disc (CD) is a digital optical disc data storage format that was co-developed by Philips and Sony to store and play digital audio recordings.
- Standard CDs have a diameter of 120 mm (4.7 in), and are designed to hold up to 74 minutes of uncompressed stereo digital audio or about 650 MiB (681,574,400 bytes) of data.
- The CD gained rapid popularity in the 1990s, quickly outselling all other audio formats in the United States by 1991, ending the market dominance of the phonograph record and the cassette tape. By 2000, the CD accounted for 92.3% of the entire market share in regard to US music sales.







Portable Music Market

- (1950s and 1960s) Transistor radio: A transistor radio is a small portable radio receiver that uses transistor-based circuitry.
- (1980s) Sony Walkman: The original Walkman started out as a portable <u>cassette player</u> and the brand was later extended to serve most of Sony's portable audio devices
- (1990s) Portable CD player: A portable CD player is a portable audio player used to play <u>compact discs</u>.
- (2000s) MP3 Player: A portable media player (PMP) or digital audio player
 (DAP) is a portable consumer electronics device capable of storing and playing digital media such as audio, images, and video files.









Transistor Radio 1958 Sony Walkman 1979 Sony Discman 1993

Flash Memory MP3 Player





The Digital Era

- Music Download: the digital transfer of music via the Internet into a device capable of decoding and playing it, such as a personal computer, portable media player, MP3 player or smartphone.
- Streaming: A music streaming service is a type of online streaming media service that focuses primarily on music. These services are usually subscription-based services allowing users to stream digital copyright restricted songs on-demand from a centralized library provided by the service over the internet.
- Streaming services saw a significant pace of growth during the 2010s, overtaking digital downloading as the largest source of revenue in the United States music industry in 2015.

