

Different types of Recording



Single track recording

- There are many ways to make and present a sound recording. The simplest method, and the one used in the earliest sound movies, is called **monaural** or simply **mono**. Mono means that all the sound is recorded onto one **audio track** or **channel** (a single spiraled groove in a record, for example, or a single magnetic track on tape), which is typically played on one speaker.

Multiple track recording

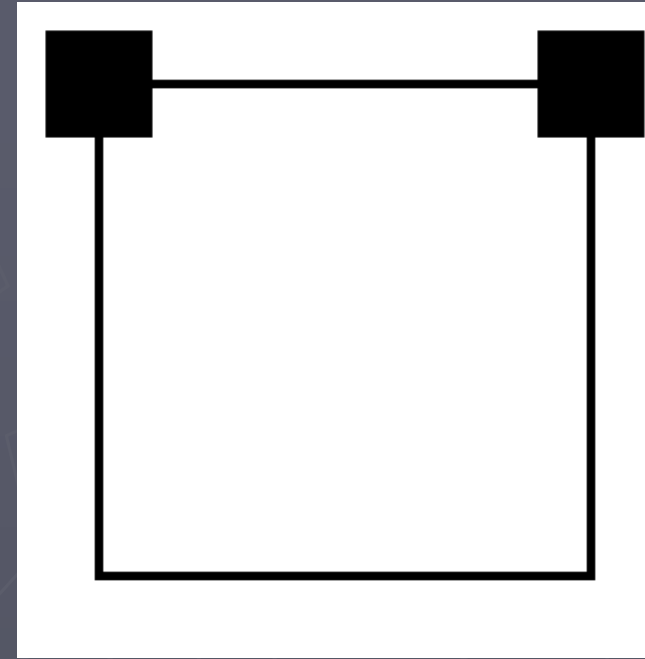
- ▶ In multitrack recording, the tape is divided into multiple tracks parallel with each other. Because they are carried on the same medium, the tracks stay in perfect synchronization.
- ▶ The first development in multitracking was stereo sound.
- ▶ At any given point on the tape, any of the tracks on the recording device can be recording or playing back, so that an artist is able to record onto track 2 and, simultaneously, listen to track 1, allowing him to sing or to play an accompaniment to the performance already recorded on track 1. He might then record on track 3 while listening to track 2. All three performances can then be played back in perfect synchrony, as if they had originally been played and recorded together. This can be repeated until all of the available tracks have been used, or in fact, reused.

- ▶ In the early 1950s, magnetic striping was introduced to carry the soundtrack on film prints. After the picture was printed, narrow stripes of iron oxide material (similar to the coating on magnetic recording tape) were applied to the release print.
- ▶ The sound was then recorded on the magnetic stripes in real time. In the cinema, magnetic prints would be played back on projectors equipped with magnetic heads similar to those on a tape recorder.

- ▶ Magnetic sound was a significant step forward, and at its best provided much-improved fidelity over the conventional optical soundtrack. It also enabled the first multichannel sound reproduction, dubbed "stereophonic sound," ever heard by the public. The voice of an actor appearing to the left, center, or right of the picture could be heard coming from speakers located at the left, center, or right of the new wide screens also being introduced at this time. Music took on a new dimension of realism, and sound effects could emanate from the rear or sides of the cinema.
- ▶ By the 1970s, however, the magnetic stripe fell into decline. Its expense, short lifespan, and high maintenance costs were the culprits.

Stereophonic Sound

- ▶ The word stereophony is derived from two Greek words 'stereos' and 'phone', meaning 'solid' and 'sound', respectively.
- ▶ Thus stereophony means solid sound or three dimensional sound.
- ▶ The main aspect of Stereophonic sound is the division of sounds across two channels. The recorded sounds are mixed in such a way that some elements are channeled to the left part of the soundstage; others to the right.
- ▶ First stereophonic motion picture in India was Sholay.



Surround sound

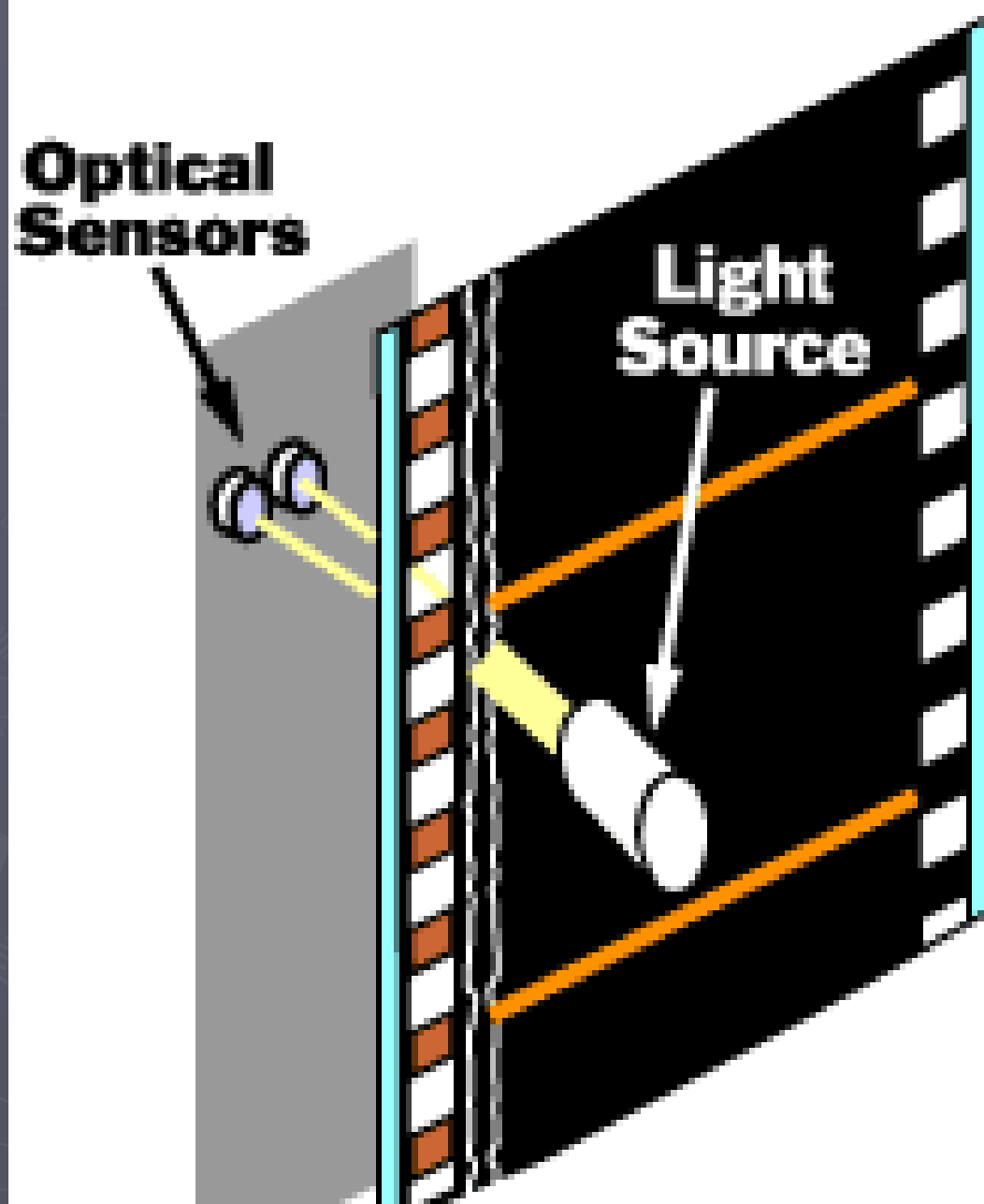
- ▶ In 1940's, Walt Disney incorporated his first surround sound technology –Fantasound.
- ▶ Fantasia the first surround sound movie.
- ▶ First wide screen format- Cinerama, length of the screen is 75 feet

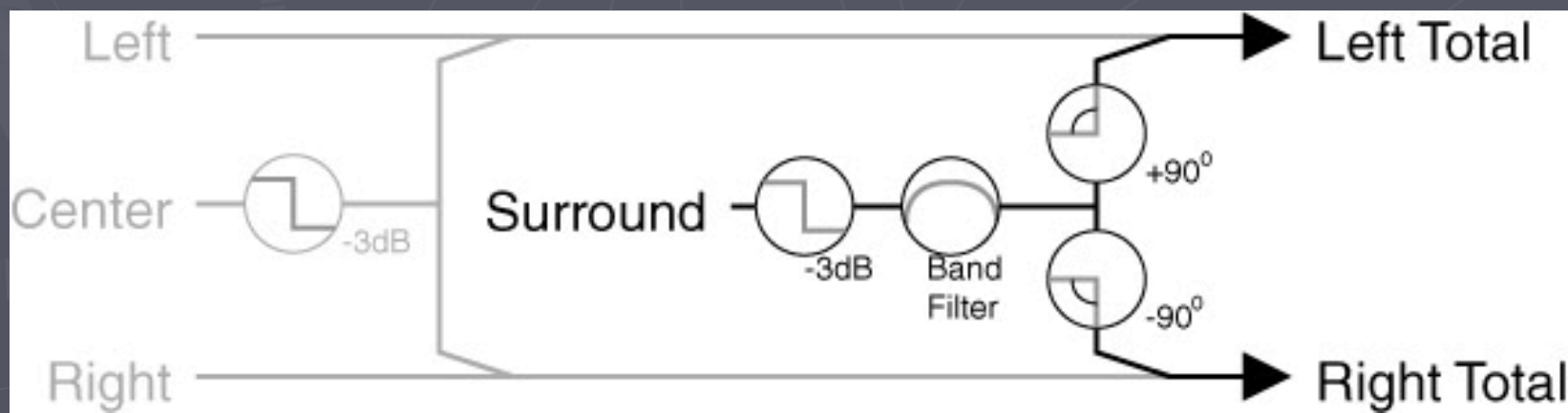
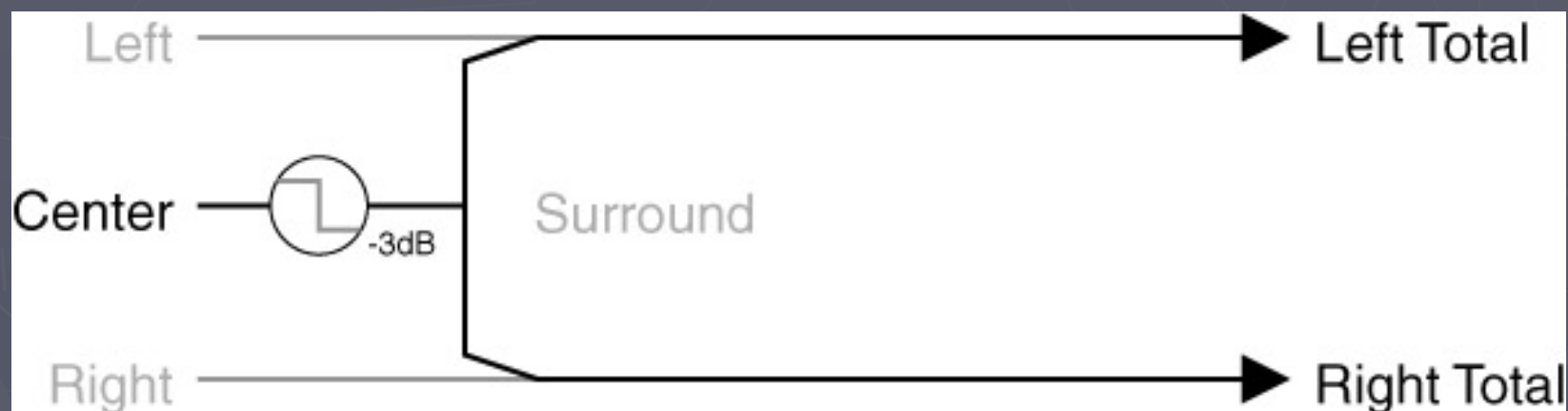
Dolby Stereo

- ▶ Dolby Stereo is a four track analog sound format. It has Left, Center and Right channels behind the screen and one common Surround channel behind and to the side of the audience. However, since conventional film can carry only two tracks of optical sound information, the four Dolby Stereo tracks are encoded into two tracks by a processor in the mixing studio. These two tracks are read by the Dolby Stereo processor in the theatre and converted once again into four tracks. Naturally, this process of extracting the four original tracks out of the two encoded tracks can never be perfect. The analog tracks on the film print are also capable of only a certain amount of loudness and soft sounds may be lost in the noise of the optical track.

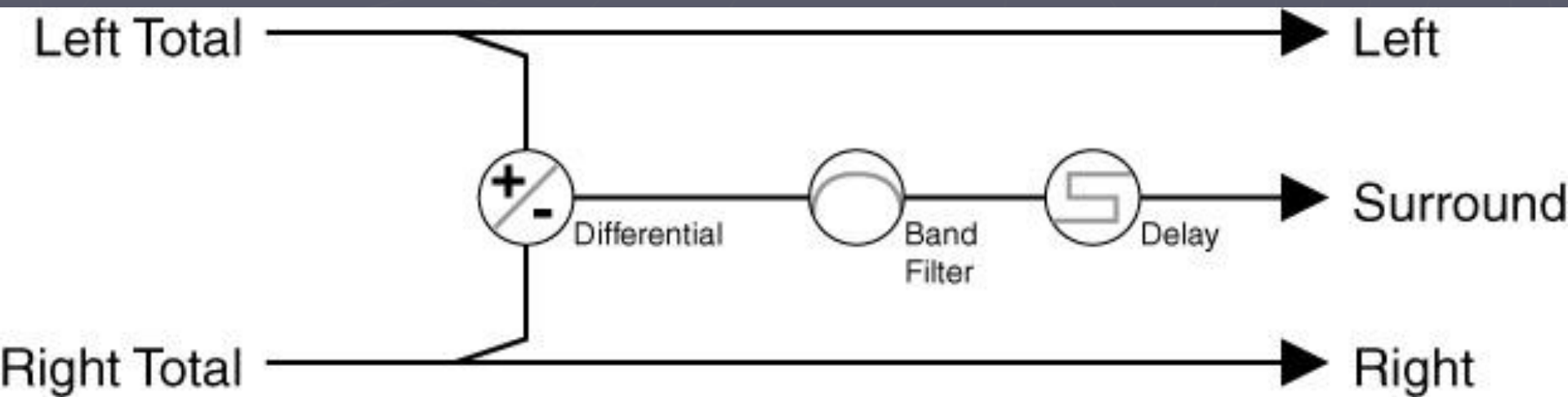


Dolby Stereo





Decoding

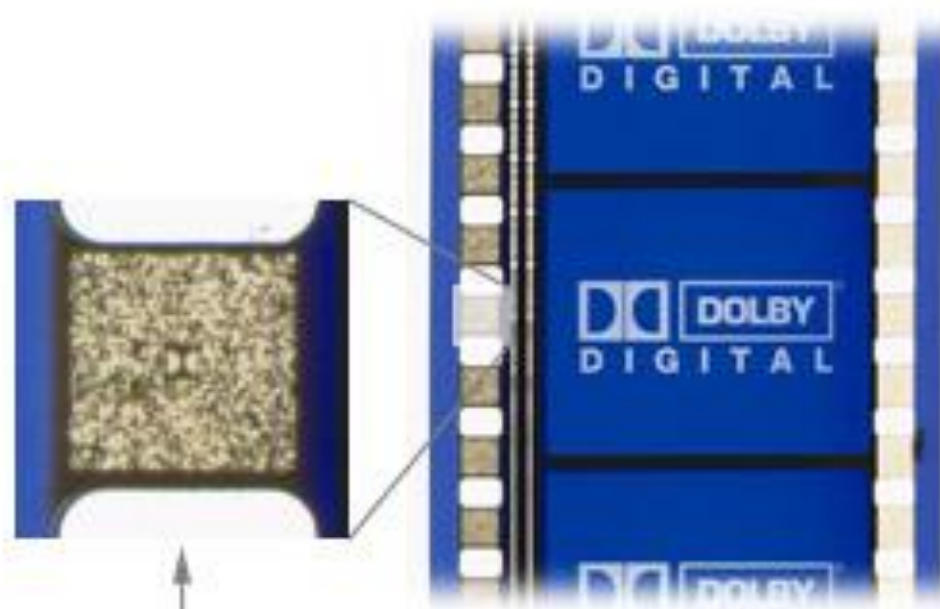


- **Dolby Prologic** - An active matrix decoder that extracts four signals from 2 channel Dolby Surround encoded material. The four channels are left, center, and right front channels, and a single bandwidth limited mono surround channel. The amplitude-phase matrix decoder uses level difference between the two source channels, called LT and RT, to steer across left-center-right, and the phase difference to steer from front to surround.

Dolby SR

- In 1986, Dolby Laboratories introduced a new professional recording process called Dolby SR (spectral recording) that provided higher noise reduction and, moreover, permitted loud sounds with wider frequency response and lower distortion. The 35 mm optical soundtracks treated with Dolby SR not only sounded superb in cinemas equipped with new Dolby SR processors, but also played back satisfactorily in all cinemas. As a result, today, the analog soundtracks on virtually all prints are Dolby SR tracks.

- ▶ **Dolby Digital** - The official Dolby name for AC-3 encoding.
- ▶ **AC-3** - A data compression method, otherwise known as Dolby Digital, that uses psychoacoustic principles to reduce the number of bits required to represent the signal. Bit rates for 5.1 channels range from 320 kbps for sound on film to 384 kbps for digital television and up to 448 kbps for audio use on DVD. AC-3 is also what's known as a "Lossy" compressor that relies on psychoacoustic modeling of frequency and temporal masking effects to reduce bits by eliminating those parts of the signal thought to be inaudible. The bit rate reduction achieved at a nominal 384 kbps is about 10:1.

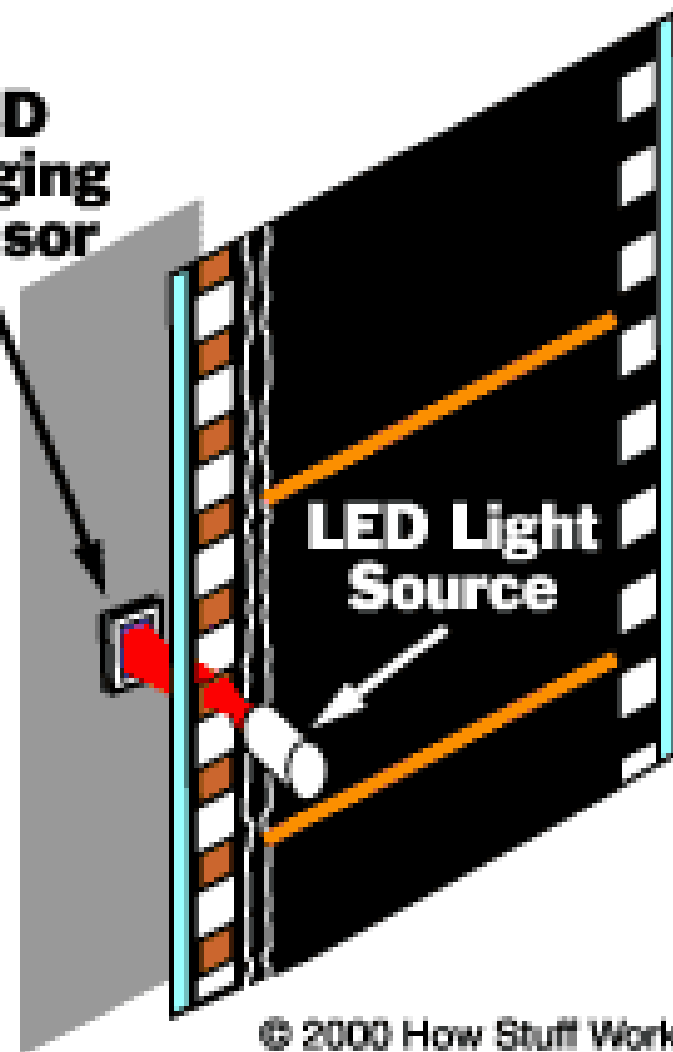


Dolby Digital

5.1 Dolby Surround

**CCD
Imaging
Sensor**

**LED Light
Source**



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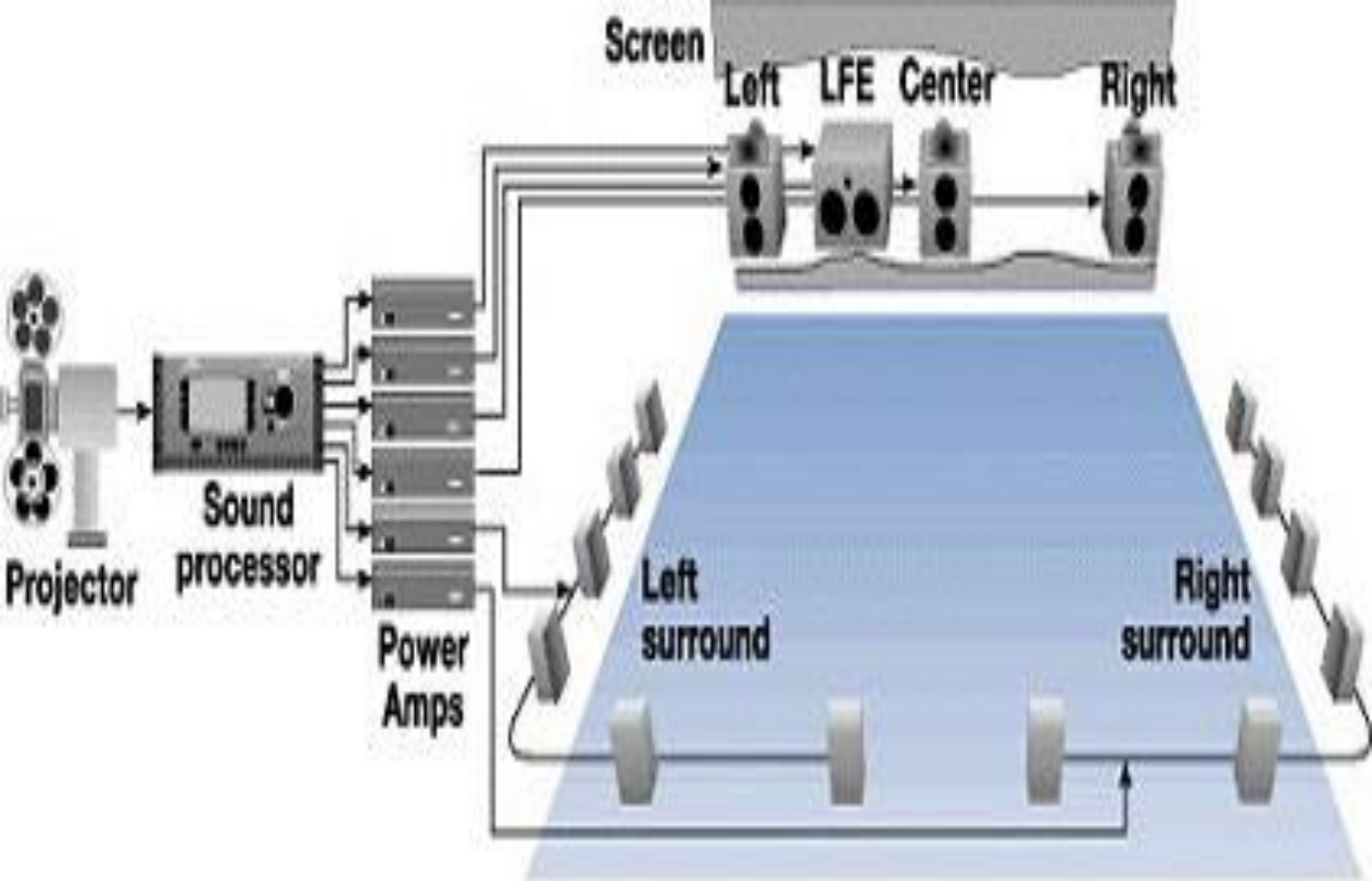


Figure 5: Dolby Digital playback

Dolby Digital Surround EX

- ▶ The latest Dolby sound technology, Dolby Digital Surround EX, was introduced in 1999, and adds a third surround channel to the Dolby Digital format. Enabling improved realism, more precise sound placement, and exciting special effects, the new channel is reproduced by rear-wall surround speakers, while the left and right surround channels are reproduced by speakers on the side walls.

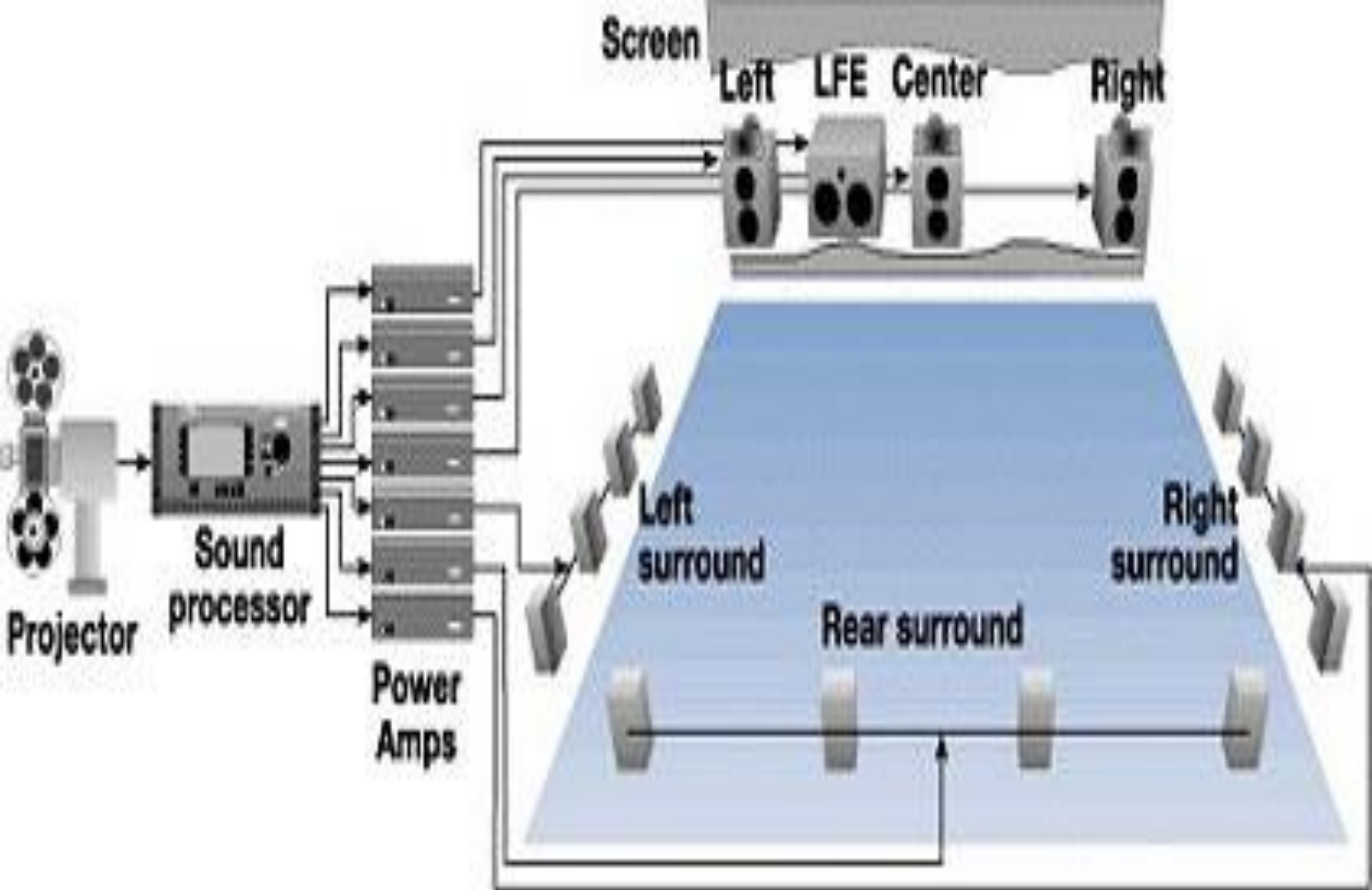
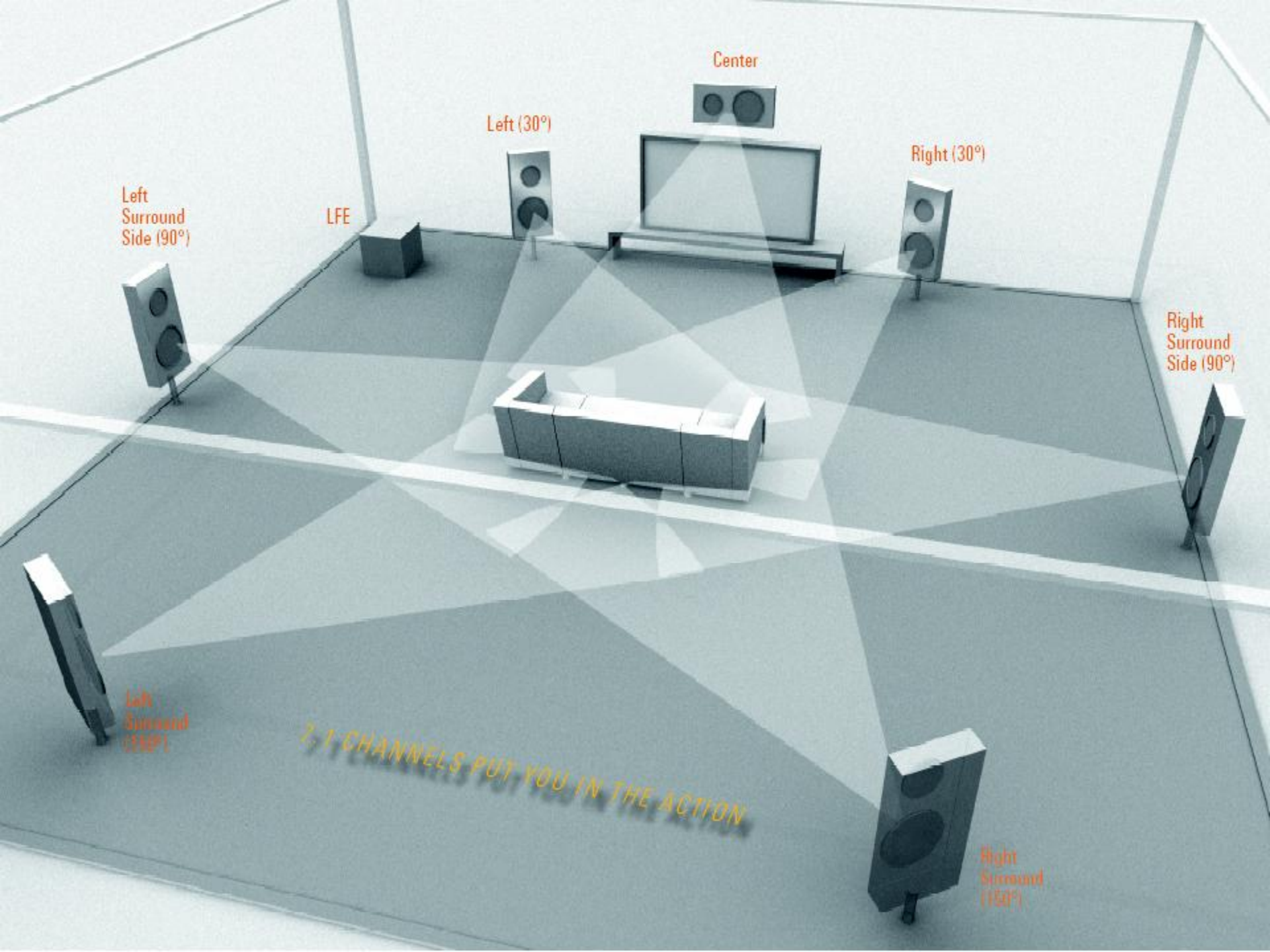


Figure 6: Dolby Digital Surround EX playback



Center

Left (30°)

Right (30°)

Left
Surround
Side (90°)

LFE

Right
Surround
Side (90°)

Left
Surround
(150°)

Right
Surround
(150°)

2.1 CHANNELS PUT YOU IN THE ACTION

- ▶ **5.1** - A speaker system which uses three speakers across the front and two stereo speakers in the rear, along with a subwoofer.
- ▶ **Encoder/decoder** - An encoder is a device which takes multiple digital data streams (as in 6 channel surround sound) and compresses them into a single data stream for more efficient storage and transmission. The decoder will perform the opposite function, taking a single encoded bitstream and breaking it into multiple data streams.

DTS-Digital Theater System

- ▶ **DTS** - A data compression method developed by Digital Theater Systems using waveform coding techniques that takes 6 channels of audio (5.1) and folds them into a single digital bitstream. This differs from Dolby Digital in that the data rate is a somewhat higher 1.4Mbps, which represents a compression ratio of about 4 to 1. DTS is also what's known as a "Lossy" compression.
- ▶ The system was launched in June, 1993 with the release of Universal Pictures' Jurassic Park, directed by Stephen Spielberg.

- ▶ DTS - digital theatre System. It has six tracks and is designed to produce the best sound reproduction possible in a movie theatre.
- ▶ The six discrete tracks used in the DTS format are Left, Center and Right which are the stage channels with their speakers behind the screen for precise positioning of dialogue, effects and music, separate Left and Right Surround channels to immerse the audience in the film and a Sub-woofer channel for enhancing the bass response and adding punch to the action.
- ▶ DTS has been honored with a Scientific and Engineering Award for 1996 by the Academy of Motion Picture Arts and Sciences.