UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Audio in GAME ENGINE

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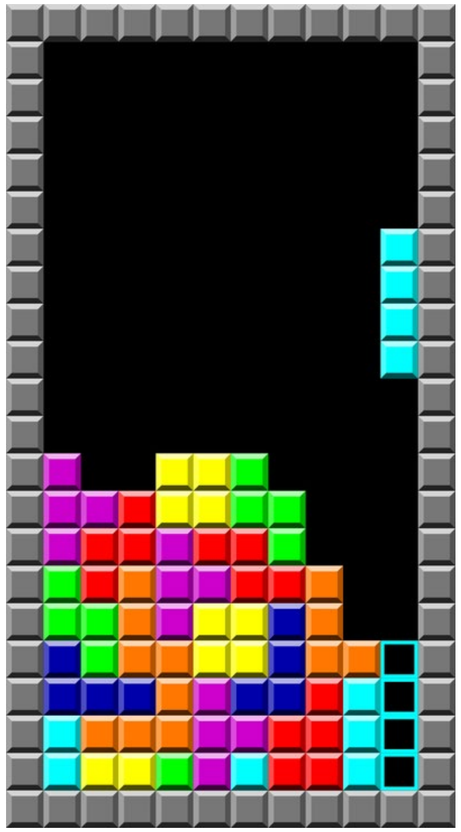
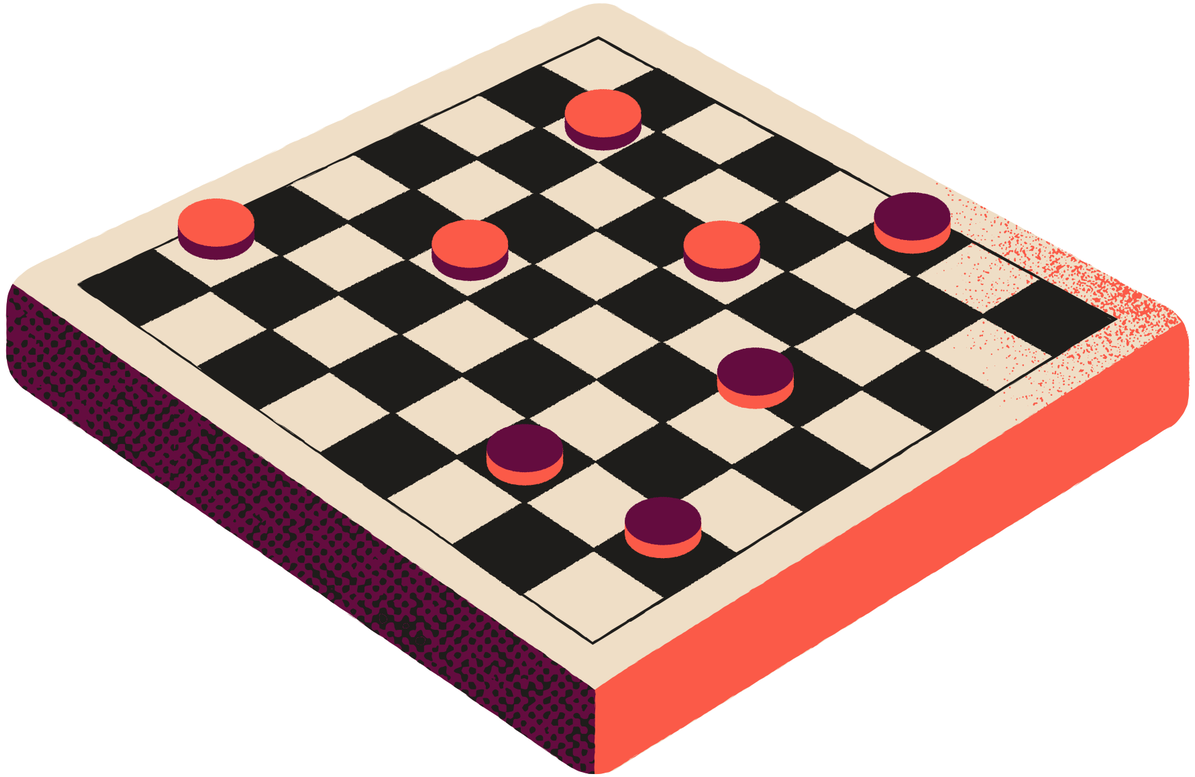
Objective

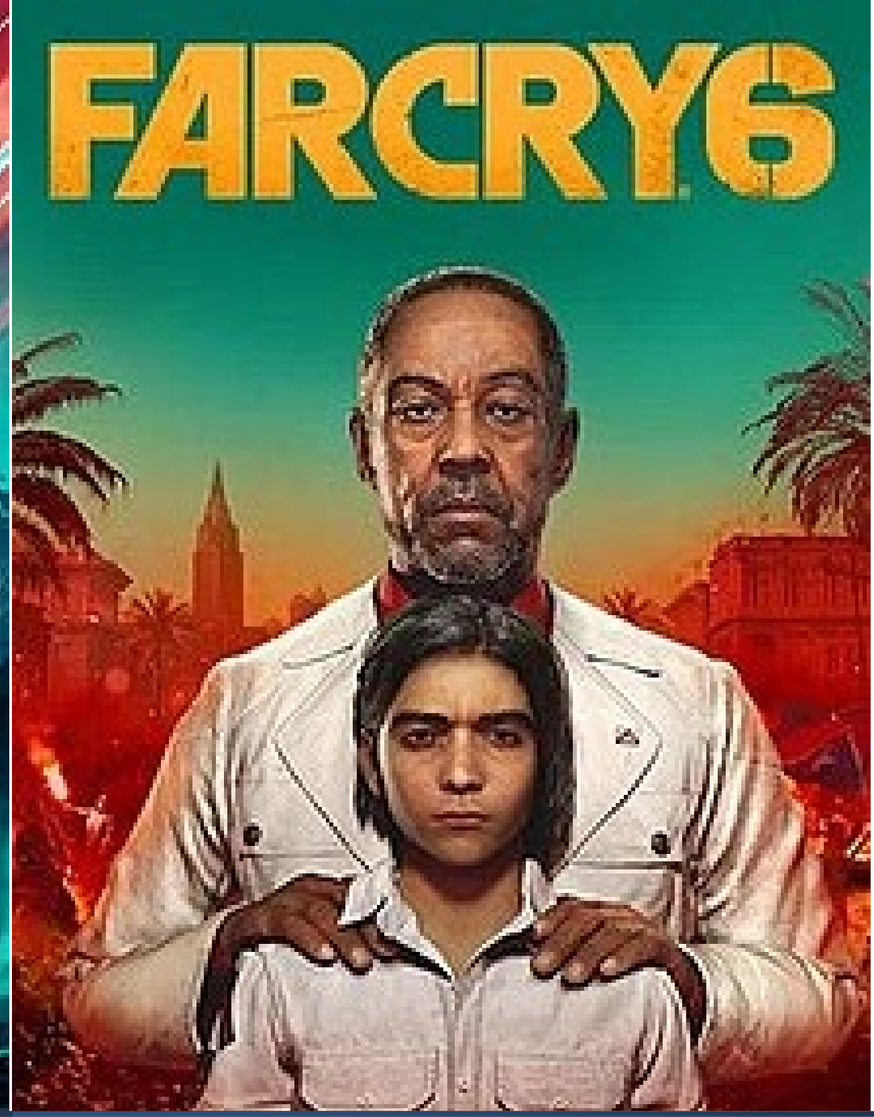
How game engine implement audio to be used by user to create game using game engine


NSR
NO STRAIGHT ROADS
ENCORE EDITION



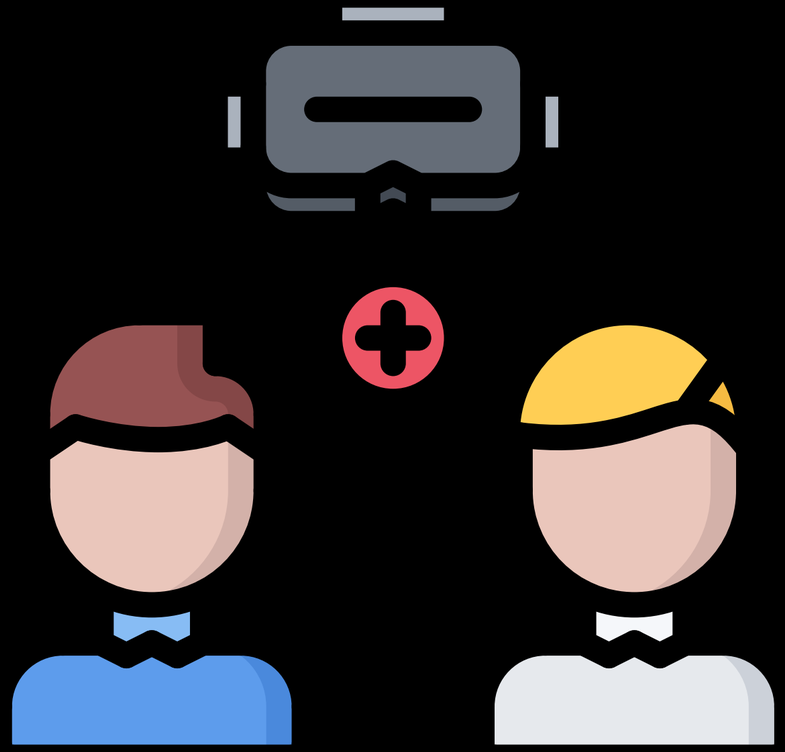


Can we create a game without any audio or sound?



What happens if we never put any audio or sound incorporated into our game?

But..



If you're playing multiplayer in a team, how are you going to win if you're not talking online with your teammates? It takes forever to type in the chat section

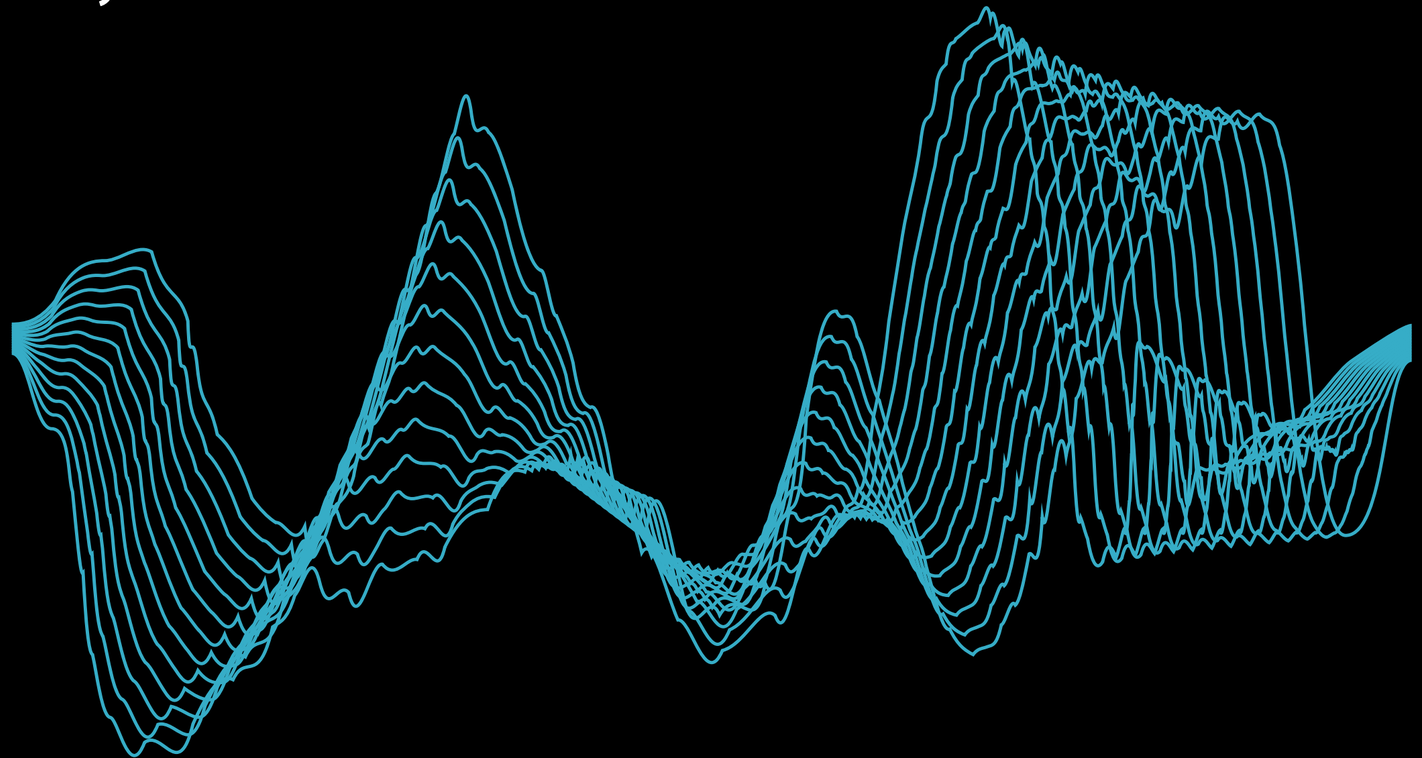
In single-player games, the immersion is what makes a playthrough truly magical. Soundtracks evoke and amplify different emotions. When you’re on your own mission, battling through a seemingly unconquerable horde of opponents, aggressive and fast beats on your ears can pump up the adrenaline and make you perform better.

https://eu.aoc.com/en/gaming/news/why-good-sound-is-important-for-gaming


This sound is important for you to 'feel' your surroundings and have an 'emotional attachment.

What is Sound

A vibrations that travel through a medium (anything) that produced something that can be heard by any living organism.



What is Audio?

Audio can be used to refer to two things: an electric signal representing sound or an audible sound

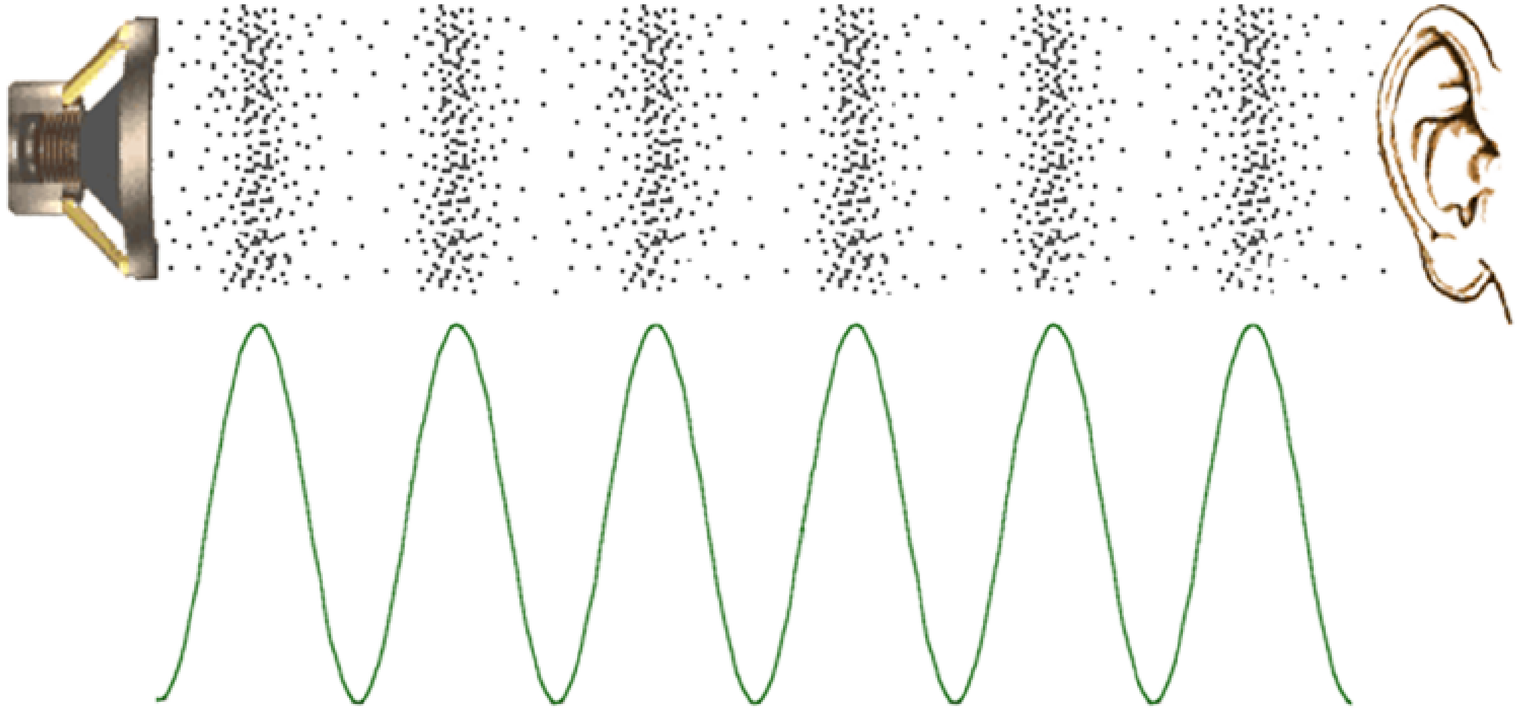
What is Audio?

- Audio is sound within the acoustic range available to humans. An audio frequency (AF) is an electrical alternating current within the 20 to 20,000 hertz (cycles per second) range that can be used to produce acoustic sound.

- Lower Hertz represents BASS
- Higher Hertz represents TREBLE

How sound works?

How sound works?



• Sound design and music play an important role in the overall experience of modern videogames. Game audio can help designers to create tension, add emotion, build immersion in the game world and even solve design problems.

- Processing audio is important to recreate sound fx and modification of the sound source.
- In games, most of the time, Audio processing is processed in real-time.
- In game development, audio process is being programmed in three level:
    - Implementation
    - Engine Programmer
    - Signal Processing

Audio Processing for Games

Implementation

- Using and application to process the audio
- Uses library such as FMOD
- Uses DAW (Digital Audio Workstation) and VST Plugins
- The end result of the Sound is in Post product

Audio Processing for Games

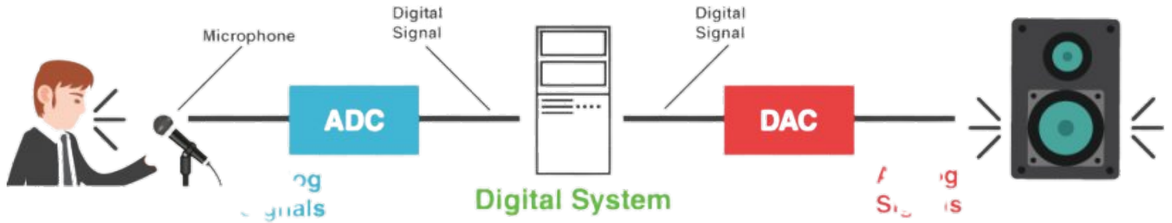
Engine Programmer

- Create an application for the user to implement
- Usually it is in library that contain functions of sound implementation and effects
- Stored in DLL

Audio Processing for Games

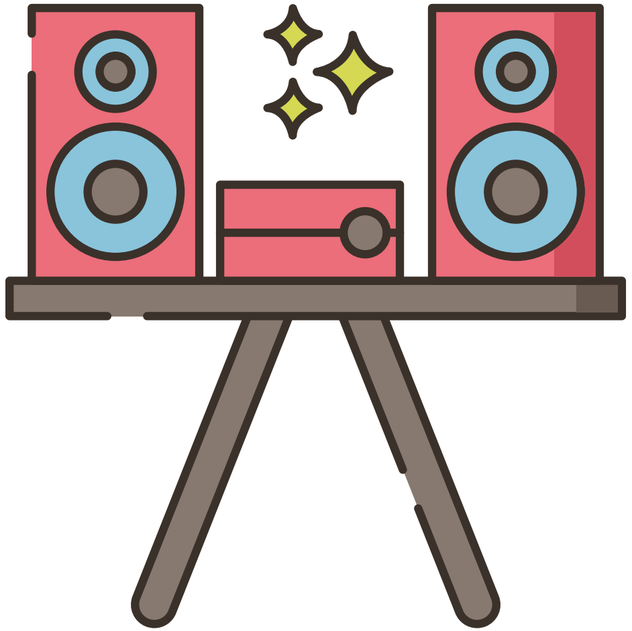
Signal Processing

- Low level programming development
- Understand how analog sound works
- Code the processing to be efficient and effective, to able it run in real-time and fast



COMMON SOUND IMPLEMENTATION

- play()Play the soundfile
- loop()Loop the soundfile
- cue()Set the starting position of the soundfile
- jump()Jump to a specific position in the file while continuing to play
- stop()Stop the soundfile



COMMON SOUND IMPLEMENTATION

- rate()Change the playback rate of the soundfile
- amp()Change the amplitude/volume of the player
- add()Offset the output of the player by given value
- pan()Move the soundfile in a stereo panorama
- set()Set multiple parameters at once

COMMON SOUND IMPLEMENTATION

- duration()Returns the duration of the soundfile
- sampleRate()Returns the sample rate of the soundfile
- frames()Returns the number of frames/samples of the soundfile
- channels()Returns the number of channels of the soundfile

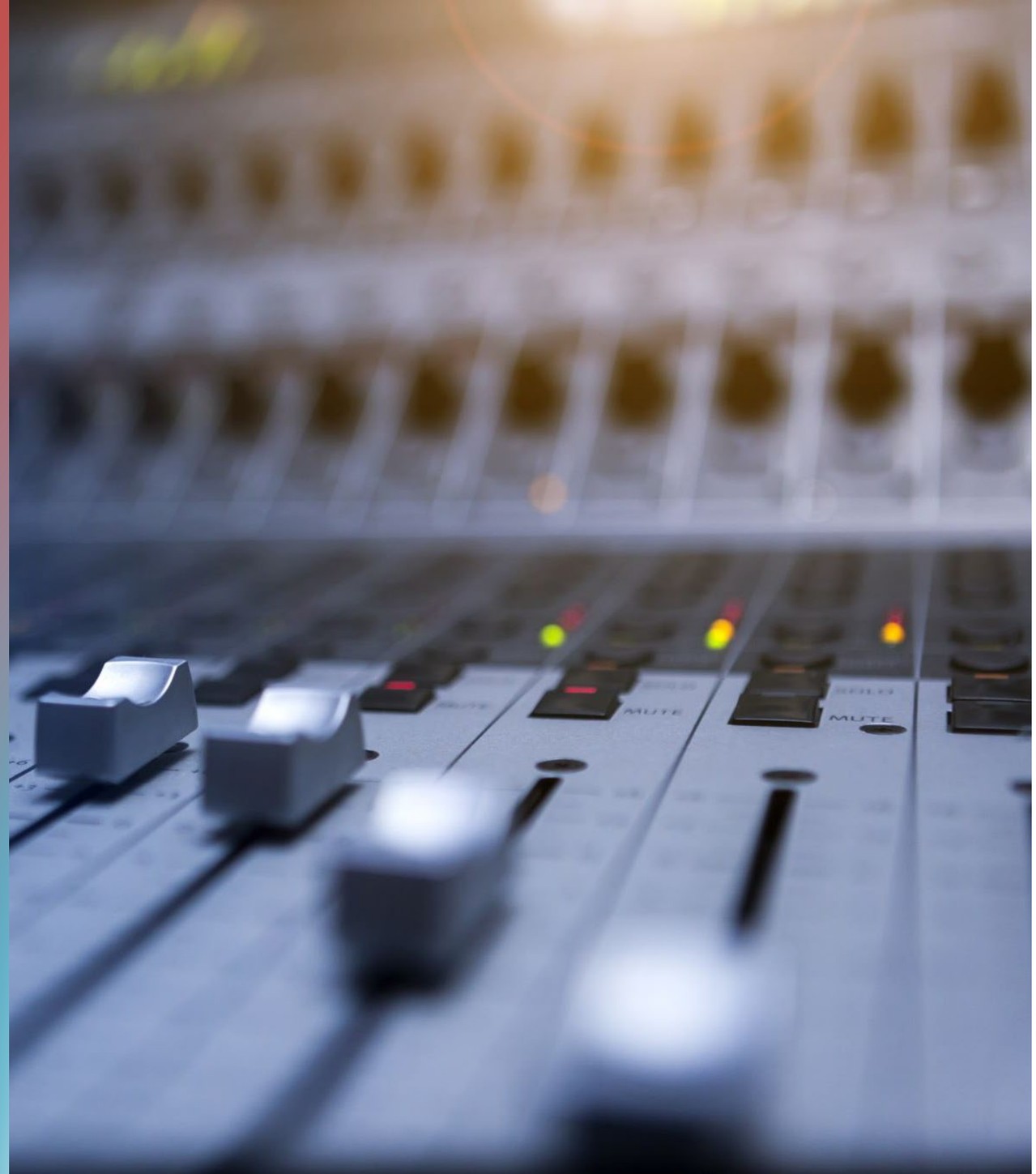
Sound SFX

- Normalize
- Compressor
- Distortion
- Low-pass filter
- High-pass filter
- Parametric EQ
- Delay
- Echo
- Flanger
- Chorus
- Pitch Shift
- Noise Removal

Sound Cue is an audio object that encapsulates complex sound design tasks in a node graph

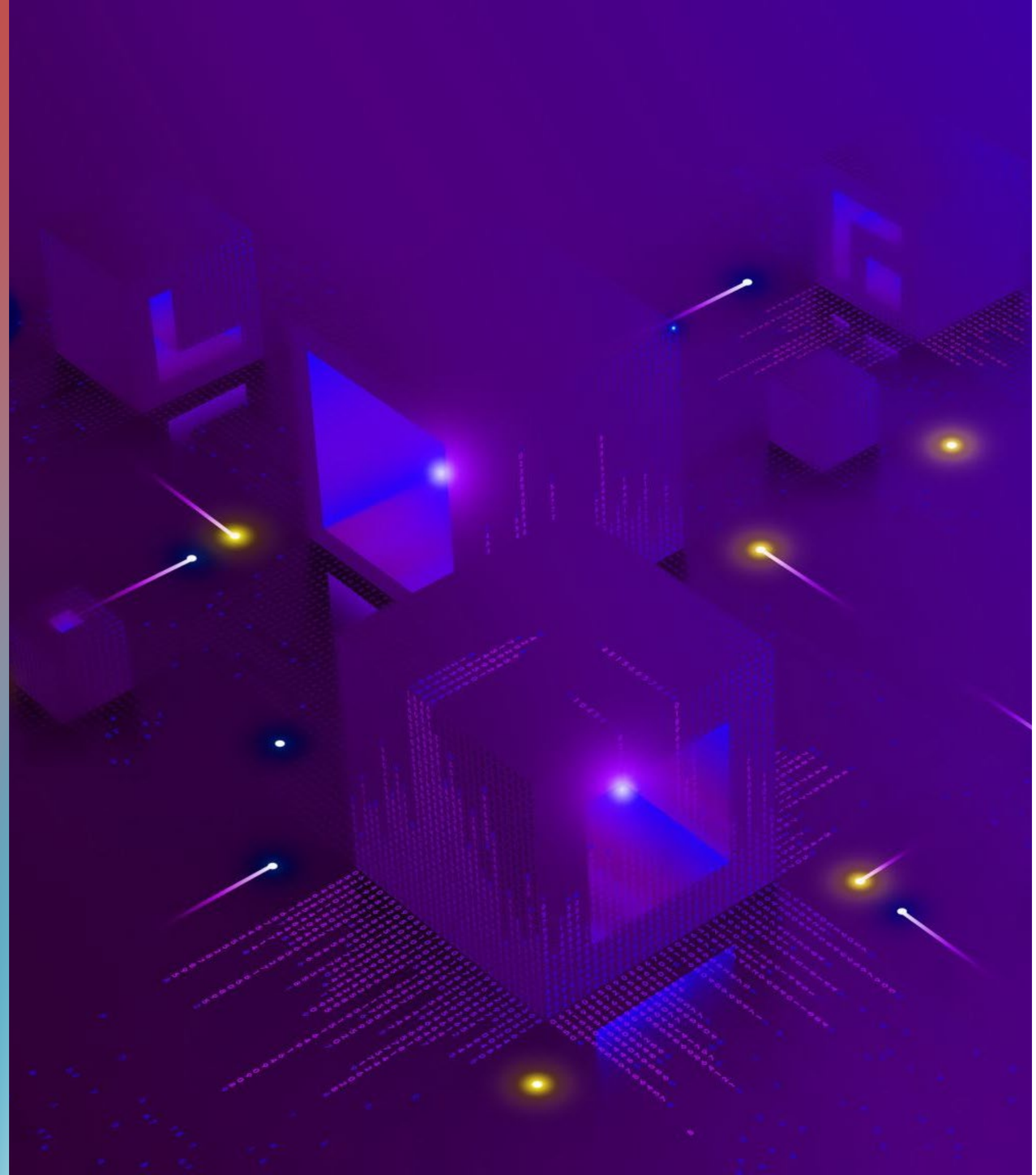
- Jumping
- Foot steps
- Crawling
- Shooting
- Hitting
- Ambient sound
- Industrial sound
- Many more

SO WHICH SOUND TO USE



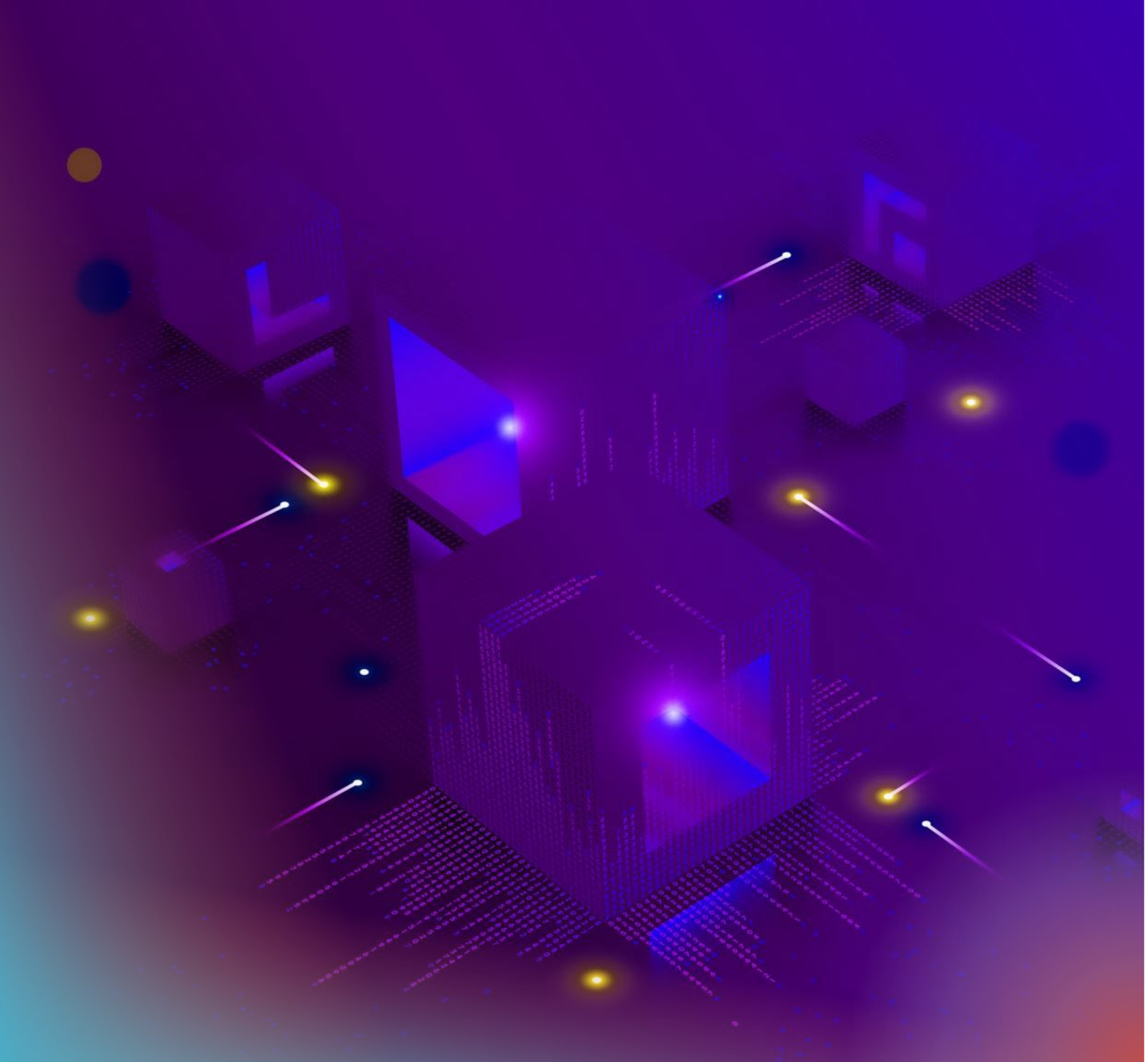
Advancements in Real-Time Audio Processing for Games (2023-2024)

- • Real-time audio engines such as Unreal Engine’s MetaSounds and Unity’s Native Audio Plugin SDK.
- • AI-based sound processing generating dynamic audio in real-time.
- • Enhanced audio fidelity with lower latency in AAA titles.



Spatial Audio and Immersion in Virtual Reality Games

- • Advancements in spatial audio (Dolby Atmos, Windows Sonic, Tempest 3D Audio).
- • Audio in VR enhances immersion by reflecting 3D space accurately.
- • Notable use in first-person VR titles like 'Half-Life: Alyx'.



AI-Driven Sound Design: Automating the Future of Game Audio

- • AI models auto-generate sound effects based on gameplay.
- • Adaptive soundscapes that respond dynamically to game physics.
- • Tools like Google’s Magenta and Jukedeck for AI-generated music.

Sustainability and Audio in Game Development

- • Reducing the carbon footprint of audio production with efficient formats.
- • Cloud-based audio processing minimizes local resource usage.
- • Eco-friendly sound engines like FMOD with energy-efficient algorithms.