

AUDIO	MEYDA AUDIO FEATURES	JUSTIFICATION
	Amplitude Envelope	The amplitude envelope, which gives a smooth curve defining the variations in the sound's strength over time, effectively represents this sound's up-and-down in loudness. This can capture the dynamic variations in loudness visually.
SOUND 1	Spectral Centroid	The audio contains a variety of musical instruments, which may cause shifts in the spectral centroid over time. Visualising the spectral centroid can assist show shifts in the tonal centre, which could indicate the focus of different instruments.
	Spectral Flux	The spectral flux, which captures variations in amplitude across time, can depict the echoing effect throughout the duration. Sharp increases in spectral flux may correspond to echoes or changes in the properties of the sound.
	RMS (Root Mean Square)	The energy of this sound appears to alter throughout time. RMS represents the average power of the signal. It can graphically indicate different energy levels by varying the overall intensity of the sound over time.
SOUND 2	Pitch (MIDI Note)	This audio appears to have a constant pitch, which we may confirm by using the pitch (MIDI Note). Constant pitch can be visualised by expressing it as MIDI notes. This can help visualise the pitch stability across the audio, providing insight into the sound's harmonic structure.
	Spectral Decay Rate	The audio has like a fading echo effect. This fading echoing effect as the audio progresses can be visually represented by the spectral

		decay rate. This feature can capture how quickly the energy in different frequency bands decreases over time, reflecting the decay of the echoes.
	Zero Crossing Rate	This audio contains sharp sounds at varying intervals. The sharp sounds with distinct characteristics can be represented by the zero crossing rate, as it captures the rate of change in the signal. Sharp transitions in the audio waveform are reflected in high zero crossing rates.
SOUND 3	Pitch (MIDI Note)	The increase in pitch can be visually represented by the pitch as MIDI notes. Tracking the pitch changes over time can provide a clear visualization of the upward trend in pitch.
	Spectral Flatness	Some parts of the audio appear to have a noise effect added. The spectral flatness characteristic can detect this additional noise in the audio. It determines how flat or peaky the spectrum is, revealing information about the tone of the sound. Parts that are noisy may have reduced spectral flatness.

Audio Visualization and Voice Control System Report

In this project, I implemented a captivating audio visualization application using JavaScript and the p5.js library, which seamlessly integrates audio processing and interactive visual elements. The primary goal was to create an immersive experience that dynamically responds to audio input, enhancing the user's engagement and providing a multisensory exploration of sound.

The core of the application revolves around the Meyda library, which enables real-time extraction of various audio features. The chosen features, including power spectrum, spectral centroid, zero-crossing rate, energy, RMS, perceptual spread, spectral slope, and spectral flatness, were meticulously selected for their potential to translate auditory nuances into visually impactful elements.

A distinctive feature of the visualization is the dynamic movement of rectangles based on the spectral slope. This choice not only adds an aesthetically pleasing visual aspect but also provides an intuitive representation of the audio's evolving characteristics. The incorporation of colors, shapes, and motion serves to amplify the user's experience, creating a visually stimulating and responsive canvas that mirrors the complexity of the audio input.

The circular visualization of the energy level further contributes to the immersive nature of the application. The varying lengths of lines, influenced by the energy level, introduce a rhythmic and dynamic pattern, offering a vivid representation of the audio's intensity. Additionally, the inclusion of particles generated from the spectrum adds an extra layer of complexity, transforming the visualization into a captivating interplay of visual elements.

In addition to audio visualization, I implemented a voice control system using the p5.speech library, introducing an interactive dimension to the user experience. This system allows users to manipulate the visual elements through voice commands, enhancing accessibility and user engagement.

The voice commands cover a range of customization options, enabling users to change the background colors (black, white, red, blue, green) and alter the shapes of the generated figures (square, triangle, circle, pentagon). Despite the innovative nature of this feature, it's essential to note a minor bug that requires a browser refresh to introduce new voice commands. Addressing this issue would result in a more seamless integration of voice controls.

In summary, the implemented audio visualization and voice control system represent a creative fusion of technology and artistic expression. The thoughtful selection of audio features and their corresponding visual mappings, combined with the innovative voice control system, transforms this project into an engaging exploration of the symbiotic relationship between sound and visuals. As development progresses, refining elements such as the voice command bug will contribute to a more polished and user-friendly application.