

# Electronic music composition thinking using visual learning and visual sensing technology

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## Abstract

This exploration aims to provide a kind of interactive electronic music composition thinking based on visual learning and visual sensing technology to enhance the thinking process of electronic music composition. Initially, it summarizes the functionalities of the physics components in Unity and analyzes the principles of visual interaction implementation using Virtual Reality (VR) devices and Leap Motion in Unity. Subsequently, the composition of interactive electronic music works is designed and implemented based on ultrasonic sensor technology. Lastly, this exploration focuses on the complete visual design of the audio-visual integration of Musical Instrument Digital Interface (MIDI) music to represent Cymatics' images of the emotional content of the music. MIDI data can be assigned to provide various mapping possibilities between images and content in music visualization composition. This exploration also designs experiments based on sensory aftereffects and audio-visual synesthesia to further determine the counterpoint law between the shape of dynamic Cymatics' images and the timbre's audio-visual synesthetic results. The results indicate that Bass and Kick are distributed in the mid-low frequency and sub-low frequency range (20–160 Hz), Vocal and Lead are distributed in the mid-high frequency range (1280–2560 Hz), and Hi-hat is distributed in the high-frequency range (2560–5120 Hz). This exploration utilizes computer technology to create a music visualization method that conforms to the visual expression and aesthetic style of a multi-sensory experience.

## KEYWORDS

composition thinking, electronic music, visual learning, visual sensing technology

## 1 | INTRODUCTION

Electronic music composition is increasingly important in contemporary music due to technology's continuous progress and development. What distinguishes electronic music is its fusion of technology, art, and innovation, going beyond being just a musical form (Frid, 2019; Turchet et al., 2020; Yang et al., 2020). Over the past few decades, electronic music has brought people unprecedented auditory experiences by exploring new sonic elements and music production techniques (Briot, 2021). However, the process of electronic music composition is not limited to music theory and the use of music production software; visual elements also play a significant role. The application of visual learning and visual sensing technology has introduced fresh ways of thinking and creative tools to electronic music composition (Gong, 2021; Kim et al., 2022; Lu et al., 2023). This composition thinking based on visual learning and visual sensing technology provides musicians with an intuitive and creative way to explore the possibilities of music composition.

Visual learning involves comprehending and learning complex data and concepts through visual representation (Wang et al., 2020). By visually presenting various elements of music in the form of graphics or images, creators gain a more intuitive understanding of the music's structure,

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