

Explainable Computational Music Visualization for Teaching Western Tonal Harmony

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Western tonal harmony represents one of the fundamental components of Europe's intangible musical heritage and continues to shape music education, composition, and performance. Although its theoretical principles have been transmitted for centuries, many learners struggle to understand the reasoning behind harmonic decisions rather than simply memorizing chord sequences. Traditional notation often requires several abstract concepts to be understood simultaneously, while contemporary AI-based harmonization systems typically present only the final harmonic solution without revealing the decision-making process.

This paper introduces the concept of Explainable Computational Music Visualization (ECMV), a human-centered educational framework that employs computational visualization to make harmonic reasoning transparent and accessible. The proposed framework combines Business Process Model and Notation (BPMN) with the Chord Wheel Diagram to represent temporal progression, functional harmony, tonal proximity, and harmonic decision points within a unified visual environment. Rather than describing harmony as a fixed sequence of chord symbols, ECMV models harmonic development as an explainable decision process in which alternative harmonic pathways can be explored, compared, and interpreted. The approach is demonstrated using the traditional folk song Red River Valley, whose simple melodic structure provides an ideal educational example for gradually introducing increasingly sophisticated harmonic concepts. Starting from a basic diatonic harmonization, learners progressively explore dominant substitutions, relative minor transformations, secondary dominants, modal interchange, and alternative cadential structures while preserving the original melody. By separating melodic structure, temporal organization, harmonic function, and tonal relationships into complementary visual representations, the framework reduces cognitive complexity and supports a deeper understanding of harmonic thinking. The paper argues that ECMV should not be regarded as a music generation technique, but as a visualization methodology designed to describe, communicate, and understand human musical reasoning. More broadly, it demonstrates how computational visualization can support the preservation and teaching of Western tonal harmony as an element of intangible cultural heritage by making complex harmonic relationships transparent, interpretable, and accessible to beginning musicians.

