

Emotion of Colors: Synesthetic Cross-Modal Key Modulation

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1. Introduction

Synesthesia is a neurological condition in which stimulation of one sensory or cognitive pathway includes automatic and involuntary responses in a second sensory or cognitive pathway. People who report such experiences are known as “synesthetes”. A subset of synesthetes, sound-color synesthetes “see” colors and simple animated shapes in association with music and other sounds. We can find a color-sound synesthetes out of two to three thousands. It has been suggested that “...every infant is synesthetic, although most gradually grow out of it” p 12 (Stein and Meredith 1993) and the synesthetes possess these cross-modal connections even they grown up. We show scientifically how these synesthetic cross-modal mapping are used in animations and movies.

2. Synesthetic sound-color test

We performed a set of test based on a standard battery of tests [Eagleman et al. 2007] that include: (1) a pitch test, (2) a chord test, and (3) a musical key test. The test subjects select colors from a color map and emotions from a list of a emotive word list after hearing sounds or short music generated by various pitches, chords, and keys. We judge the level of the synesthesia based on the battery score formula. Hundreds of synesthetes took the tests and we select only those with the high scores based on Eagleman’s criteria. The test subjects associate colors to the keys and choose colors from those in the basic color terms. In both the pitch and chords tests, they choose the same basic colors in the key test. The key has a tonic chord and the tonic chord has a root. All chosen color for its associated tonic chord and its root are the same as those chosen for the key. This strongly suggests that synesthetes perceive the sound as a structure characterized by the “key.”

3. Synesthetic cross-modality in Disney “Fantasia”

Fantasia is a 1940 American animated film produced by Walt Disney. It is the third feature-length film produced by the Walt Disney Company. It is well known various synesthetic effects appear in this film and affected many artists even recently although there is no evidence that the film was made by synesthetic artists. Based on the statistically analyzed data in synesthetic sound-color test, we statistically show that the synesthetic cross-modally mapped colors are only used in a short period just before the change of the keys, fade-in, or fade-out of the scenes to invoke the emotions.

4. Synesthetic cross-modality in Animations

Next, we show how the synesthetic sound-color cross-modalities are utilized in recent animations. It is known that emotions can be

invoked by key modulations [1]. Lendvai et al proposed that the type of emotions provoked by a key vary with respect to the previous keys. They claim that not the absolute keys themselves, but the relationship between the keys mainly determines the meanings “story” of the music. In many animations, the inserted music must finish in a few minutes so it has no time to change keys to invoke some emotions. One question arises here: how the emotions are generated using a inserted short music? One surprising answer is that synesthetic cross-modalities between the music and colors may be used to “modulate keys.” Figure 1 shows how synesthetic cross-modal key modulations are adopted in an academy awarded Japanese animation named “Spirited Away” produced by Studio Ghibli. The opening music of this film is “Summer’s Day” and its musical key is A minor. We show two shots of the film in the first 5 and 10 seconds in Fig. 1.

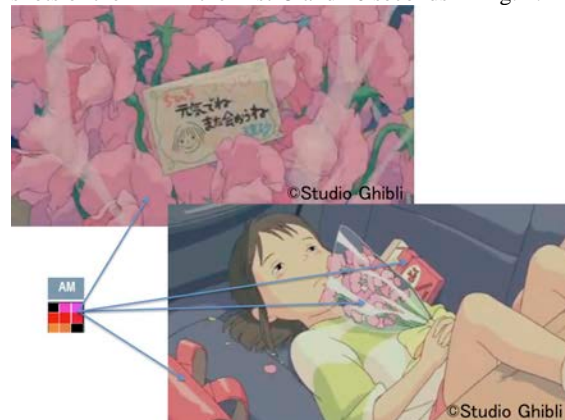


Figure 1. Synesthetic cross-modal “key modulation” in “Spirited Away”-©2001, Nibariki, GNDDTM, Studio Ghibli. An A major color palette is used with respect to an A-minor inserted song. Two images are taken from the first 10 seconds of the film “Spirited away” (H. Miyazaki et al, ©2001, Nibariki,)

As shown in Fig. 1, the colors used in this opening are those of A-major (e.g. pink). In this opening, a zoomed bouquet of pink flowers appears and a music entitled “Summer’s Day” fades-in slowly. The cross-modal key modulation, when a synesthetic A-major color palette is used with respect to the A-minor inserted music, invokes a strong ineffable nostalgic sensation [1] that strongly foreshadows the story. The key characteristics or emotions of an A-minor with respect to A-major is listed in [1] and they are “the past world” or “nostalgia”. These emotions strongly imply the story and main theme of this animation. If we replace the synesthetic A-major palette with different synesthetic color palettes, different emotions listed in [1] can be invoked.

5. Conclusions

Using scientific synesthetic cross-modal mapping, we show how the cross-modal key modulations are adopted in some animations to invoke or enhance intended emotions in the story. The synesthetic cross-modal key modulation is a very effective way to invoke targeted emotions to the audiences.

References

- 1, LENDVAI, E., SZAB, M., MOHAY, M. AND INT, K.L.Z.N.Z.G. 1993. Symmetries of music. *Kodly Inst*.