

Kinetic Relationships in Visual Music Composition: Interactive Changes Over Time

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Introduction

Today, visual music is generally a creative expression poised at the confluence of temporally based visual art and music. Essentially, it is comprised of oscillating amalgams of light and air. Here the blending of two mediums forms a third, which includes aspects of each and yet is unique in comparison to either in isolation. When occupying a mutual space/time without the intention of direct interrelationship on the part of the composer, these atomic constituents nonetheless create higher-level formations. Human tendencies toward apophenia, instinctively perceiving and creating relationships where none might exist, act as cognitive influences. However, for composers intending to exert creative influence toward such molecular formations, a wealth of potential exists. Here we will investigate several possibilities in an attempt to apprehend them knowing that, ultimately, they will dissolve into a singular expression in which they are indistinguishably inherent.

Two key and elemental structural factors in the composition of visual music reside in areas of kinetic and transitional relationships. It is posited here that mastery of these components engenders formal progressions that establish and maintain compositional cohesion. Further, their judicious and deliberate implementation provides opportunities toward the unification of these otherwise unrelated compositional elements. It is within this framework that further investigation into these relationships is exposed as fundamental to the composition of visual music. In this writing we will delve into the kinetic relationships leaving the study of transitions to another time.

The term *kinesis* refers to movement. Movement equals change over time, which is intrinsic in temporally-based art. Thomas Wilfred and Oscar Fischinger, generally considered the fathers of visual music, approached kinetic relationships in varied manners. Wilfred was primarily

interested in relational movement between visual objects. His work normally did not include an audio element (Orgeman, et al). Oscar Fischinger primarily explored kinetic relationships between visual and musical objects with an emphasis on the former (Keefer and Guldemond). Fischinger's approach is the subject of this writing, however perspectives described are equally pertinent considering Wilfred's.

Kinesis, as witnessed in visual objects, is relatively straightforward. Objects seen as traversing the field of view from coordinates (x, y, z) to coordinates (x_1, y_1, z_1) are naturally ascribed characteristics of movement. However, in reference to musical expression, the notion of kinesis may not be readily apparent. To begin, sounds move in terms of waves of air emanating from a source outward, in varying degrees, in multifarious directions. Sound is the vibration (movement) of air. Further, considering that movement equals change over time, it is obvious that a musical composition changes over the course of its duration. Finally, and perhaps more directly, working with two or more channels of audio diffusion, the perception of the location of sound events can be established and may traverse the listening space to other locations via varying paths.

In this study, 11 forms of kinetic relationships between audio and visual elements are explored. Though they may often overlap or may be intermingled, here they are teased apart and investigated in isolation in order to apprehend individuated approaches. Below is a list of the relationships that will be considered. It is not intended as an exhaustive list but instead as a point of departure into the reader's own investigation.

- Disparity
- Unity
- Rhythmic
- Timbre
- Harmonic
- Contrapuntal
- Spatial
- Energetic
- Momentum

- Speed
- Opposition

In addition to a written description of each example cited in the text, included in each section is a link to relevant audio/visual clips. This approach is derived from the practice-based perspective owing that direct experience, beyond often being an effective learning aid, is a powerful communicator of ideas. The examples utilized are derived from my own compositions. This is in part due to an intimate familiarity with the work and further to ensure there are no intellectual property issues involved. It can be realized that when experiencing the examples, they might be considered subjectively derived. Certainly, as human beings, we often experience quite different phenomena even when subjected to the same stimuli. It is therefore requested that if you do not see that which is being described immediately, take time to consider it. There will be a gain of apprehension if the extra effort is extended as necessary.

One last consideration before proceeding is that precursors to the advent of visual music, such as the work of the painter Wassily Kandinsky, were attempts to make static visual art attain musical and temporal characteristics. This approach to visual art translated through into the beginnings of experimental cinema, in which static visual art could be temporally focused (Abbado). Therefore, it is not surprising that here we will consider and compare several attributes of the visual movement from a theoretically based musical perspective.

Disparity – Disconnection

A sense of disconnection between audio and visual elements occurs when they appear to act independently in terms of movement. This relationship is prominent in visual music due, at least in part, to the ease of implementation. It is safe and easy to implement from an editing perspective since there is no concern with connecting audio and visual movements. Often overused, it lacks the characteristics of an approach intended to provide formal qualities that guide the audience through the ebb and flow of the composition. In this manner, it can quickly become monotonous lacking interest fostered by variety and surprise. From another perspective, when the audio and visual unfold in the same spatiotemporal dimension, there exists a relational connection formed by the propensity of human beings to organize phenomena into

comprehensible, yet perhaps limited, patterns. As mentioned in the introduction, apophenia can be a major source of sense-making in this paradigm.

As opposed to implementing kinetic disparity throughout an entire composition, it can be perhaps beneficially employed effectively in specific instances. For instance, it can provide a sense of release from tensions during which it allows the audience to gain a sense of emotional equilibrium... a relaxing if you will. Disparity between audio and visual elements can be inserted as a background movement to provide additional interest and dimension to a scene without detracting from the main material, which might be interacting in other manners. It can additionally provide contrast to a section during which the audio and visual are tightly aligned. Finally, it can provide a segue between themes, phrases, or movements. The suggestion here is, as with herbs in cooking, it be used sparingly and wisely.

To experience an example of kinetic disparity, watch and listen to the audio/visual file linked to below. Please keep in mind that though a section might exhibit disparate characteristics, other characteristics might also be exhibited.

http://www.perceptionfactory.com/video_examples/1_Disparity.mp4

1:1 – Unity

1:1 kinetic relationships between audio and visual elements in a composition could be termed one of unity. Here, the audio and the visual work in tight unison. Every movement of the visual is accompanied by directly related, and recognizable, movements in the audio. Again, this relationship can quickly become quite monotonous if left unchecked. Oscar Fischinger's work often employed this approach. Though often a technological feat to achieve, it becomes easy for an audience to anticipate. This eliminates the element of surprise that characterizes interest in nearly any creative endeavor.

However, similar to the disparate relationships, employed judiciously, it creates strong moments of connectedness providing "landing spots" for an audience thus allowing for cohesion in the composition. Such relationships, paired with others, can be utilized to set up and fulfill or defy audience expectations. It can provide moments of stability in moments of uncertainty. It can also be used very subtly. As opposed to the rigid unity of an army marching, it can be used in a

manner that maintains a loose unity. This subtlety perhaps requires a maturity on the part of artists skilled with their tools and with their sense of creativity. With some work it can be accomplished and is enjoyable to experience.

The following clips span the gaps between tight unity and unity of a more subtle nature.

http://www.perceptionfactory.com/video_examples/2_Unity.mp4

Rhythmic Qualities

The rhythmic qualities of a visual music composition are achieved in numerous ways. There are the obvious punctuations, accents, and patterns presented in the music via typical rhythm instruments such as drums. Beyond those the visual music medium presents opportunities for rhythmic relationships such as successions of cuts in the visual flow or accented events in musical progressions. Interrelating rhythmical patterns affords audience interest on several strata. These patterns maybe perceivable in the audio or visual separately, together, or in an exchange wherein each provides aspects of an overall rhythmic structure.

As with the unity type relationships, the rhythmic patterns can occur in a 1:1, tightly synchronized, manner, which is fairly straightforward. This approach can be used to accentuate major rhythmic passages in the composition. Somewhat isolated punctuations provide points of unison that allow an audience to easily experience a connective link between the audio and visual. When used sporadically, they provide landing points in a composition. Let's experience an example of a tight synchronization approach.

http://www.perceptionfactory.com/video_examples/3_Rythmic_00.mp4

Going deeper, variations to this approach and deviations from it can elevate a composition to a higher level of complexity and can provide a timeless quality to the work. In the next example, the visual provides for rhythmic punctuations that the music only infers. Thus, the visual rhythms become an aspect of the auditory experience and vice versa. This is just one example of myriad possible rhythmic relationships in visual music. Rhythmic syncopations, simplifications, and exchanges provide for imaginative experiences.

http://www.perceptionfactory.com/video_examples/3_Rythmic_01.mp4

Timbral – Cross Associations

Timbre is a mysterious quality that is difficult to define. Webster defines it as “the character of a musical sound or voice as distinct from its pitch and intensity. Here we might simplify this by calling it the tone of one or more sounds. Both of these descriptions lack clarity yet we understand differences in timbre when we hear them. Typically, the term “timbre” is used as a descriptor in relation to sound and music. However, when considering visual music compositional relationships, timbral qualities might be generalized to include visual material as well.

The overarching timbre of a visual music composition is established by the union of the audio and the visual. It could be considered that the composer establishes the timbre of a composition rather than it being inherent to it. For instance, watch the following example that includes not sound.

http://www.perceptionfactory.com/video_examples/4_Timbral_00a.mp4

Now, imagine what the sound that accompanies this segment might consist of. Of course, whatever audio is decided upon by the composer greatly influences the perception of the visual and vice versa. It is in establishing these types of cross associations that creates the timbre of the composition. Once established by the composer, this relationship becomes a formal element, a thematic relationship, that is varied and extended throughout a composition. Let’s watch the previous example, this time, with audio.

http://www.perceptionfactory.com/video_examples/4_Timbral_00b.mp4

Here we are interested in how the tone of the sound and the tone of the visual are in sync as they change over time. The first section of the next example exposes the original thematic material. There the composer establishes the tone of the composition through the connection of the audio with the visual. The second section presents a variation to the original theme in both the audio and visual. It utilizes the elements of each yet presents them in a varied yet related manner. The third and fourth sections take the variation further from the original theme and, yet again, it are

perceptually related. Notice how the tones of each section change and how this occurs in changes to both the audio and the visual.

http://www.perceptionfactory.com/video_examples/4_Timbral_01.mp4

http://www.perceptionfactory.com/video_examples/4_Timbral_02.mp4

http://www.perceptionfactory.com/video_examples/4_Timbral_03.mp4

Other similar implementations of timbral relationships might include subjective emotional responses such as somberness, heaviness, excitement, happiness... These perhaps describe an emotional timbre and are presented as a combination of the audio and visual material.

Harmonic / Complimentary

Harmony, whether in music or myriad other forms, occurs when there is an interaction in a complimentary manner. For example, two people dancing or perhaps walking hand in hand are usually acting in harmony. One might consider geese flying in a V formation a form of harmonic interaction. In traditional music notation, notes that occur simultaneously... that are stacked in numerical relationship on the musical staff, are usually considered harmonically related.

In the following example, the white hazy objects in the foreground seem to be acting independently of the music. However, the colored shapes in the background could be considered to be acting in a loose harmony with the music. This is an example of harmony and disparity interacting within the same scene.

http://www.perceptionfactory.com/video_examples/5_Harmony.mp4

Contrapuntal / Interactive

Counterpoint, is a very interesting interaction that provides for excellent formal material. Take a moment and think about it. How would you describe counterpoint? Musically speaking, counterpoint could be described as two or more, perhaps related and yet different, melodies occurring in the same time frame. Generally, two people living in the same house, living two separate yet congruent lives, could be considered to be living in counterpoint with each other.

JS Bach was, in many ways, the quintessential master of counterpoint. For example, his “Continuo” bass line in his fugues often acted in counterpoint to the rest of the improvised compositional elements. Often in his work, two or more melodic lines were played simultaneously achieving a tight contrapuntal interaction.

In the following example, we are interested in observing that the audio and visual act in a contrapuntal manner... there are separate lines of interaction yet each occur in relatively the same time frame. They are complimentary and yet they do not occur in sync with regard to timing. Nonetheless, the timing of each is clearly taking place in relation to the overall phrasing.

http://www.perceptionfactory.com/video_examples/6_Contrapuntal.mp4

Spatialization / Perceived Location

Musical spatialization refers to the perceived location of a sound event. This is achieved by several methods, each beyond the scope of this text. Suffice it to say that with few notable exceptions, the perception of the location of a sound is done through amplitude panning or wavefield interference patterns. I commonly work with 32 audio channels, which facilitates the spatialization of sound to a high degree of granularity. However, since this is possible to a very limited degree with stereo, the example below will provide a limited idea of the intention involved. Here we generalize the term “spatialization” to include the perceived location of visual events as well.

The perceived locations of audio and visual events are particularly interesting in a visual music composition. When operating in synchronization the effect is obvious and powerful. Imagine a visual object, existing in a 2D space. It moves from right to left and back again across the field of view. As it does a musical object is perceived to move in synchronization with it. The viewers eyes and ears now expect this as it becomes more prominent through repetition... the two events become linked in the viewer’s perspective. When it is altered or done away with altogether the surprise of the sudden contrast is dynamic.

In the first section of this example, the tendency of the audio and the visual is to move from left to right. Near the end, the correlation is much looser except at the very end where it once again syncs up. Experimenting with the spatial relationships between the audio and visual can pull a

composition together into a singular expression and it can act as a guide for the viewer's perception.

http://www.perceptionfactory.com/video_examples/7_Spatial.mp4

Energy / Intensity

How might we describe the attributes of energy or intensity of a visual music phrase or set of phrases? We might describe them as brightness verses darkness, force verses release, power verses weakness, or strength verses gentleness. It is difficult to describe beyond alluding to it yet we know it when we experience it.

In the following example, notice how the intensity shifts as the scene changes at about half way through. Both the auditory and the visual reflect the intensity of each section. The first may be interpreted as "powerful driving" the second as "gentle undulations".

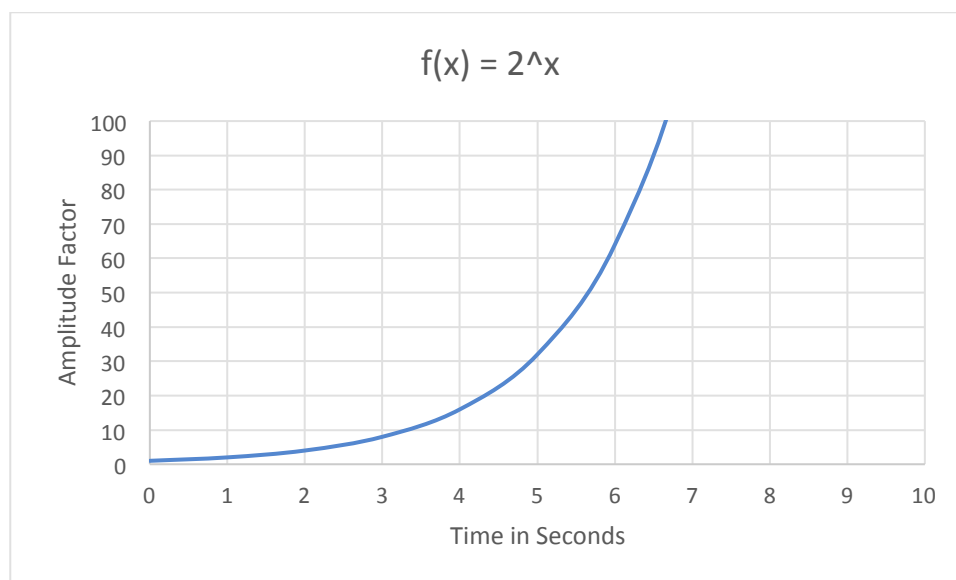
Let's see if you agree.

http://www.perceptionfactory.com/video_examples/8_Energy.mp4

Does it work here? Is it obvious? This type of audio/visual unification can be used to amplify the effects of intensity in a scene. As seen here it can emphasize a shift in intensity. As can be witnessed in this example, it causes a feeling of tension and release.

Momentum / Temporal Energetic Contrast

Momentum is one of my favorite subjects. Consider for a moment, what is momentum? For this study, it could be described as the changes in the speed of object movement, which occur in an exponential manner. Perhaps the change occurs very slowly at first and then suddenly increases very quickly as the knee bend of the curve is reached in time. Look at the diagram below for an example of such an exponential function over time. Notice that the Y axis values increase very slowly from 0 to 2 seconds. The knee bend occurs at approximately 4 seconds at which time the increase in the Y values begin increasing at a very rapid pace. This exponential increase in speed of and object's movement takes on the characteristic of momentum.



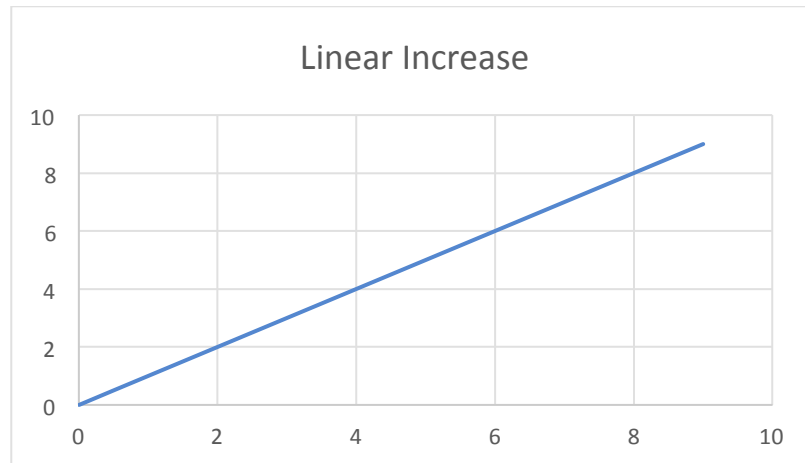
Reverse exponential motion is also a possibility. This would represent a shift in speed that is very fast at first and then, when the knee bend of the curve is reached, begins to rapidly slow.

When this effect is experienced in a composition, it takes on a very visceral quality... one can feel it physically. It is a very powerful effect and used as a compositional element it can be profoundly captivating. Whether, linked with objects in contrast with one another, in conjunction with other kinetic attributes, or implemented on an entire scene, shifts in energetic actions such as this are extremely desirable compositional and formal elements. See if you can notice the exponential shift in the following examples. It is unmistakable.

http://www.perceptionfactory.com/video_examples/9_Momentum.mp4

Speed – Rate of Compositional Progression

What is intended by the rate of compositional change? One example comes from traditional musical terminology, which is that of *accelerando* and *decelerando*. These terms designate a predominately linear increase or decrease, generally in phrasing, over time. Similarly, the terms *crescendo* and *decrescendo* designate a predominately linear increase or decrease in amplitude over time. Another feature of rate of compositional progression is in the realm of static verses dynamic (audio or visual objects moving or sitting still).



Kinetic relationships between these types of rates of change between audio and visual elements can occur in sync or in inverse relationships. It can be quite subtle or overt. In the following example, notice the end of the clip where the speed of the visual decreases and the audio increases. It is perhaps subtle but watch and listen carefully.

http://www.perceptionfactory.com/video_examples/10_Speed.mp4

Opposition / Push Pull

This last example is when the audio and the visual move in perceptible opposition. The feeling derived from this type of relationship is that the audio and visual seem to push or pull one another. The cause of this perception is often related to one aspect occurring slightly out of sync with the other. When the audio and visual phrasings seem related in some manner and yet one occurs sooner than the other, the perception of this pushing or pulling takes place.

It is quite a dramatic effect.

http://www.perceptionfactory.com/video_examples/11_Opposition.mp4

In Summary

In this paper we have briefly considered the notion of kinetic relationships as they refer to the manners in which elements in a visual music composition interact in terms of movement. Similar to more common cinematic elements of transition, such as wipes, cuts, fades, washes, dissolves, and etc., kinetic elements contribute toward a composition that is formally interesting as opposed to one that is dull, tedious, or monotonous. They provide for instantiations of tensions and

release, temporal flow, and overall formal development of compositional themes and elements. This is especially important when working with abstract or non-objective compositions.

These kinetic relationships rarely exist in isolation... they usually overlap and/or interact within the same event and within the same scene. Take the afore mentioned example of a crescendo... If it is a very linear increase in amplitude, it is a crescendo moving in isolation, which we defined as an aspect of speed. However, if it occurs in an exponential manner, besides being strictly an aspect of speed, it will portray the properties of momentum as well. Such is the nature of these interactions when implemented in conjunction. Further, these interactions may occur between musical and visual elements or simply between one or the other. For instance, as the musical elements are acting in opposition to one another, the visual elements may be acting in unison or chorus. The combination of these two disparate actions forms a third that is nearly impossible to describe. The complexity and diversity of such interactions is readily recognizable to the audience, if unconsciously, and maintains a recognizable intentionality that is a core of compositional integrity.

Ultimately, it is the composer, whether a human being or an artificial intelligence, whose challenge it is to use these, and the myriad other, types of interactions in manners that achieve desired or unexpected effects of the composition as a whole. Certainly, by developing an awareness, and subsequent deliberate implementation, of the kinetic interactions that occur throughout a composition and embracing their potential as compositional elements, we expand our pallet of expression into unforeseen modes of creativity. For it is in reaching for such expansions of ourselves that we are active catalysts of momentum toward an ever-evolving multiverse of consciousness.

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Author Biography

Michael Rhoades' primary research and creative practice involves the nexus of pseudo holography (stereoscopic), holophony, and super-computing utilized toward the creation of visual music compositions intended for 3D/360 presentation. Head mounted displays or 3D/360 projection screens, and high-density loudspeaker arrays are the venues of choice for these stochastically generated compositions. For this research he received an interdisciplinary PhD from Virginia Tech in December of 2020. He currently heads the HCI area in the Institute for Digital Intermedia Art (IDIA Lab) at Ball State University.

Michael served as a SEAMUS board member and hosted SEAMUS 2009. He curated the monthly Sweetwater Electroacoustic Music Concert Series and numerous other concerts, exhibits, and installations. His compositions and research have been presented in concert and symposia worldwide as well as used for pedagogical purposes. He is a published writer and also presents lectures and classes on the subjects of Csound, algorithmic composition, score-based sampling, sonification, spatialization, pseudo holography and holophony, high-performance computing, visual music, and creativity.