A framework for teaching fundamentals of time-based design

Isabel Meirelles
Department of Visual Arts, Northeastern University, Boston MA
m.meirelles@neu.edu

1. Introduction

We live in a world that is socially and culturally media-dependent. Design practice, criticism and education today face new challenges due not only to innovations in technology —affecting both how we produce and how we communicate— but also to new paradigms in media communication.

Designing for a time-based environment is not new. What has changed is that now motion graphics play a vital role in the contemporary practice of designers. Whether developing linear or non-linear environments, designers face the complexities brought up by the dimension of time and the addition of sonic elements when communicating information.

In resonance with the needs of current design practices, this paper suggests that dynamic visual/aural explorations should have a role in the formative years of undergraduate communication design education. The study of time-based design —theoretical, visual and technical aspects of spatio-temporal means of communicating information — has the potential of expanding cognitive, perceptive, and creative abilities and skills used in the process of solving traditional design problems. Furthermore, the introduction of time-based design at an early stage in the education can broaden students attitudes in experimenting with and deciding which medium and format is most appropriate and effective for a given design problem. The outcome is an education that fosters the understanding of human-centered and context-based information communication, rather than methods centered on object or product development.

My pedagogical model integrates visual literacy with multidimensional and multi-media ways of thinking and exploring communication design problems. I believe that it is not only possible but desirable to incorporate both schools of thought in the creative process of solving design problems.

The goal of this paper is to discuss —and ultimately to suggest— the relevance of investigating the fundamentals of dynamic visual language as a means of teaching and learning how to create visual forms in a dynamic medium. I believe that time-based projects — whether for communicating information or for artistic expressive purposes— rely on the understanding and exploration of the core principles of dynamic formations. It is my hope that the fundamentals proposed here will generate discussion.

The paper is structured in five sections. It starts with an overview of time-based design and the reasons for examining it as a system. The second section describes a proposal for fundamentals of dynamic visual formations. The third section presents an example of how to systematically explore the fundamentals from simple to complex elements. It is followed by a case study which explores the relationships between micro and macro structures in the creation of time-based projects. It concludes with an assessment of the proposed process in relation to student work.

2. Time-based design problems

Information*: From Latin* ***informare*** *to give form or shape to, from* ***in*** *into +* ***formare*** *to form, from* ***forma*** *a form or shape +* ***-ation*** *indicating a process or condition.* [*Oxford Dictionary of Psychology*]

All communication design problems aim at communicating information in a clear and effective manner to a specific audience.

Time-based design uses elements and strategies deriving from different disciplines. Similar to print communication design, it involves the articulation of visual and verbal languages in the construction of meaning, whether connotative or denotative. Similar to other time-based disciplines (e.g., cinema, literature, music, choreography), it involves methods and techniques used in the development of form and meaning along time — for example, techniques of story-telling, or establishing connections between elements and events in the micro and macro structure of the whole continuum.

Rather than studying singular aspects of time-based design, such as the types of elements (e.g., photographic images, typographical information, etc.) or how the narrative is constructed, I propose to scrutinize time-based design from a structural perspective, as a system with core principles. The system is analyzed in terms of elemental components and structural relations. The premise is that the underlying principles of visual time-based processes could be applied to the various aspects, types of elements and events used in the construction of time-based messages. With that in mind, the paper is structured from abstract concepts to concrete examples, and from the understanding of fundamentals to the application in time-based projects.

The aim is not to establish a set of prescriptive rules. Rather, the goal is to foster the understanding of the underlying principles of formation processes as a method of exploring visual time-based possibilities — articulated or not with aural elements.

Visual problems have been approached as a system in the past. It is worth mentioning a few books that served as inspiration to the present study: Paul Klee in his two note books *The Thinking Eye* and *The Nature of Nature* [Klee 1969, 1973], Joseph Albers in *Interaction of Color* [Albers 1975], and Karl Gerstner in *Compendium for Literates* [Gerstner 1974]. In each case, the artist/author/educator offers not only an analysis of their own craft and practice in terms of core principles, but also a methodology to systematically explore elements and relations to form diverse structures. It is within this lineage that my research is framed and undertaken.

For communication design students, the design process is the learning process. Therefore, it is crucial to promote a problem-solving process that is integrated and iterative. From research, structure and visual representation to communication of information and usability tests, a rich process is a catalyst for novel solutions. It facilitates discovery, interpretation and analysis.

Similar to other problem solving activities, the communication designer's creative process involves, among other cognitive operations, first searching for the appropriate methods and strategies with which to solve problems. Some methods are acquired throughout our studies and careers, becoming part of our repertoire of learned skills, whereas others have to be created for specific problems. With that in mind, this paper promotes methods that make effective use of perceptual and cognitive mechanisms for solving time-based design problems, thereby providing students with the necessary tools to succeed in both their academic and professional lives.

3. Fundamentals of dynamic visual language

The concepts underlying the fundamentals of dynamic visual language are based on ongoing research begun in my MFA thesis, which searched for the identification and definition of the most elemental constituents of dynamic visual formation towards a theory of dynamic visual language.

The premise is that visual language as traditionally taught since the Bauhaus courses in the '20s doesn't suffice for the creation of dynamic visual formations. A static visual form is a time-independent whole described only by spatial parameters, whereas a time-dependent visual formation engages the spatiality of visual form with a temporal dimension. It changes such that later parts are dependent on earlier ones in the continuous process of formation. Its dimensions of time and space cannot be isolated.

The basic elements of visual language — and of Geometry — are point, line, plane and volume. When combined with the seven attributes — shape, scale, orientation, position, tone, color and texture — they allow for the creation of virtually unlimited spatial possibilities in making meaning.

In a dynamic medium, combinations between basic visual elements and attributes are not enough — first, because they only define spatial parameters, lacking temporal and kinetic properties; secondly, because they represent only one state among many in a formation process. To use a classic example: a formation might start as a point and dynamically develop into a line, then becoming a plane. If the formation process is divided into micro-sections, we might refer to each as having a main organizing basic element: point, line, plane. However, if studied as a whole, in its macro-structure, that description is no longer valid. This example, however, is not complete until the temporal and kinetic qualities are integrated to the spatial ones: How do the spatial transformations occur along time? What are the rhythms and directions of motion? And so on.

With the objective of examining theoretically and experimentally the creative process of image-making in computational media I created a system. I will briefly describe below the fundamentals of the system. For a more in depth description, please refer to my article *Dynamic Visual Formation* [Meirelles 2005].

The fundamentals consist of a set of dynamic properties —variables— grouped in three separate but interdependent categories: spatial, temporal and kinetic.

In the **Spatial** category there is only one property called **Origin** which defines the spatial qualities of attributes. It is described by the same parameters used in visual language. Origin defines the spatial quality at zero point in time of the changes of an attribute. For example, a shape can start as a circle, with a particular color, tone, location in space, etc.

The **Temporal** properties define the temporal qualities of attributes. Two properties are proposed. The **Starting Point** defines the moment in time for the changes of an attribute to initiate. The **Duration** describes the period of time for the completion of the change.

The **Kinetic** properties define the spatio-temporal dependent qualities of attributes. Three properties are proposed. **Velocity** defines the rate (speed and direction) of the process of change of an attribute. **Amplitude** defines the extent of the process of change of an attribute. And **Reference Point** defines the point in the spatial structure in relation to which the change of an attribute happens.

Each set of properties — spatial, temporal, and kinetic — is then applied to the seven attributes of visual language: shape, scale, orientation, position, tone, color and texture. The articulation and relationship among all properties for each attribute defines the rhythm and the role it plays in the whole formation process of the basic dynamic element, which is now a rhythmic unit. An example can be viewed in Figure 1.

In the paper presentation I will show interactive experiments that explain the variables and explore rhythmic visual patterns and concepts such as synchronicity. Similar experiments can be viewed at the url: http://www.atsweb.neu.edu/dva/m.meirelles/dvf/ (This web page is a companion to the above mentioned article *Dynamic Visual Formation;* Flash plug-in required).

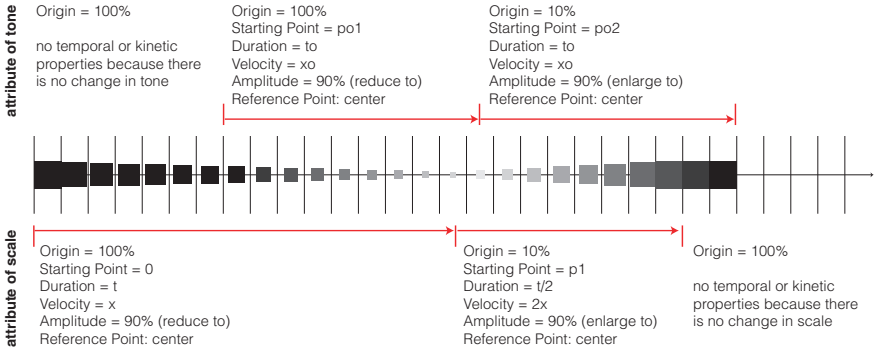


Figure 1: The diagram explains the proposed properties in relation to changes in the attributes of scale and tone. The relationship between all properties defines the rhythm of the whole element.

The fundamentals point to the parameters that one needs to know in order to conceive and to create in a time-based project. They offer ways of exploring two basic inseparable processes: motion of forms and forms of motion. This division is an artifice used as a method to distinguish between what and how dynamic processes can be explored. What follows is a systematic exploration of the proposed fundamentals for dynamic formation.

4. Systematic exploration of fundamentals: motion of forms & forms of motion

Visual research means trying out visual alternatives. Speculation is not enough; alternatives have to be seen, Hiebert [1992].

This section shows how to systematically explore the fundamentals. It illustrates the potential range of dynamic possibilities offered by the manipulation of individual properties. The different variations create different rhythms, perceptions, and meaning.

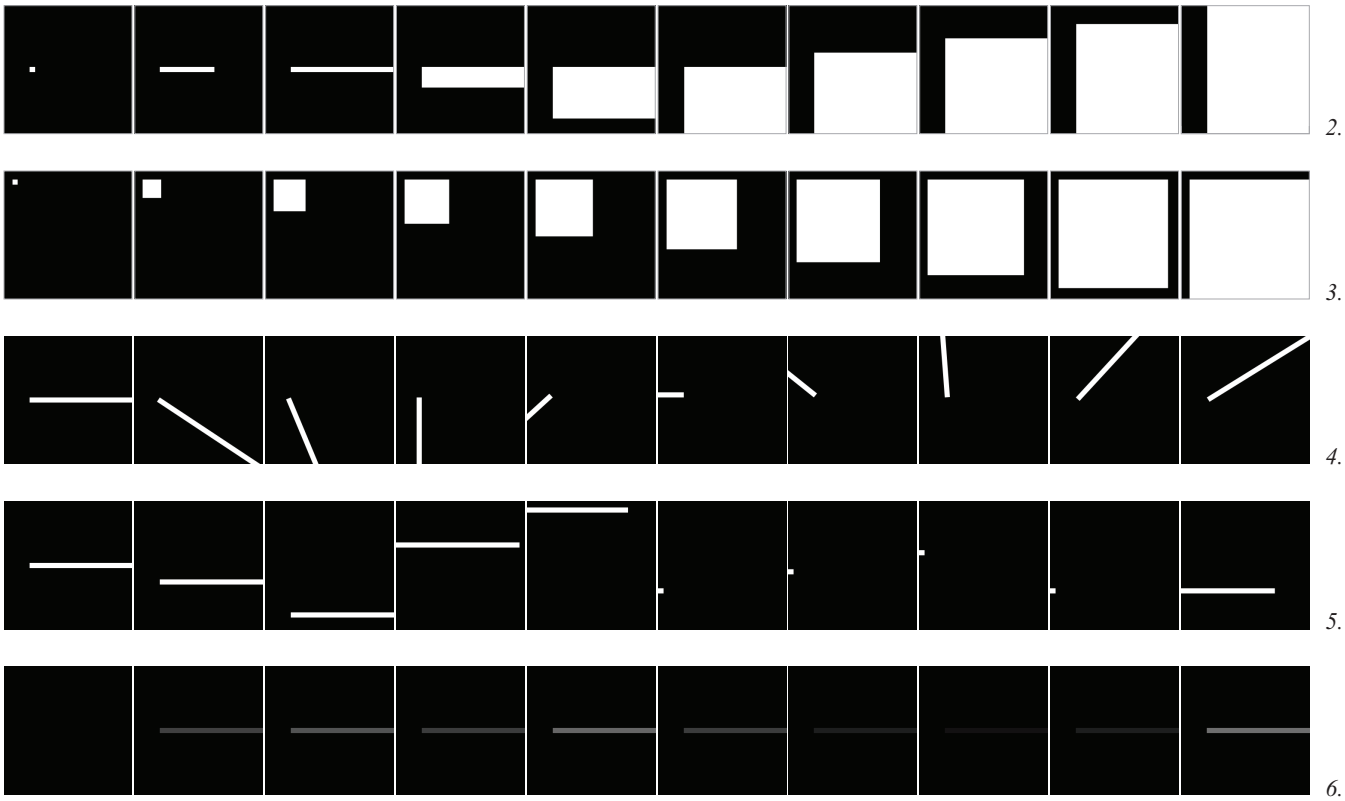
The investigation examines both motion of forms and forms of motion. The first relates to what changes in time and the second to how changes happen in time. Forms of motion relate to the temporal aspects of motion, such as rhythm, pace, accents, tensions, and so on. Because of the intrinsic kinetic nature of forms of motion, this part of the exploration is constrained to the movies that will be presented at the conference, hence they are not visualized in this paper. As Kranz [1975] states: *Repetition, rhythm and variation are elementary technical serial media. The progressing beat is articulated by the rhythm and urged by the variation*.

An exhaustive exploration can lead to an inventory of dynamic possibilities. In this paper, however, possibilities are not explored in their totality and just a few examples are shown in the form of image-sequences. The objective is to suggest a method that is ordered and structured, thus systematized in a way that could be exploited by anyone.

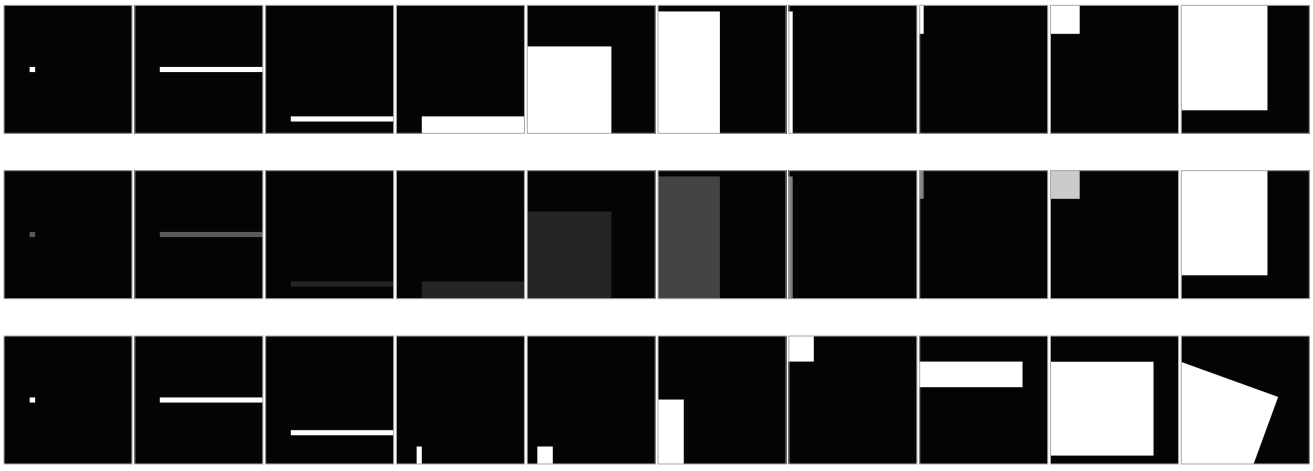
The exploration is organized progressively from simple to complex. It starts with the manipulation of single attributes and then moves to the combination of more than one attribute.

Koffka [1935] explains that the perception of motion is dependent on a system of references where the distinction between “thing” and “framework” is essential. We would not perceive a moving point in a totally homogenous field due to lack of frameworks of reference —this is a hypothetical situation, considering that we serve ourselves as a frame of reference. In this condition, the point *would be exposed to the same stresses everywhere, all positions being dynamically indistinguishable from each other*.

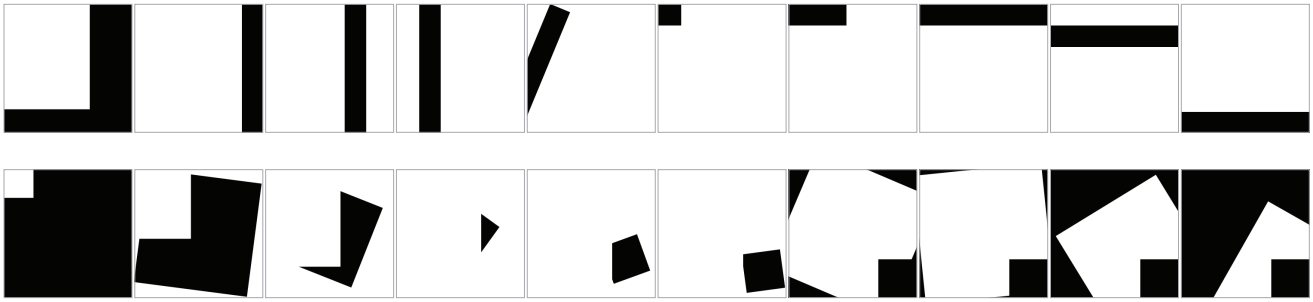
The influence of object and field factors plays a major role in the perceptual (aka phenomenal) experience of motion as well as of time. For example, experimentation has shown that *under equal stimulus conditions large objects move (phenomenally) more slow-*



Figures 2 to 6: From top to bottom, the frame sequences explore changes in the attributes of: shape, scale, orientation, position and tone. All other properties are unchanged.



Figures 7 to 9: The three frame sequences explore changes in more than one attribute. In Figure 7 the changes happen in relation to the attributes of shape and position. Figure 8 shows the same sequence as Figure 7 with additional changes in relation to the tone attribute. In Figure 9 the changes happen in relation to the attributes of shape, position, and orientation.



Figures 10 and 11: The two frame sequences explore ambiguities in the segregation between element and background. The first is a continuation from the movie showed in Figure 7.

ly than small ones and that *the apparent velocity is the smaller, the greater the field* [Koffka 1935].

In the system under scrutiny, both the elements and the background are dynamic, in that they are visual processes changing in time. Two interdependent factors play a major role in the perception of such events. One is the nature of the visual formation, the role of the attributes' properties in forming rhythms. The other is the system of references: the distinction between "thing" and "framework." When events have more than one element, the system of references is plural. In these cases, a rhythmic unit is relative not only to the space where it happens (field) but to the other concurrent rhythmic units, also working as frames of references. The latter is investigated in Section 5.

All examples examine variations on a single element. As such, the study is constrained to the dynamic relationships between element and background. Concepts are explored by attributes. In the oral presentation I will present short movies; for this paper I have captured frames from few movies. Figures 2–9 present sequences of images visualizing the systematic exploration of the fundamentals in respect to motion of forms. Because forms of motion are basically related to kinetic aspects, it is impossible to represent them in a static format, in that differences in pace and rhythm are not possible to perceive in a static medium.

As mentioned earlier, the relationships between elements and background are dynamic. The manipulation of the background properties not only changes its relationship with elements, but also generates ambiguities. For example, the background might become an element and vice-versa (See Figures 10–11).

The articulation among the elements or events is key to the conception and perception of the whole. Issues concerning the continuum of a time-based piece, such as how the succession of parts happen in relation to each other and to the whole structure is explored in the next section.

5. Case study: variations on the Tonhalle posters by J. Müller-Brockmann

This case study explores the range of possibilities offered by variations in the way elements are dynamically constructed and articulated in the macro structure of the whole event. It also examines relationships between visual and sonic elements.

The types of relationships in a dynamic event are between:
- element (s) and background;
- element (s) and element (s);
- background and background;

Articulations and relationships in dynamic events have two interdependent aspects: spatial and kinetic.

Spatial aspects take into consideration issues of forces and direction. For example, if elements move in the same direction (parallel) or in different directions (non-parallel). The latter could have directions described as contrary, oblique, symmetrical, asymmetrical, convergent, divergent, etc.

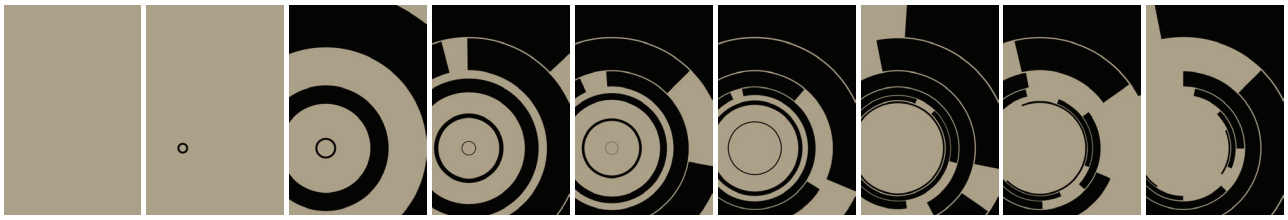
Kinetic aspects involve the temporal dimension and describe the rhythmic nature of the articulations. To use the same example as above, when two elements move in the same direction, if the speed is different for each, they would still have parallel spatial motion, but non-parallel temporal motion. In this case, a tension is created by the kinetic aspect. If they move with the same speed, a stability will be generated, in that they would be perceived as a group rather than individual elements.

It is through discrimination (same-different dichotomy) in early vision that elements and patterns are detected and ordered. Patterns are central to how visual information is structured and organized. The Gestalt School of Psychology proposes that the perception of elements (e.g., visual, musical, etc.) depend upon contextual and structural relations. The theory states that we don't experience stimuli as individual, piecemeal things. Rather, we experience larger wholes separated from and related to one another. Hence, we perceive totalities, interconnections. The arrangement and division of experience follow principles of perceptual organization, which they identified by what is known as the Gestalt Laws. The Gestalt Laws describe the way we detect patterns, how individual units are integrated into a coherent percept: proximity, similarity, common fate, good continuation, closure, simplicity, familiarity and the segregation between figure and ground [Wertheimer 1923/1950]. The organizing principles hold true to dynamic events.

The case study uses as the point of departure the Tonhalle posters designed by Swiss graphic designer Josef Müller-Brockmann in the '50s and '60s. The criteria for choosing these particular posters

12.

Figures 12: This sequence presents the formations articulated in a sequential order. The only attribute playing a role in the formation process is shape.



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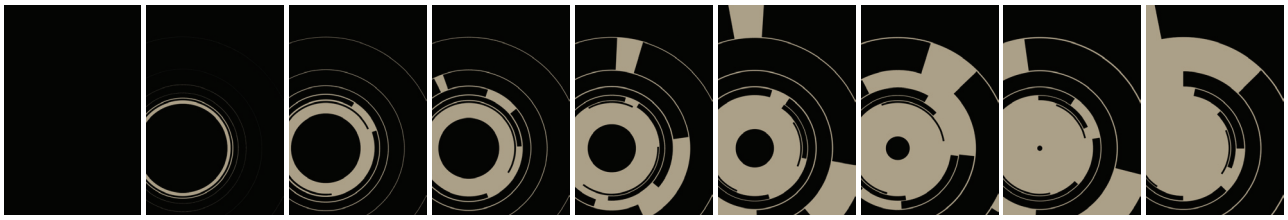

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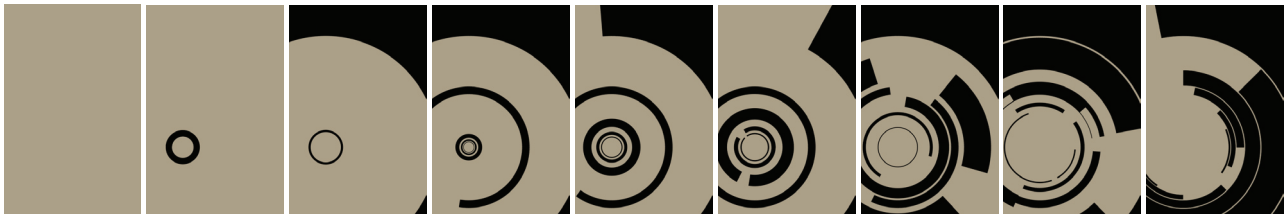
Figures 13 to 14: The two sequences present the formations articulated in a sequential order. In the first elements are added to the field and the attributes of scale, shape and orientation play a major role. The second explores a subtractive formation of elements where the same attributes play a role.



15.

Figure 15: This sequence presents the formations articulated in a non-sequential order. Visual elements are articulated with aural ones. The attributes of scale, shape and orientation play a major role.

are twofold: that the posters represent historical exemplary graphic design solutions, and, that they were designed to announce music concerts. In this way, the case study encourages three different levels of knowledge acquisition: theoretical (time-based principles), historical (exemplary graphic design solutions) and practical (exploration of time-based design: articulation between visual and aural elements).

The case study will be presented as a series of short movies. The movies are constrained by a series of strict rules that explore visual variations from simple to complex, and articulations from predictable to unpredictable, from sequential to random, and so on. The objective of the case study is to critically investigate and analyze the elements of time-based design vis-a-vis the proposed principles of dynamic visual language. For this paper I have captured frames from the movies and they are presented in Figures 12–14.

Several issues have to be considered when sonic elements are combined to dynamic formation processes. Central to all is how to keep the integrity and autonomy of both components —aural and visual elements (verbal and non-verbal)— and yet have them work well together. For example, synchronicity between visual and aural could happen occasionally (loose connections —only at certain points), or strictly (highly articulated —at all times). Figure 15 shows a variation that was articulated with aural elements.

6. Conclusions

This paper proposed a pedagogical framework for teaching and learning principles of time-based design. It examined time-based design as a system, and proposed a method for exploring dynamic elements and structural relations within the system. It did not specify or suggest a style or technique. From conception to realization, time-based design involves a process and a craft. The focus was on the making of dynamic forms as the most appropriate process for conceiving and creating time-based design projects. It could be argued that the systematic exploration of concepts through the making of dynamic forms is beneficial to:

- training the eye to see motion abstractly;
- expanding the mind to conceive of (unexpected) forms of motion;
- constructing effective dynamic messages.

Issues investigated can be divided into two groups. One investigated dynamic visual language: What are the fundamentals of a dynamic visual language? How can they be used in the construction of time-based events? How can we structure information along time? How do they affect the way meaning is conveyed? How does one perceive motion? The second examined how the conventions and principles of print-based visual communication change with the introduction of time and sound: How do verbal (written and oral) and visual elements interact in a time-dependent environment? How does the perception of motion affect traditional strategies of communicating information, such as hierarchy, contrast and clarity?

In the oral presentation I will show student work developed in the past three years for my time-based design courses. Student work range from kinetic typography to more complex assignments where students explore connections between visual and aural elements in communicating messages.

Acknowledgments

The paper presents research which is part of a larger investigation on the fundamentals of dynamic visual language and its applications in linear and non-linear time-based design projects. I would like to thank my colleagues John Kane and Nina Pattek for their continued insight and support. Finally, I would like to thank my former and present students for the dedication in the classroom activities and for the permission to show work in the presentation.

References

Albers, J. 1975. *Interaction of Color*. New Haven, CO: Yale University Press.

Gerstner, K. 1974. *Compendium for Literates*. Cambridge, MA: MIT Press.

Hiebert, K. J. 1992. *Graphic Design Processes*. New York, NY: Van Nostrand Reinhold.

Klee, P. 1969. *The Thinking Eye: the Notebooks of Paul Klee Volume 1*, J. Spiller (ed). London, UK: Lund Humphries.

Klee, P. 1973. *The Nature of Nature: the Notebooks of Paul Klee Volume 2*, J. Spiller (ed). London, UK: Lund Humphries.

Koffka, K. 1935. *Principles of Gestalt Psychology*. New York, NY: Harcourt Brace and Co.

Kranz, K. 1975. *Early form sequences: 1927–1932*. Cambridge, MA: MIT Press.

Meirelles, I. 2005. Dynamic VIsual Formation. *Visible Language*, 39.2, pp. 100–120.

Wertheimer, M. 1923/1950. Laws of Organization in Perceptual Forms. In W.E. Ellis (ed.). *A Source Book of Gestalt Psychology*. New York, NY: The Humanities Press, pp. 71–88.