

Motion Palette: Design Tool based on Motion Scale

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ABSTRACT

In this paper, I show my ongoing research, “Motion Palette” that is a design tool based on “Motion Scale”. The Motion Scale is a model to specify the motion factors: speed, angle, and motion path of the moving objects on screen display. Each of moving object has the unique inconstant patterns of the motion factors: acceleration or deceleration, sharp curve or smooth curve, diversity or convergence, and so on. The Motion Scale makes it possible for visual designers to find the systematical knowledge on the motion factors and to compose the specific motion as they wish. The Motion Palette based on the Motion Scale gives the designers a chance to compose the motion on screen display interactively.

KEYWORDS

Visual Design, Motion Composition, Octave Model, Visual Science, Motion Perception, Spatial Frequency

INTRODUCTION

Pattern in motion is getting more and more important in the field of Information Visualization on screen display. And it is very important to investigate patterns in motion by the way of academically[1] and practically[2]. The capability of temporal presentation is a characteristic of computer-based communication[3].

So, visual designers for screen display have to create some types of motion as temporal presentation in information visualization. However, they do not have the systematical knowledge on the motion factors: speed, angle, and motion path of the moving objects on screen display. Therefore, even when motion is simplified to the path of a single object, perception of motion may not be accurate[4].

The reason why the designers do not have the certain, systematical knowledge on the motion factors is the lack of models or theories on motion, such as the Munsell color model[5] that is used widely in the field of Visual Design.

The Munsell color model consists of the color factors: Hue, Brightness, and Saturation. The Munsell color model generally made the designers understand the color factors. On the other hands, the designers have not understood well the motion factors: speed, angle, and motion path.

MOTIVATION

According to Visual Science, the perceived attributes of motion are so different from the physical attributes of motion. If the designers had the rational and systematical knowledge on the differences, they could be able to *compose* the specific motion intentionally to produce the expected visual effects on screen display.

Almost of designers do not have such knowledge, so that the motions created by the designers are too distorted for viewers to identify precisely or correctly. As the result, some motions are useless and meaningless for viewers.

The important is to give the designers a understandable model for the motion factors, “Motion Scale,” and a design tool to compose motions interactively, “Motion Palette.”

GOAL of This Research

- 1) To propose “Motion Scale” defined by “Octave Model.”
- 2) To propose “Motion Palette” based on the Motion Scale.

Motion Scale

- 1) What is the simplest motion?

The simplest motion is a path or trajectory of a dot[4]. So, at the first step, we must consider how people perceive a path of a dot, which is the simplest continuous motion.

- 2) Octave Model of motion

According to Visual Science, motion perception is changed by value of Spatial Frequency of the motion object[6][7]. We can perceive motion precisely between 0.125 and 2.0 cycle/degree. Cycle and degree mean Spatial Frequency and visual angle. In other words, we can perceive motion precisely among *Four Octaves* of Spatial Frequency.

I have found we can distinguish motions in case that the value of octave difference is more than *One Octave*. According to this finding, I developed "Octave Model" of motion, which must be a systematical and understandable model of the motion factors for visual designers.

"Motion Scale" is defined by the Octave Model of motion. The Motion Scale means the magnitude of motion itself. The Motion Scale is an understandable model for motion just like "the Munsell color model" for "color," or "the scale of music" for "tone."

Motion Palette

1) Visualization of the Motion Scale

The Motion Scale was visualized on the computer screen display. The Octave Model of Spatial Frequency was represented as "radius" of the sectors on the motion paths. "Angle" of the sectors on the motion paths is changeable because the suitable angle of motion is determined by value of Spatial Frequency.

2) Development of Design Tool

Design Tool based on Motion Scale was developed as computer software. "Radius" and "Angle" of the sectors on the motion path are controllable by the input devices such as mouse or keyboard. And the shape of motion path is also controllable directly. Therefore, the designers can control the magnitude of motion, the suitable angle, and the shape of motion path interactively.

3) Basic Example

By using Design Tool, the designers can change the speed, angle, and motion path of the moving objects. They can change these motion factors easily and speedily.

Two dots move from left side to right side on the computer screen display, as Basic Example of motion. When the motion path of the dots can not be identified precisely around sharp curve, the speed around sharp curve must be low, or the shape of curve must be smooth, not sharp. The designers can choose the way of amendment of motion as they wish. How low the speed is, or how smooth the curve is? They could decide the degree easily and speedily, using the Design Tool which shows them interactively the relation between speed and curve.

The Design Tool based on the Motion Scale make it possible to show the dynamic relations among the motion factors, owing to visualization of Octave Model (magnitude of motion), suitable angle, and shape of motion path. It is a palette for Motion Composition, "Motion Palette."

4) Practical Example

Three dots move from left side to right side in basketball court displayed on computer screen. These dots represent

the changing formation of three basketball players. This example is a Motion Diagram of basketball formation. The changing formation is somewhat complicated because the courses of dots converge too close and the speeds of dots are too fast.

Next, in another variation, we can identify the precise motion paths of the dots particularly around sharp curve. This variation is an example using the Motion Palette. The speed of moving dots was controlled to keep in the suitable range of speed particularly around sharp curve. The designer of this variation decided to change the speed, not original course. The decision is up to the designer.

Motion Palette based on Motion Scale gives the designers a chance to compose the specific motion intentionally, just like color palette based on the Munsell color model.

CONCLUSIONS

The rational and systematical model on motion consists of Motion Scale (the magnitude of motion itself), suitable angle, and shape of motion path. This model could be easy for the designers to understand the motion factors.

Design Tool based on the Motion Scale, Motion Palette, make it possible to control Motion Scale, suitable angle, and shape of motion path interactively on screen display to compose the specific motion as they wish.

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