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The Dream of the Butterfly: Experimental Illusions in Motion Graphics
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Abstract

The Dream of the Butterfly: Experimental Illusions in Motion Graphics is a series of motion graphics and applications defined from visual illusions, which are based on the study of patterns and interactive multimedia. This project is not only focused on making and showing motion graphic pieces, but also providing a basis of studies and enough of the experimental process of creating them, by incorporating sections for the user to interact with. By creating a web-based interface, it provides people with a chance to experiment with the elements of basic patterns and understand visual illusions which were chosen by me for my thesis.

Thesis URL

http://www.syoungk.com/thesis

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1. Introduction

1.1. Inspiration

An illusion, which is a distortion of a sensory perception, is considered one of the most interesting elements in creating concepts for graphic designers. M.C. Escher (1898-1972), one of the most recognized artists for his use of spatial illusions and repeating geometric patterns, created his own style for designing illusions. There have been many artists whose works are focused on the illusion, such as surrealist artists Salvador Dali and René Magritte. Compared to Dali's work, which is based on irrational reality, M.C. Escher's works seems more rational in thought. M.C. Escher analyzed the way to combine two dimensional shapes to give a perceived notion of the third-dimension.

The inspiration for creating my thesis was based on the works of M.C. Escher, which are rational, seamless connections of patterns and shapes in spatial illusion. In his works, the "regular division of the plane" shows his passion of creating the geometric elements of the subject, which are interlocking of birds, fish, lizards, or other creatures. While researching of his work, I realized that his use of defined patterns developed his vision of "metamorphosis of form". This aspect of his work appealed to me as a method of creating effective solutions for transitions in my own work in motion graphics.

1.2. Visual Illusions and Patterns

While attending RESFEST, an international digital film festival in Toronto, Canada, I was exposed to various aesthetic styles and concepts, as well as new techniques in production of motion graphics and digital video. What appealed to me the most was the extraordinary variety of visual and innovative ideas for experimental motion graphics, short films, commercials, music videos and animations. The works that drew the most amount of my attention were the pieces that had a strong emphasis on visual illusions. With their inventive and polished methods of creating transitional devices, this created new ideas for use in my own works.

Because of the exposure to the innovative techniques used by the artists at the RESFEST, I developed the basic idea of my motion graphics based thesis. My thesis project will emphasize integrating visual illusions based on the concepts introduced in the works of M.C.Escher with developing seamless transitions.

1.3. The Dream of the Butterfly

Chuang Tzu, a Chinese philosopher (died around 275 B.C.), wrote a story about a butterfly. He dreamed of changing into a butterfly and fluttering about and even forgetting that he was Chuang Tzu; but when he woke up, he felt he was Chuang Tzu again. Then he wondered which was true, Chuang Tzu dreaming of changing into a butterfly, or a butterfly dreaming of changing into Chuang Tzu. To believers in Taoism, this is not important because they believe in a state of undifferentiated integration of things and self. Inspired by his story, I intend to create a storyline of butterflies in a continual state of metamorphosis using visual illusions utilizing repeating patterns. Therefore, the butterflies might be confused with who they are: vines, flowers, and butterflies.

There are several reasons that I chose butterflies as my theme. First, butterflies are beautifully colored, with distinctive patterns, which play well with my main aesthetic goals. Secondly, they have soft, fluttering motions, which would serve well in aiding my transition effects. The third aspect is the cycle of metamorphosis that all caterpillars must complete to become an adult butterfly. From the stages of egg, larva (caterpillar) and pupa (chrysalis) into developing into a butterfly, this would provide a good metaphor for analysis of my motion graphics theme. Also, playing of the four stages of the development of the butterfly, I am proposing developing four motion graphics pieces, which would serve as a precursor towards my final motion graphics piece, "The Dream of Butterfly". Therefore, creating a series of four small motion graphics provides a versatile platform for developing my concepts of patterns in visual space.

2. Review of Literature

2.1. Visual Illusions

Al Seckel said, in his book *Masters of Deception: Escher, Dali & the Artists of Optical Illusion*, "It does not matter how old they are, how artistic they are, how intelligent they are, what their background or culture is; People just love visual illusions and enjoy being deceived in a delightful and surprising way."

According to Wikipedia, "The visual illusion generally presents the viewer with a mental choice of two interpretations, each of which is valid. Often, viewer sees only one of them, and only realizes the second, valid, interpretation after some time or prompting. When they attempt to simultaneously see the second and first interpretations, they suddenly cannot see the first interpretation anymore, and no matter how they try, they simply cannot encompass both interpretations simultaneously."

Double imagery has been popular since the Eighteenth centuries. One of the most well-known and repeated motifs is a hidden skull from an illustration (fig. 2.1). The left one, an anonymous French postcard, was also adapted from earlier versions, while the example on the right was later adapted again by Charles E, Gilbert, titled "All is Vanity."

fig.2. 1
left: Anonymous, "L'amour de pierrot," French Postcard, 1905
right: Charles E, Gilbert, "All is Vanity," CA.1920

Visual Illusions was adapted by not only artists, but also psychologists. For example, an anonymous German postcard, "Young Woman/Old Woman," was later altered by the psychologist Edwund Boring into "You See My Wife, and Mother-in-Law (fig. 2.2)."

fig.2. 2
left: Anonymous, "Young Woman/Old Woman,"
German Postcard, 1880
right: Edwund Boring,
"You See My Wife, and Mother-in-Law," .1941

In the decade of the 1960s, Optical Art drew a growing movement of abstract painters, like Vitor Vasarely and Bridget Riley. Al Seckel mentioned, in his book *Masters of Deception: Escher, Dali & the Artists of Optical Illusion,* "Optical Art is a mathematically oriented form, which uses repetition of simple forms and colors to create vibrating effects, patterns, exaggerated sense of depth, foreground-background confusion, and other visual phenomena. M.C. Escher, one of optical illusion artists, has been famous since his death in 1972. The 1998 exhibition "M.C. Escher: A Centennial Tribute" held in Washington D.C., drew record crowds; 364,000 people visited the exhibit."

fig.2.3
Above: Edgar Rubin, "Hidden Faces and Goblet," 1913/ Rene Magaritte, "Human Condition 1," Oil on Canvas, 1934/
       Reginald Neal, "Square of There," Original Lithograph,1965
Below: M.C.Escher, "Drawing Hands," Lithograph, 1948/ "Reptiles," Lithograph, 1943/"Waterfall," Lithograph, 1961

There is without a doubt that the concept of optical illusions has been used in the field of motion graphics. The theme of visual illusions play a large role in the production of graphic and motion design, for designers want to create the largest amount of impact with their visual pieces. Identifying the analyzing the different types of visual illusions used in all forms of graphic design were necessary for further study. Thus after much analysis, I was able to divide optical illusions into three categories.

2.1.1 A New View of Reality

To get a new perspective on objects or situations, various converging points of view could present diverse and occasionally unexpected perceptions. Types of cues in transforming viewpoints are: angles, micro & macro, distortion, altering proportions and dimensions.

Carsberg's commercial adjusted this idea; it moved the point of focus to the foreground and emphasized negative space between a pair of shoes (fig. 2.4). The yellow negative space reminded viewers of a glass of beer, making users look twice at the advertisement.
Dior's perfume commercial was also adapted one of traditional visual illusion illustrations (fig.2.5). Just like Charles E, Gilbert's "All is Vanity," it expects that people to see a beautiful women at the first glance, and after that, find a hidden skull, reminding viewers of the product name, Poison.
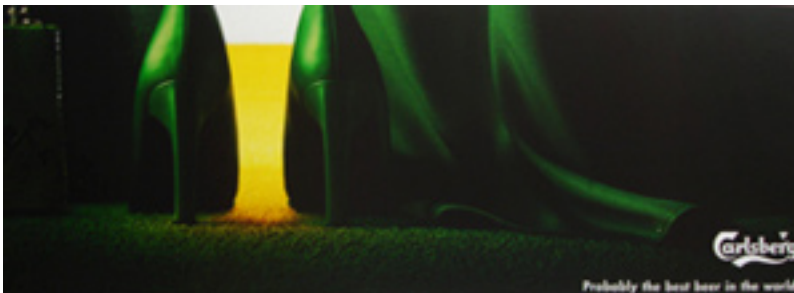

fig.2.4
Carlsberg, Agency: WL/BBDO

fig.2.5
Christian Dior, Agency: CLM/BBDO

Unique camera angles can give an unexpected and unusual effect, such as commercials for Marithe Francois Girbaud. They placed camera at the bottom and exaggerated the feeling of looking upwards (fig. 2.6).

fig.2.6
Marithe Francois Girbaud, Agency: Air

2.1.2. Pixels, Dots, and Pattern Element

The majority of images we see today are made up of halftone dot patterns. In fact, the idea behind using halftone dots is a visual illusion. If you magnify an image comprised of halftone dots, you would notice that it is a grouping of dots, that when viewed at a normal distance, optically blend to create colors.

Three examples where optical illusions are used to create powerful background images blending with the main information (fig. 2.7) and M&M using their M&M pieces to mimic a halftone dot pattern (fig. 2.8).

fig.2.8
Mars
Agency: BBDO-
Dusseldorf

fig.2.7
Premesons Bazaar, Agency: Grey Worldwide

2.1.3. Morphing and Shape-shifting

A transitional device from one image to another, or where one object morphs into another. These concepts are commonplace in today's motion graphics. As techniques are further developed, designers have tried a myriad of ways of freshening this transition effect. According to Mario Pricken, *Visual Creativity: Inspirational Ideas for Advertising, Animation and Digital Design,* These include:
• Morphing with images.
• Morphing with sound.
• Changing the speed of the transitions.

The kaleidoscope effect in treating images could formulate dynamic movements in abstracting images into a motion graphics form (fig. 2.9), and the visual plane could transform into a woman's flying scarf at the end to emphasize the vehicle's speed (fig. 2.10).
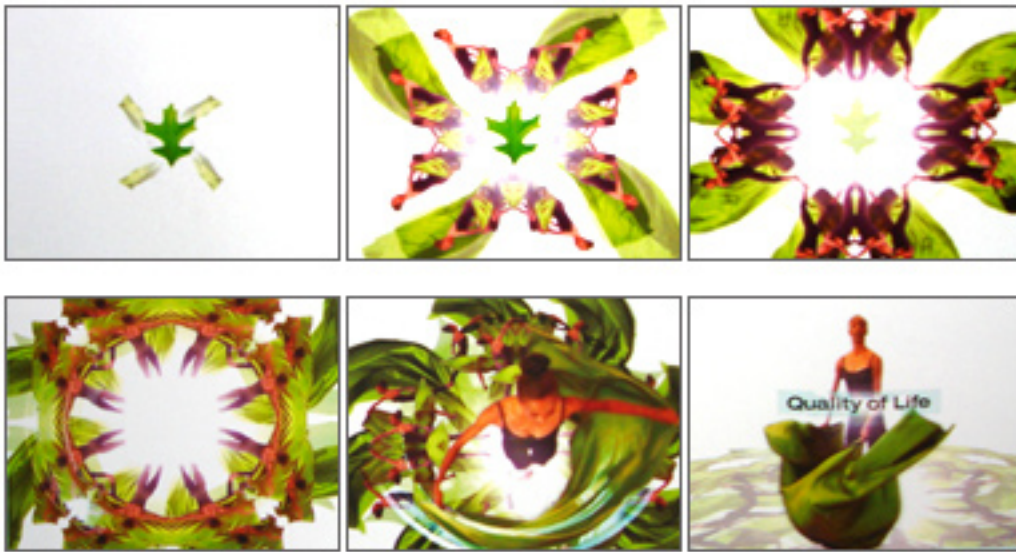
fig.2.9. Charlotte USA, Agency: Luquire George Andrews
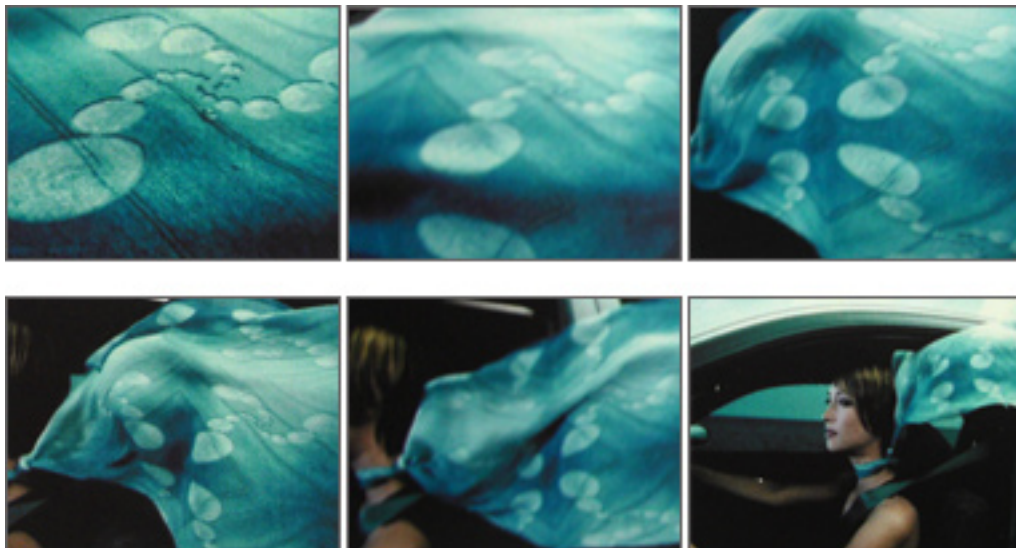
fig.2.10. Kia Motor Corp., Agency: Colorado FX, www.coloradofx.com

2.2. The Idea of Symmetry

Cynthia Maris Dantzic, an art professor of Long Island University, says in her book, *Design Dimensions:*

> "To some symmetry calls to mind beauty and harmony; to others it has a mechanical, decorative connotation. On the one hand, symmetry suggests regular placement of identical elements, repeated to produce a structural whole, bringing focus, strength, completeness, elegance, majesty, well-balanced, well-proportioned unity and order to works of nature as well as human invention. On the other hand, symmetry says rigid, formal, impersonal, predictable, tedious, mathematical, precise and ornamental-an accretion of evenly positioned modules, the antithesis of uniquely human creative expression."

Symmetry is involved with far greater concerns than simple ornamentation. According to Hermann Weyl, author of *the definitive study of the topic,* "Symmetry is a vast subject, significant in art and nature. Mathematics lies at its root. The entire theory of relativity is but another aspect of symmetry. It is the inherent symmetry of the four-dimensional space/time continuum that relativity deals with." I also believe that symmetry is a vast subject in creating artistic work including motion graphics.

2.2.1 Radial or Rotational Symmetry

According to Wikipedia, a web encyclopedia, "Rotational symmetry of order n, also called n-fold rotational symmetry, or discrete rotational symmetry of nth order, with respect to a particular point (in 2D) or axis (in 3D) means that rotation by an angle of 360°/n (180°, 120°, 90°, 72°, 60°, 51 3/7 °, etc.)does not change the object."
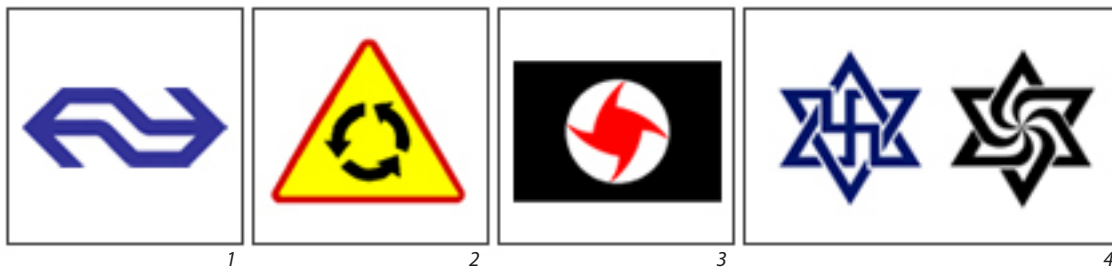

fig.2.11
1: logo of Nederlandse Spoorwegen (Dutch Railways), 2 fold
2: traffic sign roundabout, 3 fold
3: Syrian Social Nationalist Party flag; C4 applies for the circle area, 4 fold
4: the Raëlian symbol, before and after 1991, 4 fold and 6 fold

2.2.2. Bilateral Symmetry

According to Cynthia Maris Dantzic, an art professor of Long Island University, in her book, *Design Dimensions,* " Bilateral or two-sided symmetry is easily created by reflecting any image between mirrors at certain angles, or by folding a sheet of pater... The central line or axis of symmetry, usually thought of as vertical, can be at any angle to the viewer's eye."

fig.2.12
Chinese Embroidery, 18 century.

2.2.3. Translational Symmetry

Cynthia Maris Dantzic, an art professor of Long Island University, says in her book, *Design Dimensions:*

> "Modules are repeated at equally spaced intervals along a path to produce decorative patterns. Since the impulse for this continuous, additive process is movement from spot to spot a long a line, it is called a "one-dimentional symmetry operation." The designs themselves are two-dimentional; it is their guiding principle which has only directed length, in mathematical terms, a vector. "

fig.2.13
M.C.Escher, 2 Mofis: Transitional System, 1937

2.3. The Regular Division of the Plane

Through several artistic journeys across Italy and Spain, from 1936 until 1937, M.C. Escher drew his inspiration from the colorful geometric patterns of Majolica tile and the decorative tracery in the stucco, and then he started to create his own interlocking patterns. Since his days as a student, his special fondness for symmetry, including upside-down, or half-turn, had intrigued him. Developing his interest, he classified existing patterns, which were made by the mathematician George Polya and illustrator Hagg at that time, so that he could create his own regular divisions of the spatial plane.

In analyzing M.C Escher's work, I realized that his work was focused on transitional symmetry. In addition, his work introduced another element: Metamorphosis, where one form can be seen to slowly change in subtle steps into another form, often becoming the positive image of the background shape around the original form (fig 2.14).

fig.2.14
M.C.Escher, Day and Night, Woodcut in Balck and Gray, 1938

Doris Schattschnedier, the author of *Visions of Symmetry*, identified M.C.Escher's four isometrics of the plane, which are basic patterns in M.C.Escher's division of the spatial plane. These include:
• Translation
• Reflection
• Glide reflection
• Rotation

In developing my thesis, I plan to use these four principles to develop a series of motion graphics.

2.3.1. Translation

A translation is the way of sliding all motifs the same way; a vector *v* shows the direction and distance of the slide (fig.2.15). By sliding a given motif left or right, up or down, it can moved to any of the four motifs.

In using this method, it automatically attracts the viewer's eye in a certain direction, because each object is oriented in the same direction. It appears in Figure 2.16 that all the flying pegasuses are flying towards the upper left hand corner of the plane.

fig.2.15

fig.2.16
M. C. Escher

2.3.2. Reflection

A reflection transforms figures to their mirror images across a line *m*, the reflection axis, which acts as a mirror (fig. 2.17). The left and right sides of a fish are mirror images of each other (fig. 2.18). The reflection axis, the center of rotation, could be implemented in several ways:
• vertical angles
• horizontal angles
• kaleidoscope effect
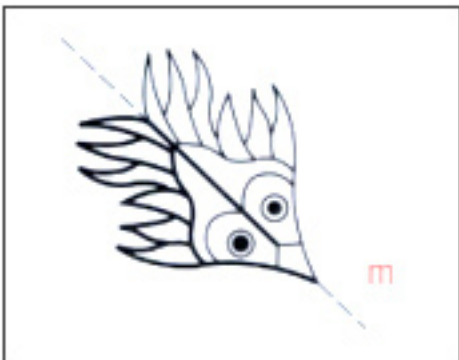
fig.2.17
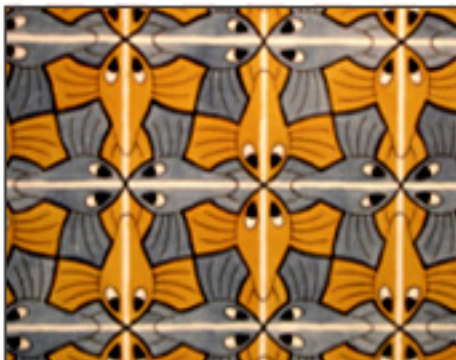
fig.2.18
M. C. Escher

2.3.3. Glide-Reflection

A glide-reflection is a two step translation: a translation with vector *v* followed by a reflection across an axis *m* which is parallel to v (fig. 2.19). Because each row of objects has an opposite direction to the row previous, it suggests to the viewer the illusion of more dynamic movement.
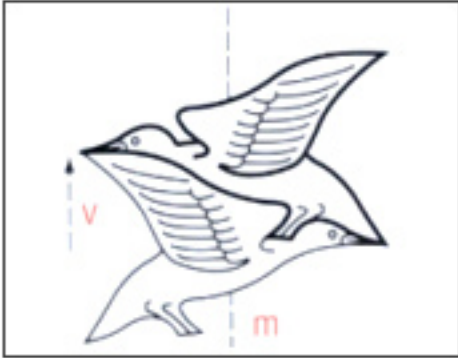

fig.2.19

fig.2.20
M. C. Escher

2.3.4. Rotation

A rotation turns figures about a fixed point *o*, the rotation center, through a specified angle (fig. 2.15). In Figure 2.22, the lizard rotates 90 degrees from the other. The fixed point would attract the viewer's eye by following the circles, which implement the principle of rotation.
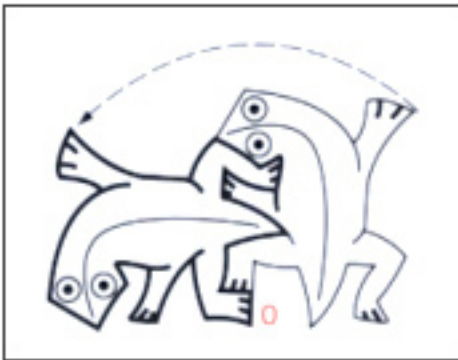
fig.2.21

fig.2.22
M. C. Escher

3. Process

Before the process of visualization of my final motion graphics piece, "The Dream of The Butterfly", I decided to experiment with each of M.C Escher's principles in separate motion graphics pieces. The idea behind this is to better understand each concept and to improve upon my skills in motion graphics before combining each concept in the final motion graphics piece.

The main concern of this thesis is the process of developing an effective solution in implementing patterns in the formulation of motion graphics. Avoiding excessive effect, such as three-dimensional modeling and special plug-ins, I concentrated on the transformation of basic two-dimensional shapes

3.1. A Series of Experimental Motion Graphics

For my series of experimental motion graphics, I chose to render the images in the style commonly used in east Asian countries. There are several reasons why I chose this style.

First, it has lots of empty space in the background (fig. 3.1). Jinyoung Kim, a student of Columbia University, mentioned in the paper, *Emphasizing Invisibility and Poetic Simplicity: Understanding Robert Mapplethorpe's Work in Relation to Asian Painting,*:

> "An abundance of empty space typifies Asian art. Air in the mountains, or central white spaces and clouds, create a zone of calm within paintings and simultaneously offer viewers a chance to participate in the artistic process, as they relentlessly pursue a perfection that is inherently incomplete. Unlike the common Western perception of empty space as flat, inert, and lifeless, Asian landscape paintings use voids to represent dynamic and active spaces linking what is visible to the invisible, allegorically symbolizing a harmony between each compositions subject and the universe. As such, the paintings become embodiments of specific moments in time; yet concurrently represent a potential flow of time created by the expressive use of empty space. This duality of meaning in Asian painting invites viewers to experience the essence of the subjects in relation to time and space on both physical and meditative levels."

By utilizing the empty space would provide a great benefit for controlling time and space. Being able to control these two elements are the core tenants in developing an effective motion graphics piece. An additional benefit in using this artistic style is that it would provide additional depth for the placement of graphics.

fig.3.1
Korean Painting, http://www.koreasang.co.kr

Secondly, as a designer from Korea, I have a large interest in creating paintings and illustrations in the styles prevalent in Eastern Asia. It's historical precedents of emphasis of form and shape, while using muted colors have influenced a great many of the works I have produced previously. The need to harmonize the traditions of the East Asian illustration style with the high technology of motion graphics presents an extremely difficult challenge, but could open many doorways towards future developments, and provide extremely valuable experience towards my future endeavours.

3.1.1. Translation (Size: 360 x 270, Length: 25″)

In this piece, I tried to visualize two kinds of motion; one is the butterflies' formation from translation derived vines, the second is their gentle and vibrant flying motions into the empty space. Using translated flower patterns as a background texture, it is differentiated from the growing vines by it's perceived depth of field. Therefore the slow camera movements allow for more effective depth perception in this piece.

In my first attempt, I tried to make the shape of the butterfly from the background (fig. 3.2). Therefore, two layers (the background and translated flowers) were duplicated with the butterfly's shape, which would break out from the flower layer and fly into the empty space. It was a good try in executing the visual illusion; however I wanted to find additional ways of transforming the flower patterns into butterflies. I realized that translated flowers' shape should be simple, which is for making patterns, so that they need to be ready to transform into other shape like butterfly.
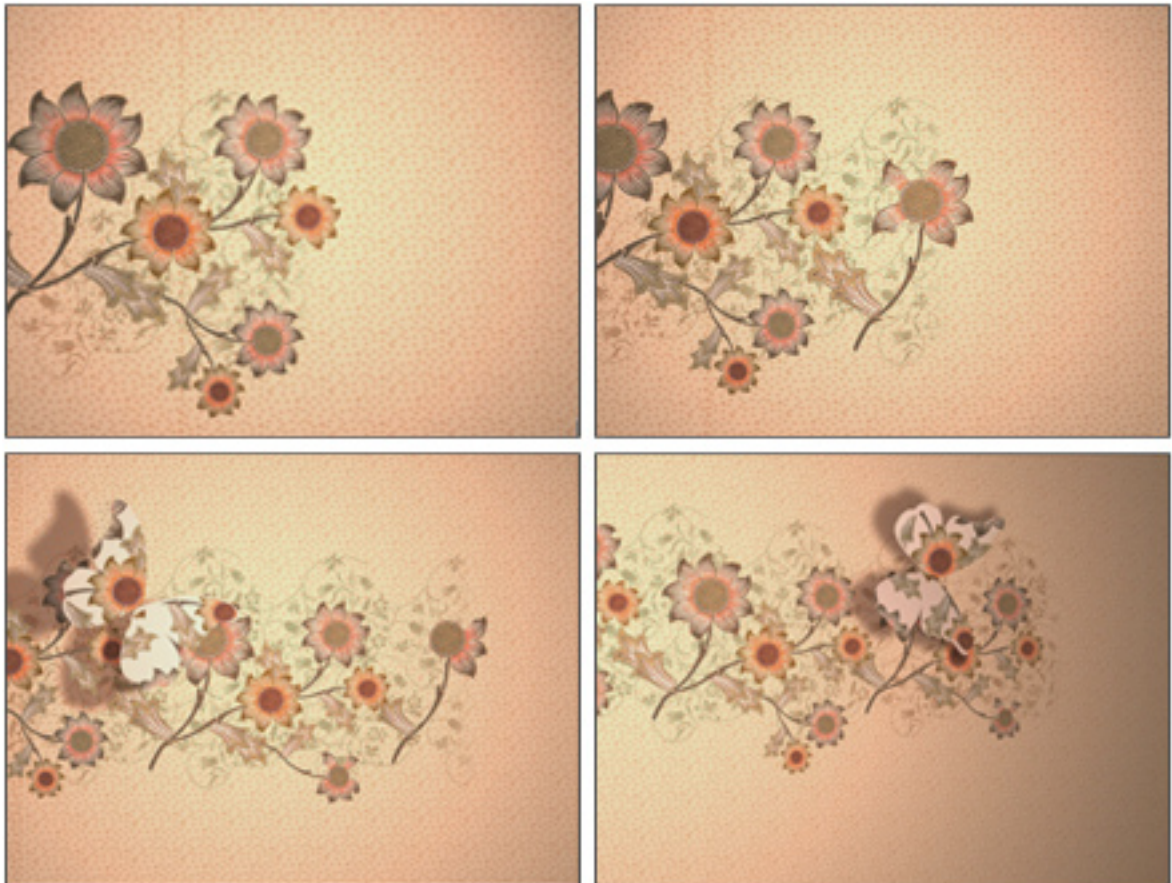
fig.3.2
The first Version

In the second version, after lots of sketches, I formulated the butterflies transformation directly from the vines, without the duplication of the background as in the previous version (fig. 3.3). Using this method, it produced a more effective way in creating the shape of the butterflies, however two issues arose from this. First was the ineffective lighting scheme used, which rendered the butterflies shadows too dark, and secondly was the camera position, which made the butterflies seem as though they were tumbling towards the ground (fig. 3.4).

fig.3.3
Idea Sketches

fig.3.4
The Second Version

In the final version, I changed the illustrational style and colors due to the fact that the white and thinly drawn butterflies were hard to distinguish from the background (fig. 3.5). A vine gradually grew into the shape of a butterfly (fig. 3.6) and the butterfly metamorphosed from this shape, fluttering away into space (fig. 3.7). After this initial action, the camera would pan out to show additional butterflies randomly flying away from the vine. To solve the lighting issue, I placed a shadow layer on top of the scene and resolved the camera issue through better placement.

fig.3.5
 Illustrations
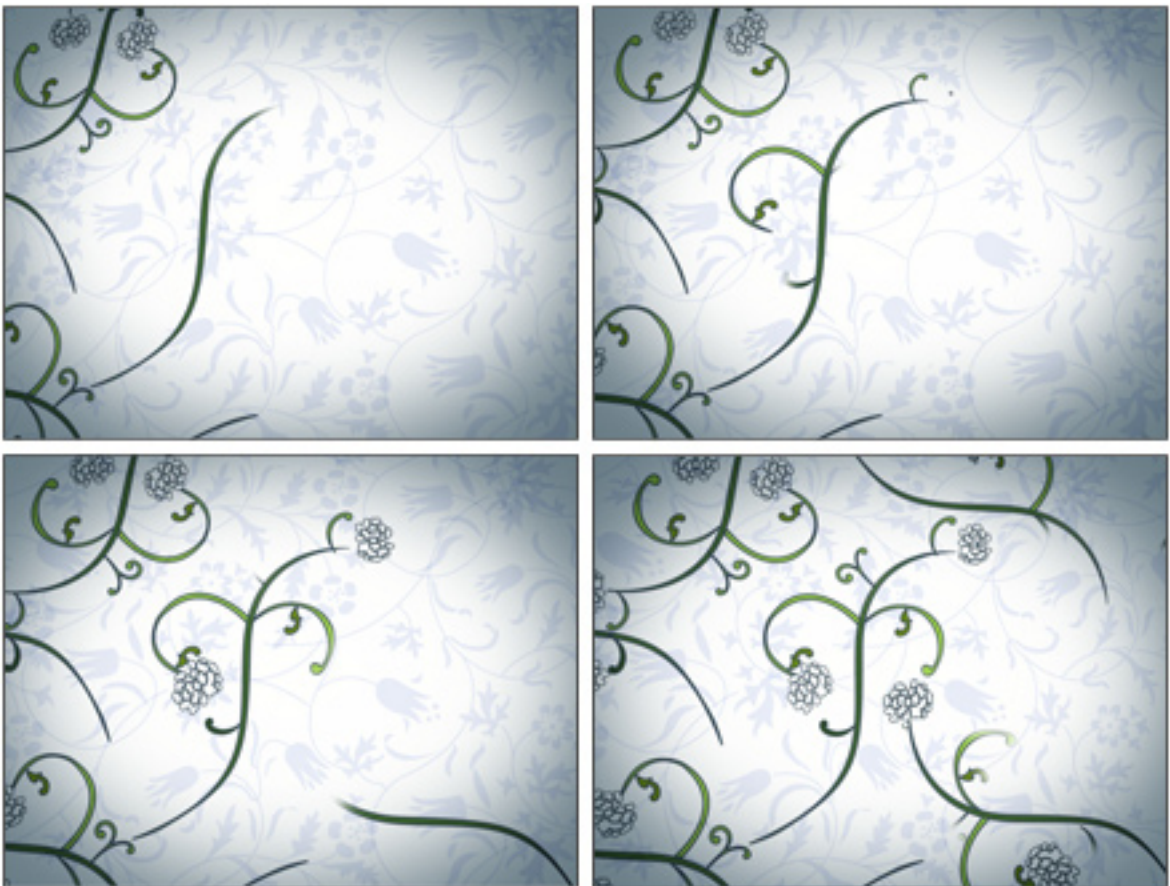
fig.3.6
The Final Version
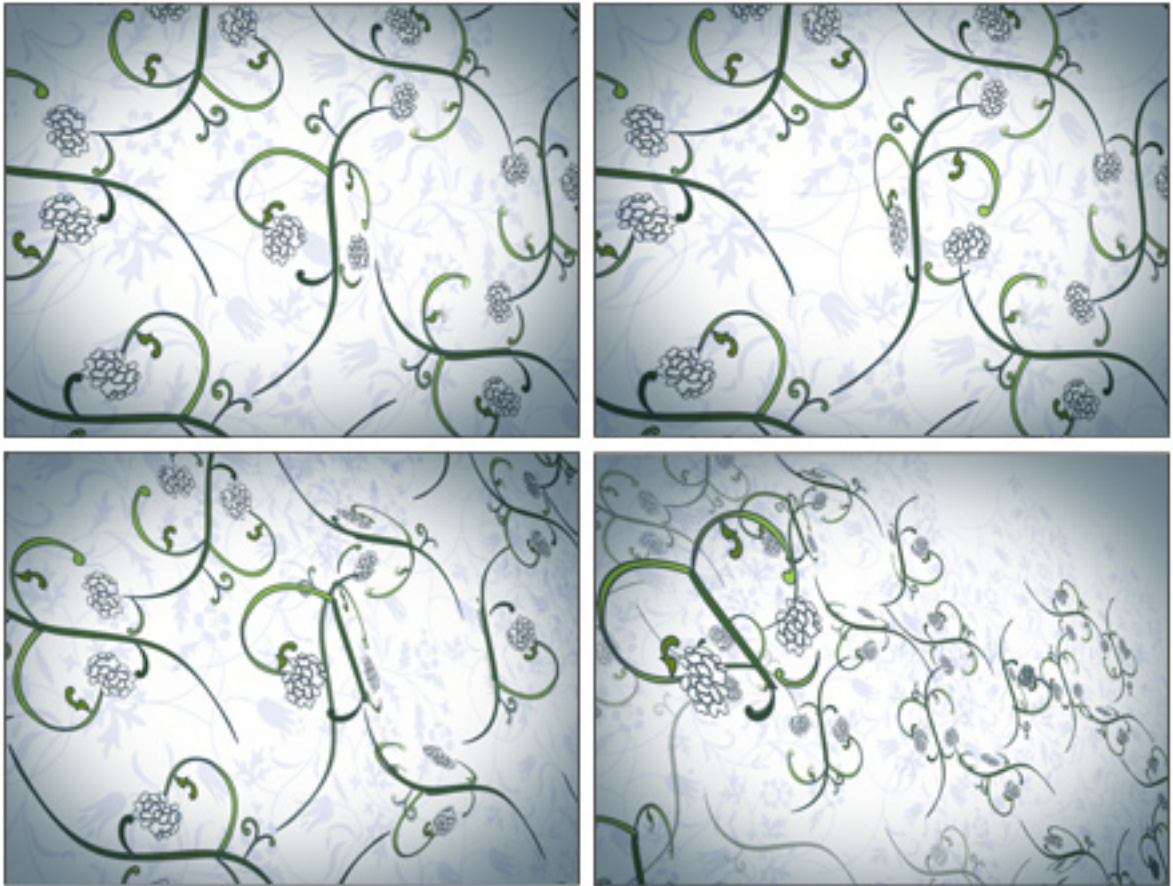
fig.3.7
The Final Version

3.1.2. Reflection (Size: 360 x 270, Length: 26″)

All elements of this piece, the rocks, flowers water and butterfly, all appear on the main stage through the use of reflection. Therefore, all items were designed with this concept, so that I created half of the final shape (fig. 3.8). A butterfly that has 2-fold symmetry became the perfect subject for this piece.
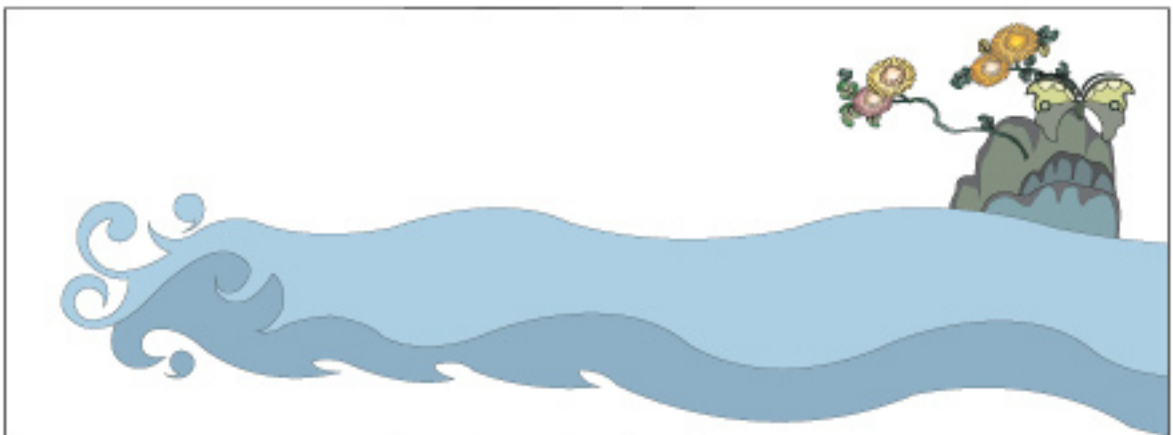
fig.3.8

I utilized a moving kaleidoscopic image as the background to use more instances of the reflection technique (fig. 3.9). The reflection axis used for the rocks, flowers, butterfly and water was the vertical, while the main butterfly also appeared as a reflection on the water, using a horizontal axis to achieve this effect (fig. 3.10).
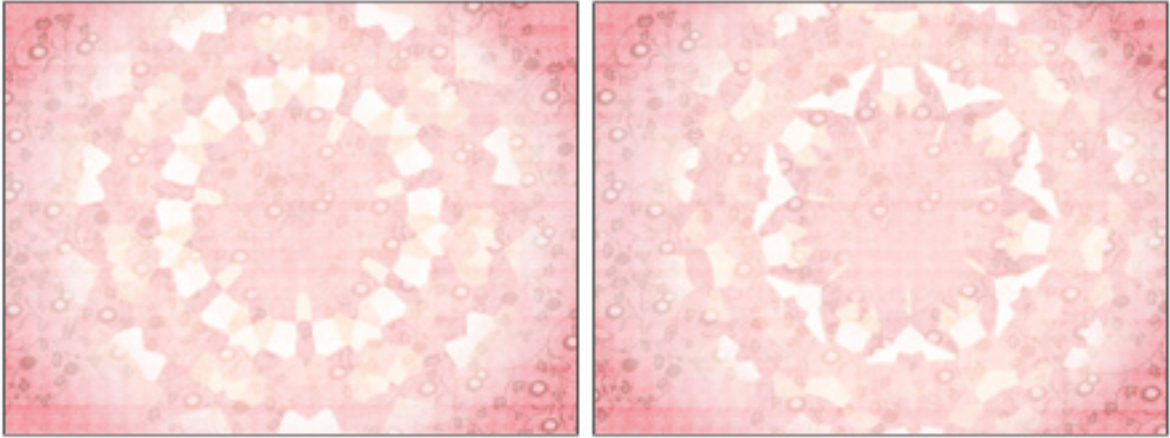
fig.3.9
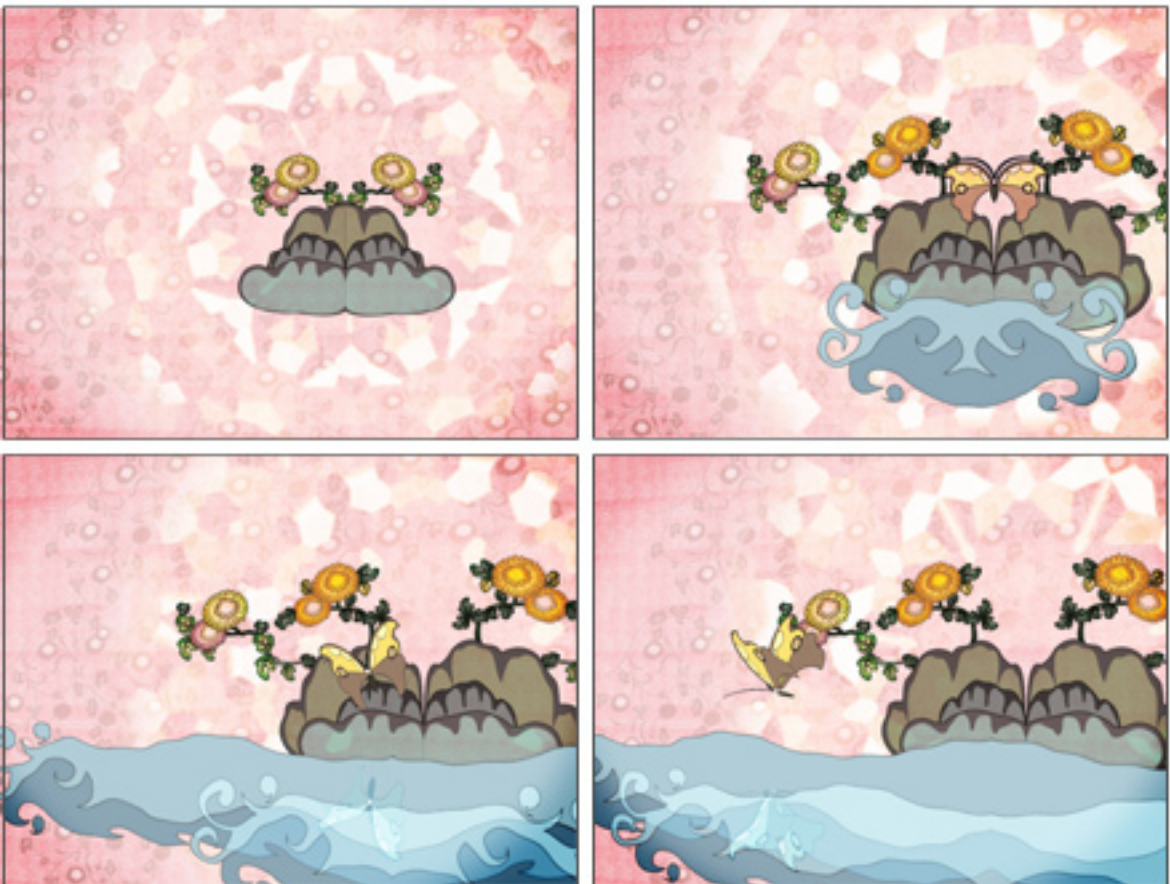
fig.3.10

My intention was to give this piece the feeling of the east Asian style of painting, providing for lots of empty space and a unique illustrations emphasizing style and color. I then combined these elements with cartoon-styled illustrations. I paid special attention to the reflection of the butterfly in the water, giving this a realistic impression.

3.1.3. Glide-Reflection (Size: 360 x 270, Length: 23")

Every object has its own glide reflection on the surface of the pond. One duck steadily moves from right to left on the stage, whereas the glide reflection of the duck travels in the opposite direction. After experimenting in several ways, I decided to use two wings of the ducks (fig. 3.11). When these two ducks meet at a certain point, their two visible wings turn into the wings of a butterfly, then this newly created butterfly flew slowly into the empty space provided (fig. 3.12).
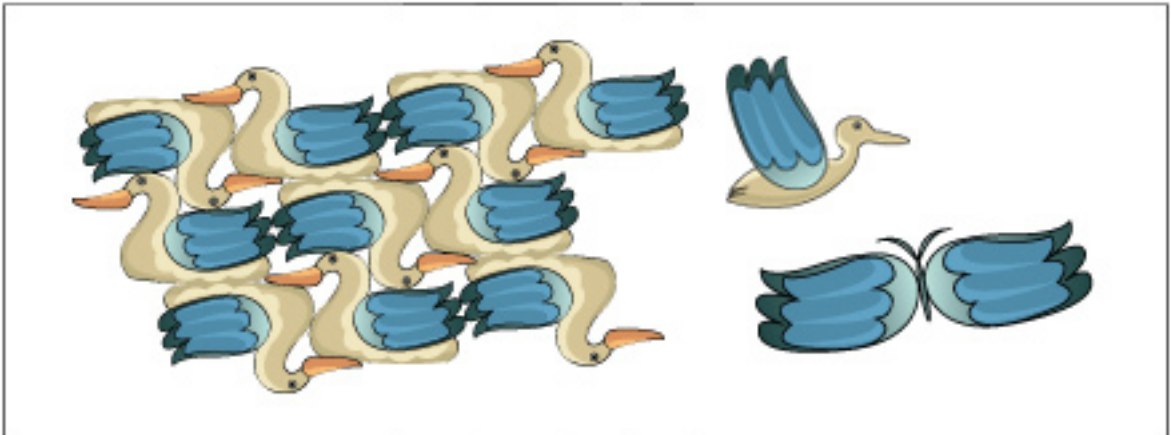
fig.3.11 Illustrations
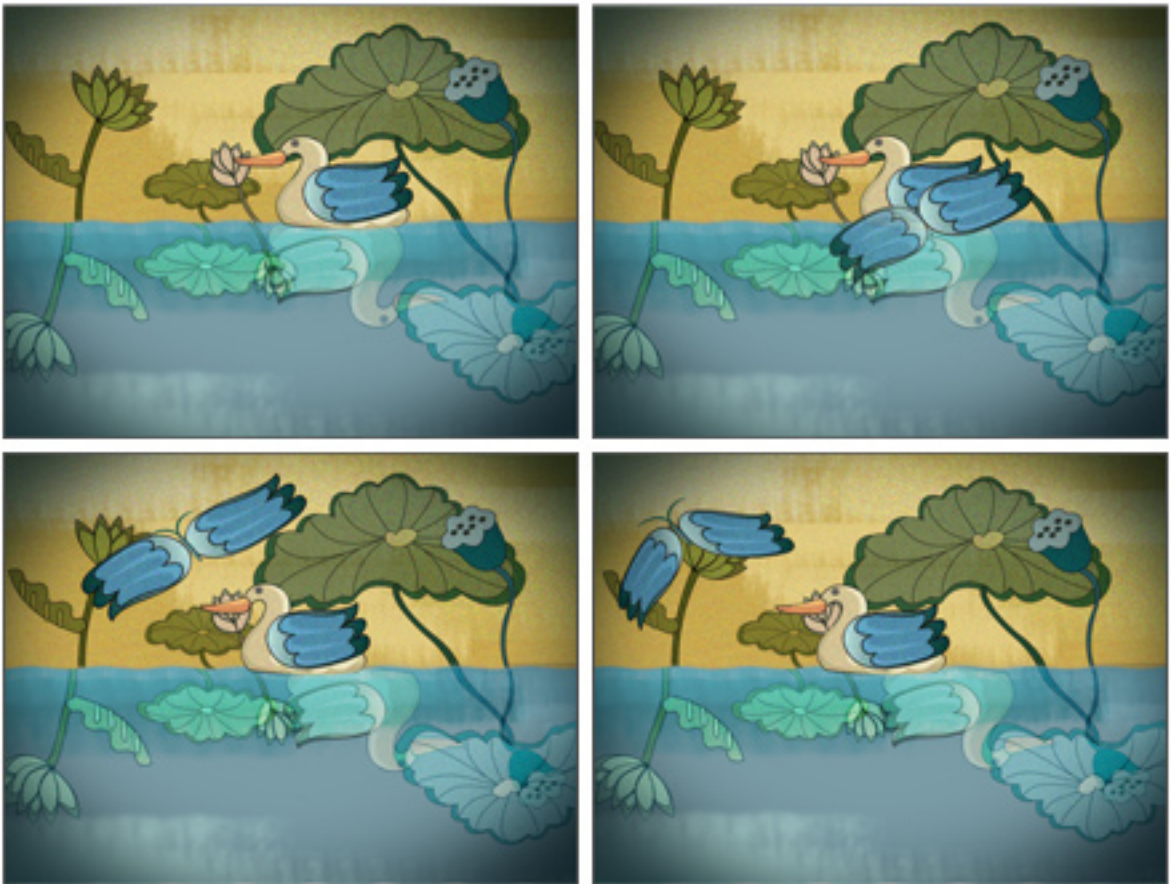
fig.3.12

3.1.4. Rotation (Size: 360 x 270, Length: 24")

In the example of rotation, I generated a butterfly that would transform into a flower, in result of rotation and duplicating itself. To give more effect, I put a little ornament to the top of the butterfly's wings to emulate the petals of a flower. After rotating a butterfly six times, in 60 degree, I could get proper shape of flower, and it could separat into two flowers unexpectedly (fig. 3.13). I used circles as background images to emphasize the concept of rotation. To give contrast between butterfly and background images, all items were designed with simple vector images (fig. 3.14).
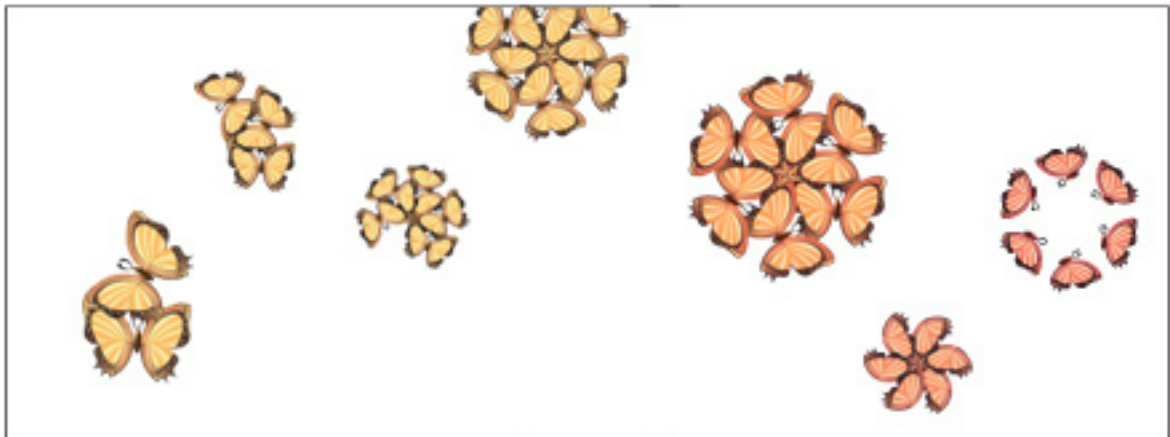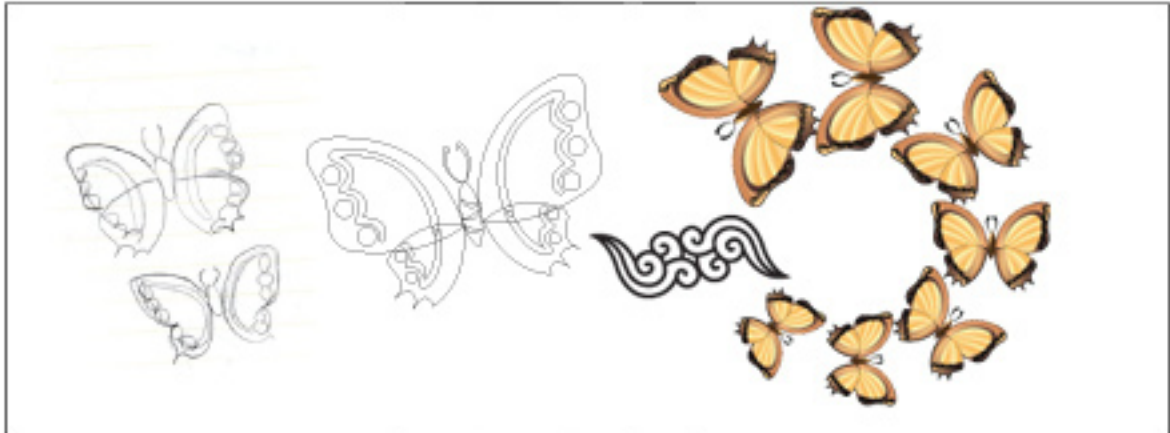

fig.3.13

fig.3.14

In the beginning, a rotating butterfly was duplicated six times in a counterclockwise motion, which resulted in creating a flower with their left wings. This then results in having the remnants of the butterflies fly away into space, while the flower petals remain, rotating on the z-axis. The camera then focuses on another butterfly in movement, creating foot steps, which spun on their own axes. Gradually, as the camera pans out, all of the elements are absorbed into the center of the scene (fig. 3.15).
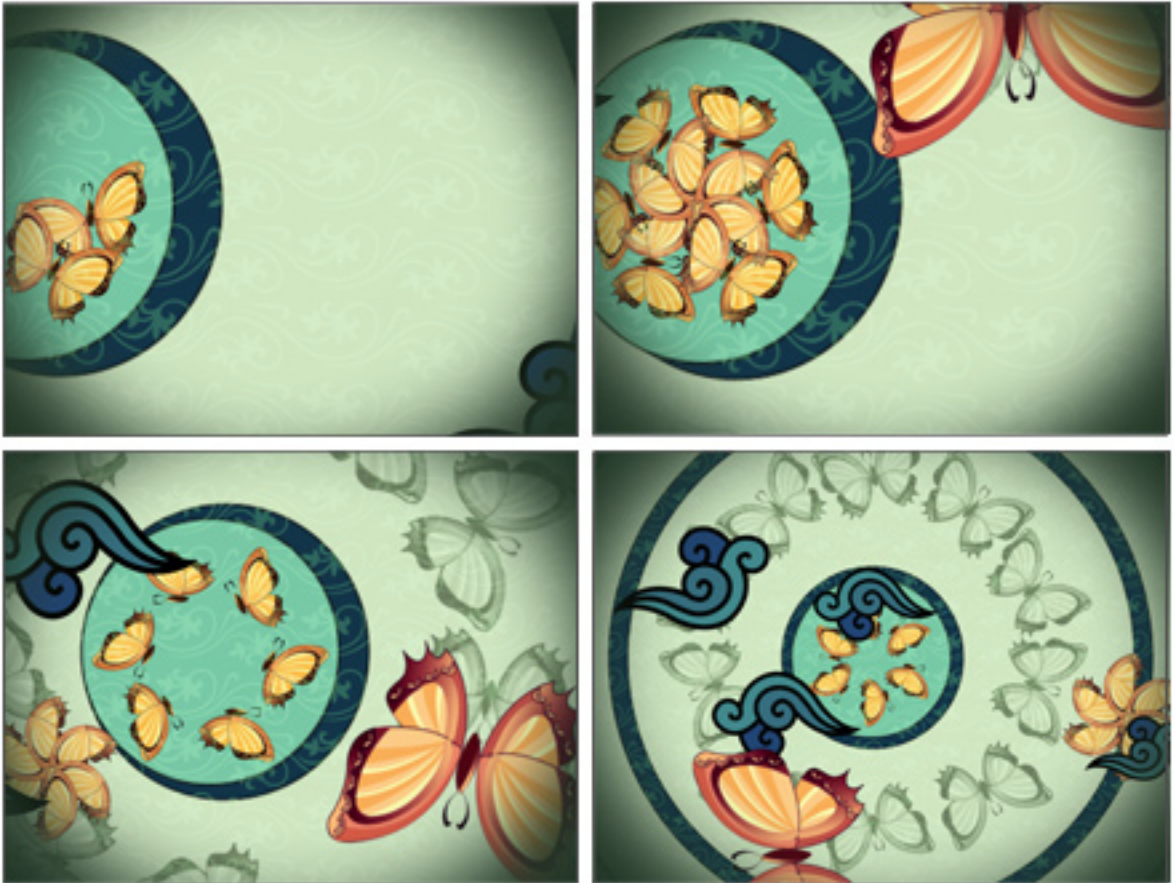

fig.3.15

3.2. The Dream of the Butterfly (Size: 720 x 540, Length: 1' 14")

3.2.1. Story Line

In creating this project, I developed a short story about a butterfly dreaming of its journey. As I mentioned previously, my inspiration was the story of Chuang Tzu, resulting in my butterflies being in a constant flux of metamorphosis, causing the butterflies to not understand who they exactly are. Consequently, the butterfly could turn into anything they dreamed of. The main butterfly in my story, starts its journey transforming from a shape into another form, such as flowers, clouds and rain drops. Also, at the end of the scene, they return to the metaphor of the growing vine, and are assimilated into the vine. The ending means that all occurrences in nature, no matter how they appear, are cyclical in nature.

In the first scene, three butterflies are born from the vines that have grown off a branch on a tree. Of these three butterflies, the camera follows the journey of one butterfly (fig. 3.16). As the butterfly makes it's journey through the vines, the second scene starts, showing multiple butterflies transforming into flowers. The camera angle was specifically chosen to show these butterflies transforming into flowers from the top. The movement of the nine butterflies create flower petals at each 60 degree increment around their circular path (fig. 3.17).

After the butterflies create nine flowers, the butterflies separate into two parts; each comprised of either the right or left wing of the original butterfly. The left wings of the butterflies become blowing flowers, while the right wings remain as the petals on the created flowers. After this, the camera shifts 90 degrees down to serve as a frontal view for scene three.
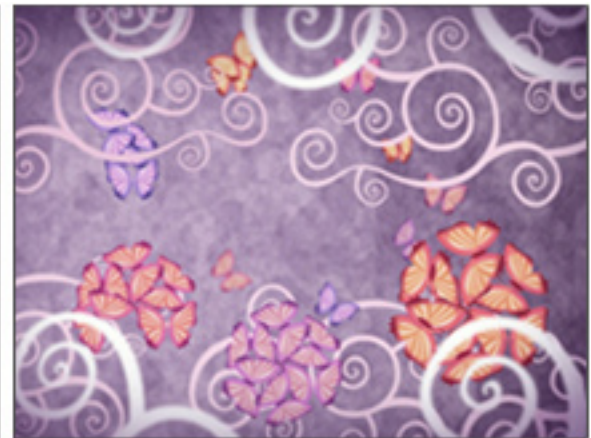

fig.3.16
Scene #1: The birth

fig.3.17
Scene #2: The Dream

Scene three starts off with stems emerging from the remaining flowers (fig. 3.18). After this action, the camera moves from left to right to show the flower garden until a group of butterflies form to create clouds and rain drops. Scene four starts when rain starts to fall, creating ripples on the surface of pond. Fish emerge into view from beneath the surface (fig 3.19). In the last scene, two butterflies flutter back to the vines from which they were created from (fig. 3.20).

fig.3.18
Scene #3: Flower Garden

fig.3.19
Scene #4: Rain

fig.3.20
Scene #5: Homecoming

3.2.2. Graphic Elements

The basis of my illustration style was geometric and organic, using such shapes as a circle, an ellipsis and a spiral. These shapes are naturally occurring in nature, and blended well with creating movement and transformation in my piece. Also their curved shapes are good at making elegance and refinement motion by repeating and duplicating in various ways, for the main concept of the project, which is illusory dream. Additionally, in order to simplify the transitions from shape to shape, I treated each plane as a piece of cut paper. This method also enabled my work to give a feeling of perceived depth, and differentiated well from the background layer. Through using these shapes in the creation of patterns, and the repetition of form enabled me to achieve my main goal of visual illusion.

fig.3.21

3.2.3. Color

In creating my vision of fantasy and a more dreamlike state, I chose a color palette using an analogous color scheme of violet, mauve, magenta, indigo and violet. According to Wikipedia, purple symbolized royalty:

> "Dating back to Roman times, when clothing dyed with Tyrian purple was limited to the upper classes due to the rarity and thus, price, of the dye. The color, which was closer to crimson than our idea of purple, was the favored color of many kings and queens. As a result of its association with royalty and luxury, the term purple is often used to describe pretentious or overly embellished literature. For example, a paragraph containing an excessive number of long and unusual words is called a purple passage."

Robert J. Hoss, MS is author of *Dream Language: Self-understanding Through Imagery and Color*. A scientist and former researcher in the field of light energy, Hoss is Executive Officer and Past President International Association for the Study of Dreams. According to Hoss, "colors in dreams are attached to thoughts, beliefs, desires, behaviors and emotions; purple means intimacy, magic, and union."

Purple is not only elegant and luxurious in nature and in the emotions it evokes, but it also mixes well with the other colors chosen in an analogous color scheme, such as pink, red violet and violet blue/indigo.
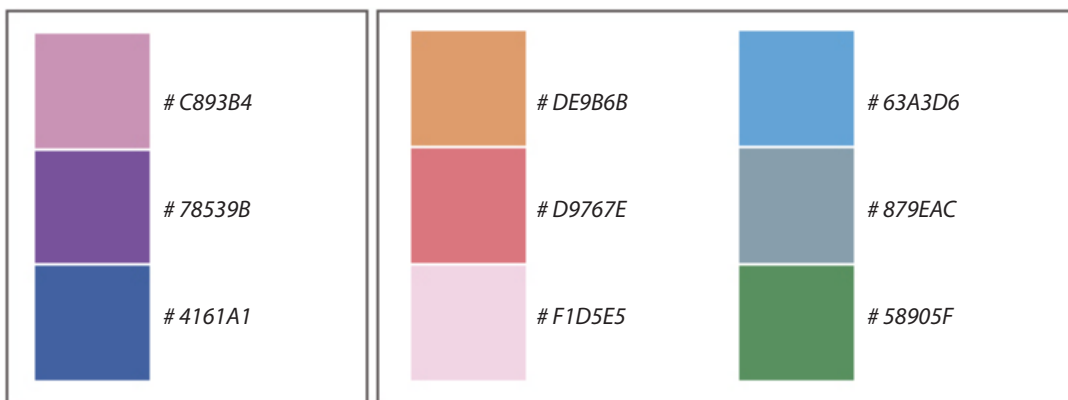

fig.3.22
Main Colors

C893B4

78539B

4161A1

fig.3.23
Sub Colors

DE9B6B

D9767E

F1D5E5

63A3D6

879EAC

58905F

In creating the butterflies, I used orange and yellow scheme, which contrasted nicely with the color blue used for water, and harmonized nicely with the shades of purple used throughout the project. In addition, selecting pale blue and green as sub colors gave a feeling of calm and serenity, which was suited to the main concept, a dream (fig. 3.23).

fig.3.24

3.2.4. Time and Space

Dealing with time and space is essential in developing a successful motion graphics piece, and they are fundamental component of motion design, integrating with other elements: form, sound, and effects. Through developing all of my imagery in Adobe Photoshop and Illustrator, it made it easy to incorporate these designs into After Effects and place them in their proper context.

Layer & Depth
As the project is intended to be developed on a small stage size (720 x 540) and short length (1' 14") , I used slow camera movements for maximum impact. To generate a feeling of space, I used the camera's depth of field to blur certain elements as they shifted into and out of focus (fig. 3.24). Therefore, after the first vine generate the first butterfly, it placed backward, and the second vine appeared in the front of the stage. At this point, the first vine became blurred so that they got individual depth to the camera. This principle was applied to other scenes to get more realistic view. In the right image of fig. 3.25, since many layers were shown at the same time, the proper expression of depth was important. Focusing on the middle of layers, a white vine that was moving forward got blur image, even though it placed on the top of layers. Also, all flowers got different blur according to distance to the camera.

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fig.3.25

In order to show certain elements in space, I shifted the camera angles to change the perspective. This enabled me to show the stems of the flowers, and it gave them depth in my project (fig.3.26). Also, the flight path of the butterfly as it flew through the flowers gave the visual illusion of depth and layering (fig. 3.27).
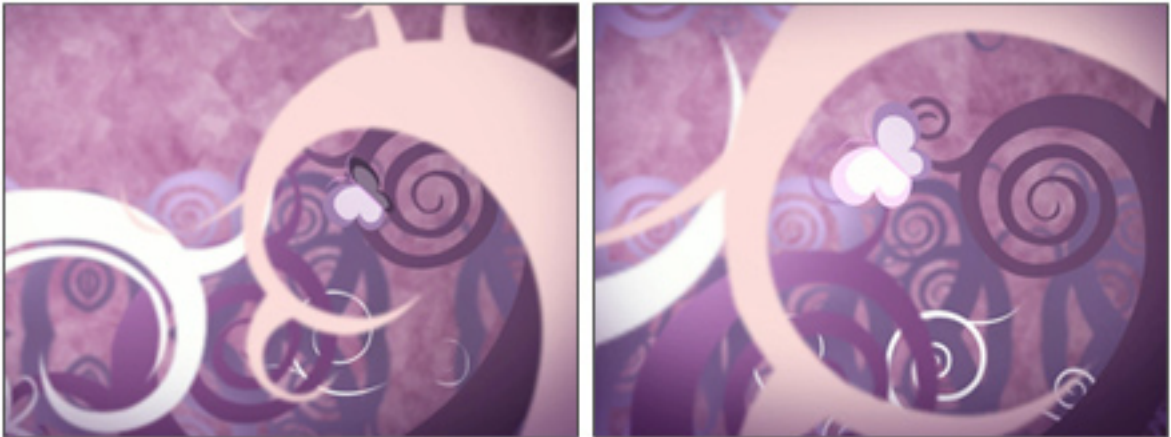

fig.3.26

fig.3.27

Speed

Over all, I used slow camera movement, however, I adjusted the rhythm of speed to give motion more intense effect to translations of scenes. For example, in fig. 3.28, when the main butterfly fluttered into the inside of a vine, the camera zoomed in quickly so that it allowed rhythmical and dynamic mood in the project, with getting attention of viewers. Also, it formulated visual illusion that the main butterfly seemed like to soak into the vine. In fig. 3.29, the camera shifted 90 degrees down quickly to get a frontal view, therefore, stems emerged form the flowers unexpectedly. After this, the camera moved slowly from left to right to display the flower garden. The adjustment of speed allowed the project to get more dynamic and vivid feeling.

fig.3.28
Between scene1 and scene2

fig.3.29
Between scene2 and scene3

3.2.5. Visual Effect

Background

In creating the background image, I used the fractal noise effect, which can provide random and natural movement to the plain background. It slowly changed its shape and shade so that it seems like moving clouds or smoke, representing fantasy or dreaming. The title, "The Dream of the Butterfly" also kept the same look and feel of the background, so it appeared smoothly at the empty space next to vines, when applying several moving masks (fig. 3.30).
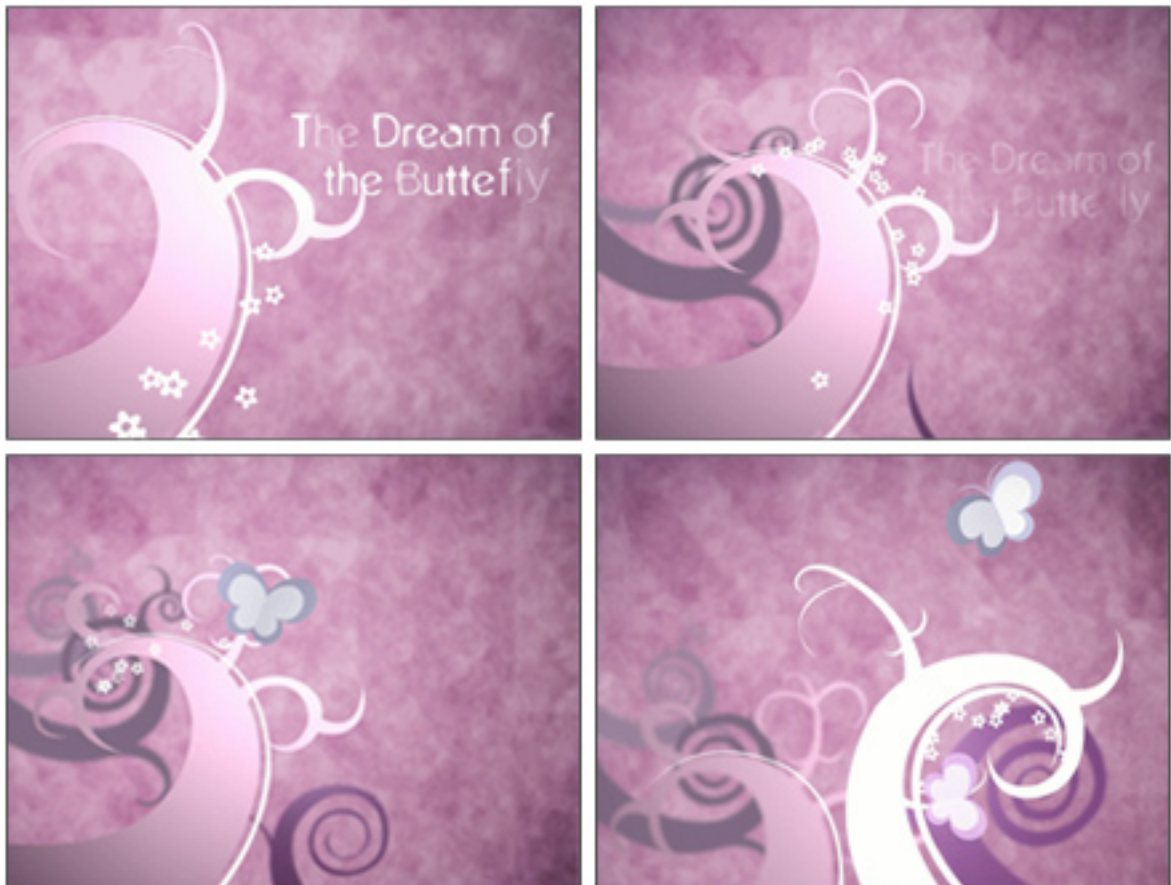

fig.3.30

Transformation

In creating this project, the challenge was developing different transformations, each fresh and unique to the viewer. One example is the butterfly growing from the vines and the rotation of the butterflies into flowers. For these transformations, I attempted to create various conversions for them, based on experiments in the series of short motion graphics. In the translation piece, I formulated the butterflies transformation directly from the vines. However, in the final project, I developed the butterflies from the negative space that followed vines' growing. After gradually appearing their shape from the empty place, butterflies started to flutter their wings and departed for their dream journey (fig.3.31).

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Rotational butterflies transformed into flowers, as I had made previously in my short experiments with rotation. In the final movie, I placed 9 butterflies spirally by giving different depths and speed to each butterfly. Therefore, each flower had it's own unique depth and various floating petals (fig.3.31).
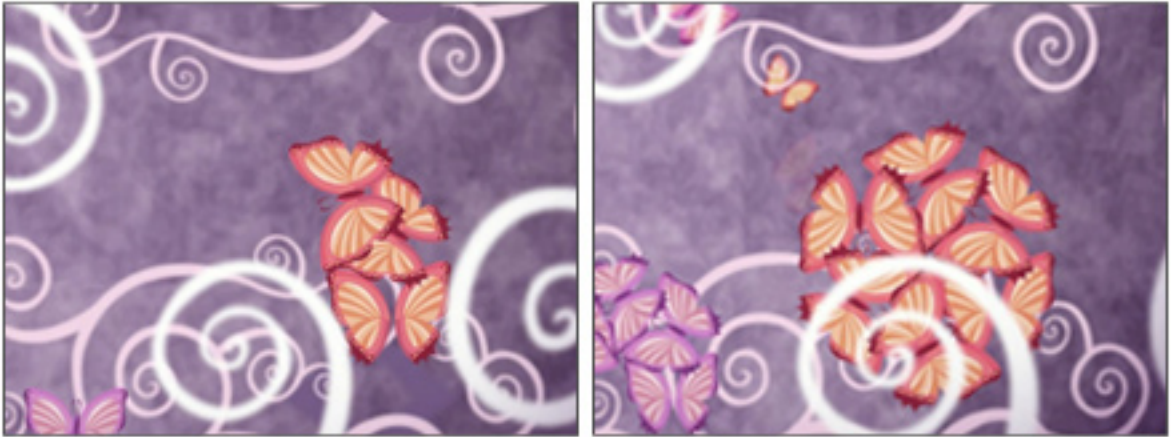

fig.3.31

Additionally, some of the objects transform into other objects, without a change in their form. The pattern of the vine shifts into a symbol for wind (fig. 3.32)and a grouping of butterflies become a cloud (fig. 3.33)

fig.3.32
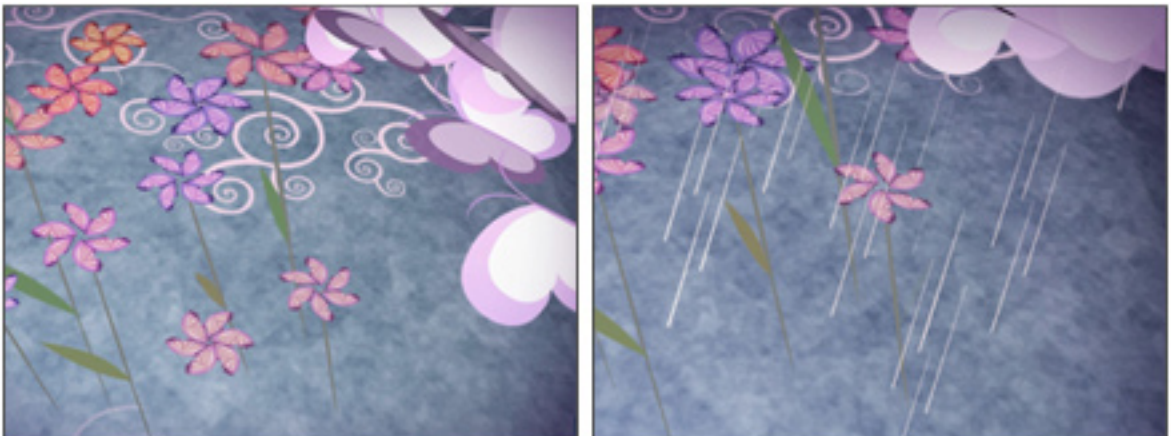
fig.3.33

Patterns

By repeating geometric shapes, I made translated patterns for water, rain, and vines (fig. 3.34). Translating circle patterns inside of the water presented doubled patterns spontaneously, and also, the inner patterns gave feed back to the motion of the rain drops. To make ripples on the water's surface, every pattern were appeared to spread from the inside out, and they disappeared gradually.

All vines were the same shape and they were reproduced and translated after reflecting each other on a vertical or horizontal axis. It provided not only interesting patterns with organic perception, but also solid structure.
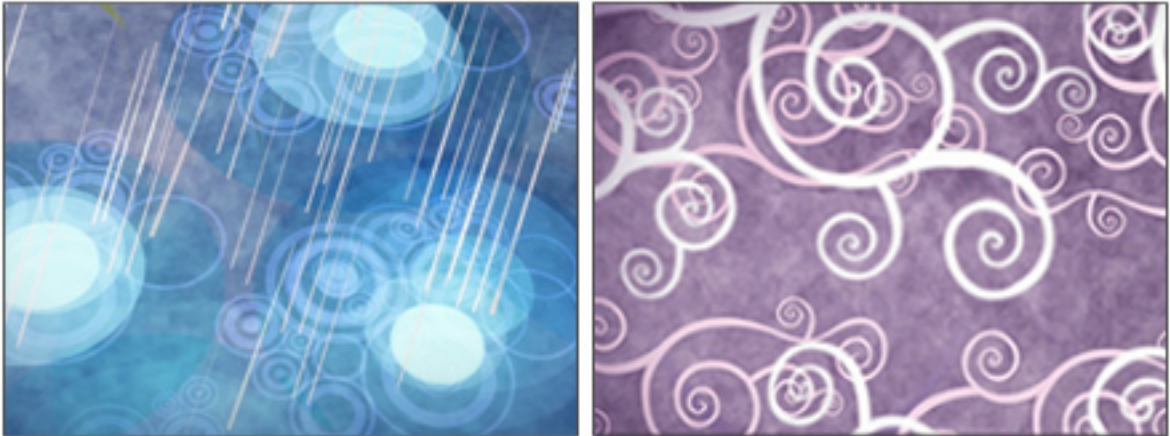

fig.3.34

Additionally, vine images were reflected as a background pattern. Because I planned to change background color naturally, pale violet color of vines that were placed back side of the stage moved, reflecting and making patterns (fig. 3.35). While the vine pattern moving, background were changed its color.

fig.3.35

Fish were duplicated into a kaleidoscope effect as they swam in the water (fig. 3.36). Combining or separating randomly, fish's patterns were harmonized with other patterns: water, ripples, and rain drops. Also the fish had a different perspective, because their image was dissipated by the water.
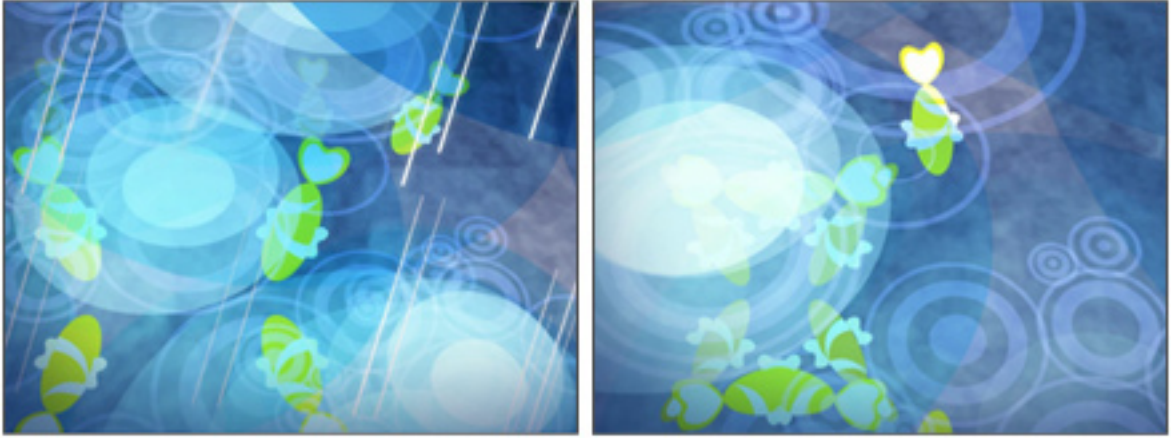

fig.3.36

4. Summary

In creating my project, I received feedback from my committee members on a regular basis through individual and group meetings. Throughout my development stages, I received feedback from ten individuals, and incorporated it into my project, refining my patterns and effects for visual illusions. A majority of the testing group enjoyed the aesthetic style of my project, which is east Asian illustrations and color schemes, but they felt a bit constrained by the camera movements and lighting schemes, especially in the scenes where the camera changes its point of view.

For the issue of the camera, I adjusted all keyframe according to the proper ease value and velocity, which are continuous bezier keyframe and auto bezier keyframe. After numerous tests, I received more content results. To solve the lighting issue, I produced a shadow layer on top of the scene for a series of small pieces, providing basic lighting below the shadow layer. As a result, the middle of scene was steadily illuminated so that they received a more stable lighting effect. It also prevented objects from being too dark when they were close to the camera. For my final piece, I placed multiple lighting effectively and achieved the desired result.

Some people pointed out that several parts needed more attention to detail, and the need for background music to create a mood. I tried to touch every scene and motion more delicately. For example, the main butterfly's subtle movement provided intimate transitions between scenes. For this, I placed the main butterfly in most of the scenes, which is incorporated with other objects. Also, in the third scene, flower stems which are shaken by the wind vertically provided the project with more delicate expressions.

I also planned to make background music using Sonic Foundry Avid Pro, which is sound editing software that mixes various loops. I finished only one for the "Translation" piece and making music will be continued further. Therefore, even though it has room for modification, I was able to receive positive feedback on my project.

5. Conclusion

The purpose of this thesis is to create a two dimensional motion graphics project based on geometric patterns and transformations. In order to achieve this goal, I studied the theories of creating visual illusions, and the works of M.C. Escher. Through this research, I chose to use patterns as the vehicle to create my visual illusions. I developed a series of four motion graphics outlining the four different stages of visual illusion: translation, reflection, glide-reflection and rotation. After completing these motion graphics pieces and mastering the techniques for visual illusion, I applied this knowledge towards my final piece, " The Dream of the Butterfly".

Consequently, translating, repeating, reflecting and rotating patterns translate into countless applications in the field of motion graphics. Through the development of this thesis, I have gained valuable knowledge, and I plan to develop this concept further in my future works.

As a designer who seeks to challenge herself with developing new aesthetic techniques in each work, I've realized that the worth in developing new skills is essential for growth as a graphic designer. Mimicry of already established and contemporary design trends do not allow for such growth. Designers should strive to be on the cutting edge of design, affecting society through our design decisions. In this context, this thesis project allowed for me to establish my own style of work.

6. Appendix

Idea Sketch
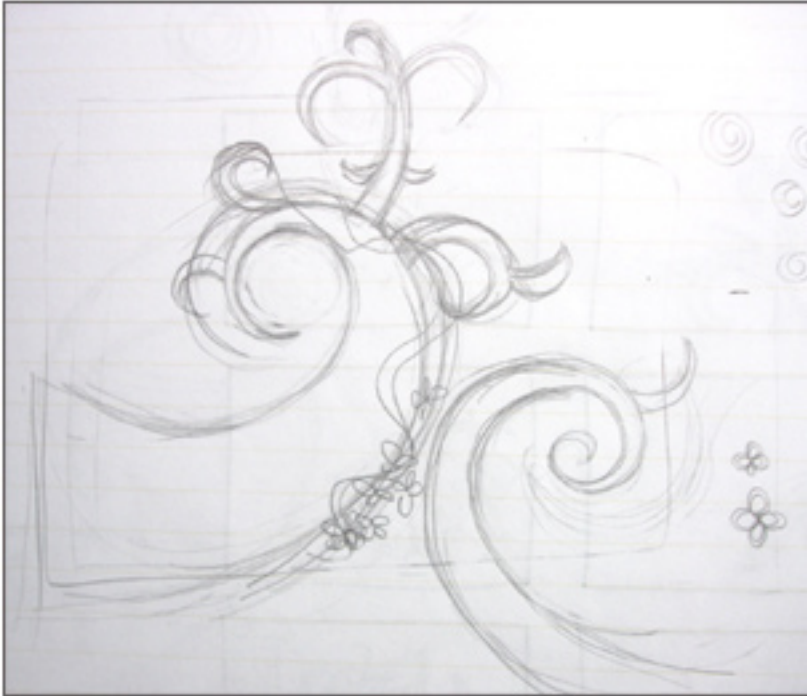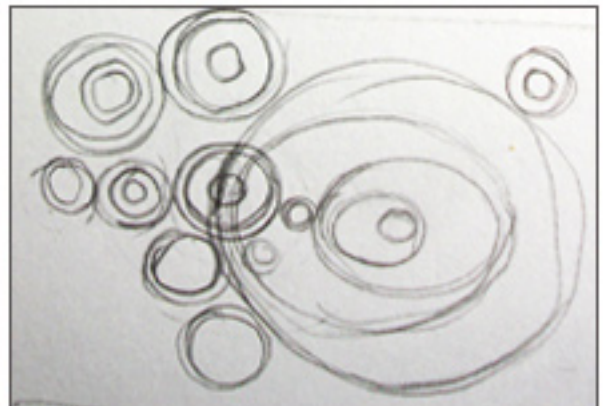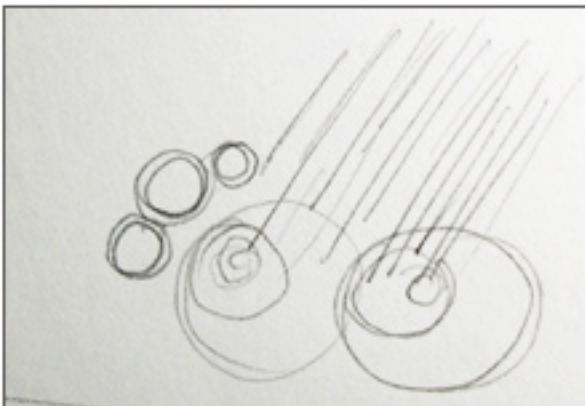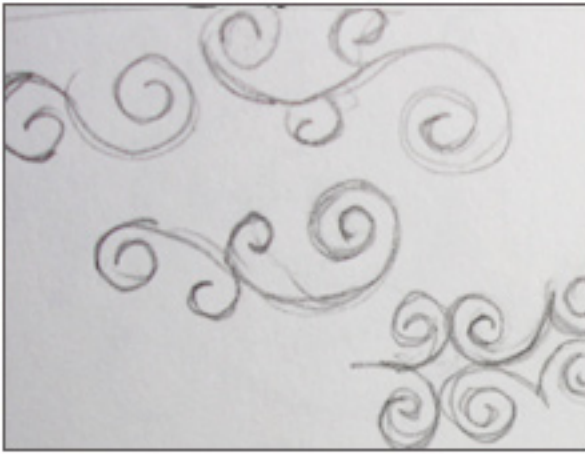
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Online Resource

George Pólya
http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Polya.html

M. C. Eshcer:
http://blog.naver.com/mathmky?Redirect=Log&logNo=90004956104
http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Escher.html

Korean Painting:
http://www.koreasang.co.kr/?doc=cart/item.php&it_id=1148025053
http://www.koreasang.co.kr/?doc=cart/item.php&it_id=1148021358
http://www.koreasang.co.kr/?doc=cart/item.php&it_id=1148025973

Optical Illusion:
http://www.magritte.com/
http://www.michaelbach.de/ot/
http://psylux.psych.tu-dresden.de/i1/kaw/diverses%20Material/www.illusionworks.com/html/hall_of_illusions.html
http://www.psy.ritsumei.ac.jp/~akitaoka/sakushinokagakue.html

Taoism:
http://www.eng.taoism.org.hk

Tesellations. org
http://www.tessellations.org/index.htm

Wikipedia (Symmety):
http://en.wikipedia.org/wiki/Rotational_symmetry
http://en.wikipedia.org/wiki/Bilateral_symmetry