

The Butterfly Effect: Movement between Newton's Deterministic Laws and Chaos Theory in Digital Contemporary Fractal Paintings

Dr. Mohra Hamed Mohammed

Lecturer - photography at the Faculty of Fine Arts, Mansoura University

mohrahsakr@mans.edu.eg

Abstract

Through the years, movement has always been part and parcel of the art of painting; whether through illusion of physical movement on canvas or through directing viewers eyes within a painting. This research discusses the concept of movement through paintings utilizing the digital medium. It examines movement through two viewpoints, first: the illusion of physical movement, second: movement as a vital principle contributing to the success of a painting. In the paintings, physical movement is represented through painterly expression of birds and butterflies' while flying, and movement as a design principle by using various painterly elements to express the concept of movement and rhythm.

Moreover, the paintings are categorized in three groups; each group offers a visual representation of one of Isaac Newton's laws of motion. However, they are fractal paintings based on Fractal Geometry; a field relating to the study of nonlinear chaotic systems. In the philosophy of science, chaos stands in opposition to Newton's determinism. Thus, these paintings offer a kind of paradox between the topic it embodies, and the tool used to bring them to life.

This research follows a descriptive analytical method to describe and analyze the concept of movement in both Newton's laws and Chaos Theory. In addition, it also follows an experimental method through paintings representing deterministic movement through a chaotic tool. Results include relative success of use of digital Fractal Art to represent the illusion of actual movement in accordance with Newton's determinism as well as movement as a painterly principle within the artworks.

key words

Fractal art – Digital Painting - Concept of Movement - Deterministic Philosophy - Chaos Theory.

An Introduction

When the English scientist Sir "Isaac Newton" put Sir. Issac Newton (1643 AD - 1727 AD) his famous Three Laws of Motion that was the embodiment of his philosophy called Determinism. Determinism means the belief that every event or action is the inevitable result of another event or action that precedes it, that is, we can predict in advance any event or action in the future, if we know what precedes it (Trump 1998).

In the second half of the twentieth century, another philosophy appeared that contradicted Newton's deterministic philosophy, known as the "butterfly effect". The butterfly effect is a term for a theory in physics known as Chaos Theory. The theory is concerned with developing a scientific explanation for the complexities of nature that may appear to us in a state of chaos;

As predicting climate conditions, and interpreting cloud formations, river flow, and bird movement.

This research presents graphic paintings that are a continuation of the researcher's experience in the art of fractal, which she started with her PhD in digital photography around 2006 AD. And Fractal Art is a digital art that relies in its production on Fractal Geometry, which is concerned with the study of chaotic systems, and the development of models capable of providing an explanation for complex phenomena that may appear to us in a state of chaos, such as the movement of birds and butterflies, lively and set off.

The research paintings were presented by the researcher in an art exhibition entitled "The Butterfly Effect" in the Great Hall of the Faculty of Fine Arts, Helwan University. The exhibition was opened on February 10, 2018. The paintings represent in fact a kind of paradox, as they provide a graphic expression of Newton's laws of motion, which is an embodiment of his deterministic philosophy, which believes in accurately predicting the state of bodies and systems in the future, while the path taken by the researcher in producing these works follows another contradictory philosophy, the philosophy of chaos, which She believes that any change in the state of bodies and initial systems makes us unable to predict their future states.

Search problem

Expressing the concept of motion according to Newton's theories and philosophy (determinism); And this is in the form of graphic works using the digital medium represented by "fractal art", whose production follows another philosophy known as the theory of (chaos) or (butterfly effect), which is concerned with the study of non-linear chaotic systems. The research will also be exposed to the concepts of movement and rhythm within the graphic work through a photographic experiment that exploits the digital medium, in particular the "art of the fractal".

research importance

The importance of the research lies in shedding light on two philosophies in science that are located at opposite ends of each other to a large extent that aim to understand and explain the nature around us, especially the concept of movement, namely (determinism) and (chaos) Chaos. The research also provides a practical experience that combines the concept of physical movement and movement from a pictorial standpoint through the digital medium, especially "fractal art", one of the most important fields of contemporary digital photography, which works to enrich the Arab library, and the artistic community in general, with a new artistic and research experience. and contemporary.

research aims

- Identifying two philosophies in natural science that are concerned with the interpretation and understanding of movement physically, namely the (deterministic) philosophy represented by Newton's three laws of motion, and the philosophy (chaos), which follows the so-called chaos theory.
- The link between movement (inevitability) and movement (chaotic) through pictorial works representing the first using the tracking tool of the second.

Providing a practical experience in the art of photography that combines physical movement and movement in composition as one of the principles of the success of photographic work.

- Recognizing the potential of "Fractal Art", one of the modern digital photography fields, in providing graphic works that express the concept of movement.

Research hypotheses

- The research assumes the possibility of representing movement as described by the scientist Isaac Newton in his three laws of motion through creative graphic works using digital media, especially the "fractal art".

- It also assumes the possibility of the digital medium represented in "fractal art" to help the artist in figurative expression in general, and to express movement - and the resulting rhythm - as one of the most important principles for the success of figurative artwork in particular.

Conclusion

In this paper, I tried to present a pictorial vision of Newton's laws of motion, which confirms the accuracy of predicting the results of the motion of systems and bodies in the future, but through the works of "Fractal Art", which is a representation of another philosophy opposite to Newton's philosophy (determinism), which is the philosophy of (chaos). .

Chaos is what the results would look like if only a very small change occurred in the calculation of the initial state of motion of bodies and systems. This is what prompted the American meteorologist Edward Lorenz to call this phenomenon the "butterfly effect" as a metaphor for the randomness of the results; The vibration caused by the movement of the wings of a butterfly in one part of the world results in a destructive hurricane on the other side of the globe.

The attempt to graphically express a concept or philosophy (determinism) by using a medium that follows the opposite philosophy (chaos theory) presents somewhat of a paradox, and highlights the importance of both theories in trying to understand nature around us.

And the research presents the concept of movement through figurative formations of the movement of birds and butterflies. We see that some paintings presented a representation of the actual repeated movement within the boundaries of the work, while in other paintings the movements of birds and butterflies overlapped with the elements of the figurative work of lines, spaces and colors on the photographic surface to produce all of them a figurative expression of Movement and rhythm in general.

The research work is using the digital medium, which some may consider to be contrary to the concept of photography with traditional photographic tools, but the matter is nothing more than a difference in the tools of creativity, which we have seen happen again and again throughout the history of art, starting with the use of animal bones and blood as tools for drawing and coloring on walls Caves, and through the many, many inventions that contributed to the evolution of photographic tools over the years and centuries.

Just as the artist who wants to use traditional photographic media must understand the material and the tool so that he can adapt it to present his own artistic vision, the artist who uses the computer must study the tool and build his expertise little by little so that he can present his artistic vision as well. Whether through traditional or digital media, it ultimately comes down to the product of the creative process and the vision it carries or leaves in the same scenes.

The most important results

- The research presented a definition of the concept of physical motion in nature from the point of view of philosophy (determinism), which is represented by the world's three laws of motion, Isaac Newton, and the philosophy of (chaos) that follows the theory of chaos.
- To a large extent, the research panels were able to link the concepts of (deterministic) and (chaotic) movement through the pictorial expression of Newton's inevitable laws through the digital "fractal art" that follows the philosophy of chaos.
- Many of the experimental research panels were characterized by movement and pictorial rhythm, as they presented multiple linear formations and the use of the concept of repetition. The research, with its new and contemporary practical experience in the art of digital photography, especially the "fractal art", is a new addition that works to enrich the Arab library and contemporary art of photography in Egypt and the Arab world.

Recommendations

In light of the research findings, the researcher recommends the following:

- Urging researchers to link the concepts of science and art through research that provides new and advanced practical experiences in the field of photography.
- Urging researchers to study and research in the field of digital photography, especially the "art of fractal", which works to enrich the Arab library in Egypt and the Arab world.
- Encouraging practical experiences in the field of digital photography in general, and "fractal art" in particular, to work on the spread of this type of contemporary digital photography.

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