

Graduate School of Fundamental Science and Engineering  
Waseda University

博士論文概要  
Doctoral Dissertation Synopsis

論文題目  
Dissertation Title

Extension of Painting Artwork by Utilizing Structural Color Materials and Perspective  
Projection Simulation

構造色材料と透視投影シミュレーションによる絵画表現の拡張

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My thesis mainly studies how to use new materials and Perspective Projection Simulation to provide assistance for creation to promote the creation of new works, and how to use this technology to better assist artists to complete their own works. In my experimental works, new structural color pigments are used to apply to painting, so that people can explore the relationship and changes between angle light source and color, as well as the relationship between works and light source when watching structural color works. New projection technology and 3D technology are introduced to assist creation and detect changes in perspective in painting to complete new creation.

New material creation refers to the new and vigorous visual language created by organically using various media materials in artistic creation. New materials include traditional water-based and oil-based pigments, as well as common living materials such as ready-made products, clay, paper, mineral colors and wastes. It also refers to the newly discovered new materials and performance techniques being developed.

In the first stage, the experimental work "The Umbilical Cord of the Universe" series has been created. This new type of pigment is mainly used to paint cars and toy models. At present, few artists have used this new paint to create paintings. In the first three parts, aluminum plates were selected for painting because the aluminum plate was closer to the car skin, which was easier to color and highlight the effect. In terms of pigment selection, transparent nail polish and laser powder were tried to combine propylene and oil painting to create. The first creation was to create a complete painting on a flat aluminum plate. The second creation was formed after the deformation of the aluminum plate, which presented unexpected figures and effects. Under the light, pearlescent powder and laser pigment showed differences in color with the change of angle on the uneven plane. The disadvantage of creating on the aluminum plate is that the edge of the aluminum plate is very sharp, and the work will encounter certain obstacles in transportation and storage. Later, we will try to use new structural color pigments on paper. Structural color pigment is a kind of paint material that cannot be absorbed by the paper, so propylene pigment is used as the bottom of the paper.

In the second stage, the disadvantage of creating on the aluminum board is that the edge of the aluminum plate is very sharp, and there will be certain obstacles in the handling and storage of the work, so it is necessary to try to use structural color pigments on the paper. Structural color pigments cannot be

absorbed by the paper surface, so it is needed to use acrylic paint as a base color on the paper surface. Choose a softer sketch paper, and after creasing it, use black acrylic as a base color and spray with structural color paint.

In the third experimental stage, ICT technology was adopted to assist creation. Traditional artists can start to create on the plane, which allows artists to draw sketches and revise drafts on the uneven screen, and then to intuitively preset the final effect in advance. The projector was used to link the computer painting software and put the pictures on the uneven creative materials to make a draft. For example, it is more convenient to create on sculptures and uneven pictures.

Throughout the 20th century, the application and fascination of modern science and technology have greatly stimulated the imagination of artists. For example, PS, AI, C4D, 3DMAX and other computer graphics software have also brought convenience and amazing visual effects to painting. Technology has provided a more convenient way for traditional painting, and people can use some drawing software to quickly produce near-realistic with the real thing. Some of my personal attempts and creations want to make use of the more advanced software to help artists overcome difficulties in reality and present their works better.

This thesis consists of the following contents:

Chapter one: The background, research purpose and composition of the thesis. It introduced the development of pinhole imaging technology from the 15th century to the 19th century, how artists used convex mirrors to create, how art has been linked with science and technology since ancient times, and how the progress of science and technology and chemical technology has promoted art progress and assisted artists to complete their creations. The application of new pigment structural color in painting makes it possible to explore the relationship and change of angle light source and color, and the relationship between work and light source when viewing structural color works. The introduction of new projection technology and 3D technology-assisted creation can detect changes in perspective in paintings and use computers to create new creations.

Chapter two: Utilization of cutting - edge technology in the history of painting. Imaging technology before the 16th century, 17th to 18th centuries - Relation between the development of alchemy and art materials-Invention of new

color materials by alchemists, 19th century to 20th century - From the appearance of photographs to 3DCG - Pre-18th century photorealistic paintings driven out by photography. Searching for new expressions that cannot be expressed with a camera, on the integration of sense and reason in the relation between science and art.

Chapter three: New materials and painting expressions. Development of painting technology in the latter half of the 20th century, contemporary alchemy, changes seen from the aspect of physical materials, the emergence of current painting materials and their application in painting, appearance of structural color materials, a new painting technique created by new materials, changes in canvas material, development of car painting, development of pearlescent pigments.

Chapter four: Application of Structural Color Pigments in Art Creation  
Experimental creation of structural color pigments and the relationship between structural color pigments and light sources. The visual connection of the work's shape, color, viewing position and light source to the audience. Challenges for applying structural color paintings.

Chapter five: Development of pictorial expression by introducing new projection technique, Changes in perspective in painting. Perspective in 16th Century Painting. The Influence of the Appearance of Photography on Painting in the 18th and 19th Centuries. Perspective in Cubism in the 20th Century. The influence of computers on art. Effect on pictorial expression brought about by change of viewpoint Leveraging computer simulation for new projections.

Chapter six: Combining software with projection technology to assist painting. Projection model for abstract representation. Introduction of tracing technique by applying projection mapping. A work using a new projection method.

Chapter seven: Results and discussion. About an attempt at a new painting technique. Art and science impact the present. Remaining issues and future prospects.

## List of research achievements for application of Doctor of Engineering, Waseda University

Full Name : 馮 琳	seal or signature
Date Submitted(yyyy/mm/dd):	
2023/04/17	
種類別 (By Type)	題名、発表・発行掲載誌名、発表・発行年月、連名者（申請者含む） (theme, journal name, date & year of publication, name of authors inc. yourself)
○Articles in refereed journal (peer review)	“On the Integration of Sense and Reason in the Relation Between Science and Art—Take the Influence of Mathematical Form on Art Design as an Example”. Art and Society:ISSN 2709-9830 . Vol. 1 No. 2, [2022] P1-10 ,FengLin.
Articles in refereed journal (no peer review)	<p>《关于作品中的场性研究》/“Research on the field in works of art”. Beijing Film Academy International New Media Art Triennial Exhibition. ITERATION&amp;BLENDING . collection of essays. China Film Press .2018.1 ISBN 978-7-106-04438-1. P105-112 . 馮琳/Fenglin</p> <p>フラットベッド型ハイパースペクトルスキャナの試作と絵画の分光報の計. 映情学技報, vol. 44, pp. 311-312, 2020年3月. ISSN:Print edition: ISSN 1342-6893 Online edition:ISSN2424- 1970 . 岩崎遥 坂井滋和 馮琳(FengLin)</p> <p>ハイパースペクトルスキャナを用いた各種画像の分光計測とその比較. 研究報告人文科学とコンピュータ (CH) 巻:2022-CH-128号:5. P.1-2 2022-02-12. ISSN:2188-8957.榎本翔悟 坂井滋和. 馮琳 (FengLin)</p>
○Painting	<p>“The Umbilical Cord of the Universe” series</p> <p>Shortlisted for the public exhibition "Fantastic Art" The National Art Center, Tokyo.2022.3.12</p> <p>"On Earth, Round Universe" Five-person exhibition～在東京中国人アーティストによる現代アート展～ワセダギャラリー 2022.3.19</p> <p>Shortlisted for the public exhibition "ベラドンナ・アート" Tokyo Metropolitan Museum of Art.2022. 4.19.</p>
○Video	<p>“The Eye of Hell”</p> <p>The 5th Beijing Film Academy International New Media Art Triennial "BORDERLESS" . 2021.12.11</p> <p>"On Earth, Round Universe" Five-person exhibition～在東京中国人アーティストによる現代アート展～ワセダギャラリー 2022.3.19</p> <p>Side exhibitions of the Venice Biennale: Meta-Curation 16/N   On Earth, Round Universe @ VENEZIA.2022.8.20</p>
○Painting	<p>“Interlocution" series</p> <p>Group exhibition "2016 Fragment Reconstruction Genes" Central American International, Beijing,</p>

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種類別 (By Type)	題名、発表・発行掲載誌名、発表・発行年月、連名者（申請者含む） (theme, journal name, date & year of publication, name of authors inc. yourself)
Video	<p>China; 2016.10.15</p> <p>"Dialogue" group exhibition at Chung-Ang University, South Korea 2017.5.30</p> <p>Beijing Film Academy International New Media Art Triennial Painting Unit- Dongyue Art Museum-Beijing . 2017.12.10</p> <p>FengLin Solo Exhibition-The Energy of Magma(Beijing Film Academy International New Media Art Triennial, Postgraduate Teaching Achievement Unit, Curated by Ursula Pan Hansen, Professor and Curator of Kassel University) International Gallery, Central Academy of Fine Arts, Beijing .2017.12.10</p> <p>Jialilili   2018 Qinhuangdao • Dimensional structure of Haibitai Art Festival—The field of contemporary art Qinhuangdao . 2018.5.13</p> <p>Image Inspection-Nantong University Art Academy Art Museum.2019.11.1</p> <p>Thirteenth Xiucui Exhibition——Tokyo Metropolitan Art Museum.2021.12.6</p> <p>Exhibition“くうなんアート”，北海道教覚寺 2021.12.17</p> <p>Shortlisted for the public exhibition "New Soprisha Exhibition". The National Art Center, Tokyo.2022.2.20</p> <p>Shortlisted for the public exhibition "Once In Lifetime" Tokyo Metropolitan Museum of Art.2022.3.3</p> <p>Shortlisted for the public exhibition "The 27th アートムーブコンクール". Osaka.2022.5.10</p> <p>“mileage”</p> <p>participated exhibition-The 2nd Chongqing International Image Biennale-a high rise from the ground.2017.4.28</p> <p>"Dialogue" group exhibition at Chung-Ang University, South Korea.2017.5.30</p> <p>Entered the college unit of the first Hechuan Diaoyucheng International New Media Art Festival. 2017.11.15</p> <p>Talents China University Alliance Joint Exhibition-Beijing Quanyechang-Beijing. 2017.12.23</p>