# The innovative practice of contemporary oil painting language from the perspective of media transformation

**Zicheng Li***

*Applied Science and Technology College of Shangqiu University, Kaifeng, 475000, China*
**Corresponding author: 10500011@henu.edu.cn*

***Abstract:*** *Against the background of media transformation, the intervention of digital technology has caused the language of contemporary oil painting to face a structural migration from materiality to information. Traditional oil painting relies on a material substrate composed of pigments, oils, and supports, and its tactile representation and optical depth are established through light propagation and mechanical feedback in a heterogeneous medium. The digital interface reconstructs the painting surface through pixel arrays and algorithmic logic, thereby forming a dematerialized visual field. Between pigments and pixels, a grammatical translation takes place between subtractive color mixing and additive color mixing, as well as between continuous media and discrete units. Fluid simulation algorithms attempt to reconstruct the rheological behavior of oil painting in the digital domain. Parametric design, real-time rendering, and interactive installations further transform brushstroke morphology, color temporality, and the rules of image derivation. The screen as a canvas alters perceptual distance and embodied adjustment. Digital archiving redefines the aura of the original work, and the mode of algorithmic collaboration gives rise to a creative modality of the distributed author.*

***Keywords:*** *Media transformation; Oil painting language; Materiality; Dematerialization; Grammatical translation; Parametric design; Real-time rendering; Interactive installations; Aura; Distributed author*

## Introduction

Contemporary oil painting faces the demand for a restructuring of its language system under the penetration of digital media. The traditional creation and viewing methods centered on the material substrate encounter challenges from algorithmic logic and interface operations. The study of innovative paths for oil painting language from the perspective of media transformation has theoretical necessity, as it helps to clarify the conversion mechanisms among pigments and pixels, tactile and visual, static and dynamic, and provides an analytical framework for the legitimacy of oil painting in the cross-media field. Exploring the perceptual distance of the screen canvas, the temporal extension of real-time rendering, and the transformation of authorship under algorithmic collaboration can reveal how oil painting language disembeds from its material carrier and generates new visual structures. This research has fundamental value for understanding the evolutionary logic of painting language in the digital age.

## 1. Media Transformation and the Restructuring of Materiality in Oil Painting Language

### *1.1 The Material Substrate and Tactile Representation of Traditional Oil Painting Media*

The material substrate of oil painting media is jointly constituted by pigments, oils, resins, and fabric supports, and its physical thickness and drying process form tangible brushstroke traces. This tactile representation originates not only from the mechanical forces applied by brushes and palette knives but also from the shrinkage and cracking of pigment layers under different drying rates, thereby making the painting a sedimentary body of time and matter. The translucent glazing technique of oil painting relies on differences in the refractive index of the medium to produce optical gray tones through multiple layers of superimposition. This process is essentially a control of the propagation path of light in a heterogeneous medium, which, together with the microscopic undulations of the painting surface, constructs a unique visual depth. The texture of the support fabric and the absorbency of the

ground layer jointly regulate the resistance coefficient of pigment spreading. The periodic undulations of the linen warp and weft threads produce a vibration feedback with stable frequency when the brush is dragged, and this mechanical coupling relationship is used by experienced creators as an implicit reference for controlling brushstroke boundaries[1].

The material substrate also determines the preservation and aging behavior of oil painting works. The oxidation reaction of metal ions in the pigments alters the stability of color hues, while the humidity response of the support causes periodic fluctuations in canvas tension. These physical properties constitute the irreplaceability of traditional oil painting language, meaning that every color and texture corresponds to a specific material handling action and cannot exist independently of its carrier. The tactile representation further extends to the viewer's gazing experience: the raised pigment stacks on the painting surface trigger a virtual tactility, thereby interweaving visual perception with imaginary touch and forming an aesthetic interaction based on material substantiality. The refractive index matching effect of the varnish layer makes some underlying pigments visible only at specific incident angles. This angular dependence cannot be transmitted through mere visual reproduction; it requires the combination of body movement and head tilting to fully read the picture information, thus establishing a viewing ritual at the moment of the original work's presence.

### *1.2 The Tendency toward Dematerialization of the Painting Surface under the Intervention of the Digital Interface*

The digital interface transforms the output of oil painting into a pixel array on the screen, where the original pigment thickness and brushstroke undulations are compressed into a planar distribution of RGB values. This dematerialization process does not simply eliminate surface texture; instead, it reconstructs the scale of viewing through parameters of resolution and color depth. The microscopically magnified edges of brushstrokes appear on the display as jagged or smoothly interpolated forms, thereby altering the generative logic of accidental textures in traditional oil painting. The sliding gesture on the touch screen further replaces the physical resistance of the brush, and the visual focus no longer follows the direction of pigment accumulation but instead engages in skip-style browsing along the trajectory of the cursor.

The tendency toward dematerialization is also reflected in the editability of the painting surface. The digital interface allows for lossless layer separation and texture filter replacement of the oil painting image, and cracks or brush drying traces on the original canvas can be arbitrarily removed or enhanced. This operation transforms the painting surface from a fixed material entity into a variable information carrier. Through zooming operations, the viewer can observe brushstroke sequences that are indistinguishable to the naked eye in traditional viewing, yet the viewer simultaneously loses the sense of orientation created by the canvas warp and weft threads and the reflection of the varnish layer when facing the original work. The backlight illumination of the screen replaces the diffuse reflection of natural light, and the highlights on the image no longer drift with changes in viewing angle. The stationary luminous plane dissolves the specular reflection areas unique to the oil painting surface, thereby forming a uniformly diffused visual field. Rotation and scaling commands in multi-finger gestures allow the viewer to reorganize the spatial relationships of the picture through topological transformation. The compositional order originally fixed by the rectangular boundaries of the canvas is deconstructed into a layer stack that can be arbitrarily cropped, stretched, and mirrored.

### *1.3 The Grammatical Translation Mechanism between Pigments and Pixels*

Pigments and pixels correspond to two forms of information organization, namely continuous media and discrete units, respectively. The grammatical translation between the two must resolve the fundamental difference between the color mixing rules of pigments and the additive color mixing logic of pixels. The color mixing of oil painting is based on subtractive color mixing, where the physical mixture of different color powders in an oil medium produces a nonlinear spectral response, whereas the color generation of pixels relies on the independent luminance modulation of red, green, and blue sub-pixels, which belongs to additive color mixing. The translation process typically uses lookup tables or neural network fitting to map the gamut boundaries of the two, but it cannot fully restore the unique metallic luster or iridescence of certain mineral pigments, because these optical effects depend on the directional reflection and crystal structure of pigment particles.

The translation mechanism also involves the encoding rules from brushstroke dynamics to the pixel matrix. The acceleration variation and the pulling behavior of the paint medium during a continuous

brushstroke in oil painting can be decomposed into a sequence of trajectory coordinates and a time series of pressure values, which are then converted into convolution kernel parameters in image processing algorithms. In the opposite direction, edge detection operators in the pixel array can extract the trajectory direction of a virtual brush, but the generated brushstrokes lack the surface tension shrinkage characteristics of actual paint during the drying process. To bridge this gap, some algorithms introduce the Navier-Stokes equations from fluid simulation to calculate the spreading behavior of the paint, treating pixels as computational nodes rather than as the final presentation units, thereby reconstructing the rheological behavior approximating that of traditional oil painting in the digital domain. However, such simulations still cannot reproduce the sedimentation and stratification phenomena of pigment particles of different sizes during the drying process, and the latter has a non-negligible modulating effect on the transparency and scattering spectrum of the glazing layer[2].

## 2. Algorithmic Logic and the Generative Transformation of the Visual Structure of Oil Painting

### *2.1 The Reshaping of Brushstroke Morphology and Movement Trajectory through Parametric Design*

Parametric design deconstructs the brushstroke into a set of controllable variables, including the pressure gradient, the velocity vector, the direction angle, and the pigment flow coefficient. By adjusting the numerical ranges and mapping curves of these parameters, the brush movement that originally relied on muscle memory is transformed into a quantifiable and editable mathematical model. The initiation, transition, continuation, and termination of the brushstroke are no longer constrained by the physical elasticity and paint load of the brush; instead, they are driven by periodic functions or noise algorithms in parametric equations. This transformation enables the brushstroke morphology to produce regular variations that are difficult to achieve with traditional tools, such as a thickness distribution that decays logarithmically along the movement trajectory or a brush deflection behavior based on gravitational field simulation. After introducing random seeds and fractal dimension parameters into the variable space, the edge of the brushstroke can acquire a self-similar texture that lies between the controllable and the accidental, and its statistical characteristics can be adjusted by changing the frequency and amplitude of the noise algorithm.

The reshaping of the movement trajectory is further reflected in the parametric system's ability to reorganize the temporal relationships of brushstrokes. The acceleration variation within a single brushstroke can be precisely controlled through the time function of the velocity parameter, and the superimposition order of different brushstrokes is determined by the parametric hierarchical structure to decide the covering logic. Parametric design also allows external data sets (such as audio amplitude or ambient temperature) to be mapped onto the width and torsion angle of the brushstroke, thereby endowing the movement trajectory with a cross-modal generative logic. Unlike the brushstroke in traditional oil painting, which serves as a direct record of bodily action, every turning point of a parametric brushstroke can be traced back to the historical values of independent parameters, thus forming a de-subjectified and reversibly analyzable visual structure. The constraint conditions in the parametric system (such as the maximum curvature and the minimum brushstroke interval) can simulate the deformation limits of the brush hair, thereby maintaining the generative freedom of the algorithm while avoiding the output of pseudo-brushstroke forms that fall outside the recognizable range of oil painting language.

### *2.2 The Temporal Extension of Oil Painting Colors in Real-Time Rendering Technology*

Real-time rendering technology changes the presentation mode of oil painting colors, so that hue and brightness are no longer fixed in the dried pigment layer but are continuously recalculated with the rendering frame rate. The RGB value of each pixel in every frame is dynamically modulated by the time variable t in the shader. The optical mixing effect that originally required months of waiting for the glazing layers to dry can be completed through iterative calculations of the mixing function on a millisecond time scale. This temporal extension endows oil painting colors with a reversible evolutionary path: the color temperature can oscillate periodically, and the saturation can linearly decrease or increase according to the timestamp. The static harmonious relationship in the traditional color system is replaced by a dynamic equilibrium in the time dimension.

Real-time rendering also allows multiple independent time streams to be superimposed within the same frame, so that the color change rate of the foreground brushstrokes and that of the background

area have a heterochronic relationship. For example, a hue drift modulated by a noise function can produce a yellowing effect similar to pigment aging in local areas, while maintaining the original color values in other areas. The inter-frame interpolation and anti-aliasing algorithms in real-time rendering technology further smooth the color mutations, so that the rapidly changing hue transitions do not exhibit discrete jumps. This temporal extension of color dissolves the temporal logic of "drying as fixation" in the original oil painting, and the image enters a continuous, unfinished state, where each rendering output is an instantaneous sampling of the color parameters at a specific time slice[3].

### *2.3 The Dynamic Derivation Rules of Oil Painting Images in Interactive Installations*

Interactive installations transform the oil painting image from a static output into a dynamic system that responds to external inputs, and the derivation rules define the mapping relationships between viewer behavior and image changes. These rules are typically constructed based on state machines or particle systems, where the viewer's touch position, movement speed, or body distance is encoded as a trigger condition to drive the rearrangement of brushstrokes, the mixing of colors, or the superimposition of textures in the oil painting image. The design of derivation rules needs to balance predictability and contingency: on the one hand, it ensures that the viewer's operations produce perceptible corresponding changes; on the other hand, it preserves the algorithm's autonomous generative space to avoid mechanical repetition. The random weight factors embedded in the rules can generate differentiated visual outputs under the same viewer input, thereby extending the performance duration of the work.

The dynamic derivation rules also involve the management of the temporal depth of the oil painting image. Each interactive event generates a new image state, and the previous states can be compressed and stored as historical layers. The viewer can recall previous brushstroke configurations through reverse interaction, thereby forming a nonlinear visual narrative structure. At the technical level, the dynamic derivation of the oil painting image relies on real-time image synthesis and differential update algorithms, which perform partial repainting only on the interactive area to maintain a stable frame rate. The boundary conditions set in the derivation rules (such as the value range of colors or the maximum density of brushstrokes) prevent the system from falling into a state of visual chaos, thereby ensuring the recognizability of the oil painting language. The interactive installation thus defines the oil painting image as a set of possibilities, where each viewing corresponds to the instantiation of a specific path within that set. Multimodal inputs (such as the joint mapping of sound frequency and gesture acceleration) can construct more complex networks of derivation rules, enabling the oil painting image to exhibit adaptive behaviors similar to those of an organism during the response process[4].

## 3. The Identity Transformation of the Oil Painting Creation Subject in the Cross-Media Field

### *3.1 The Perceptual Distance and Embodied Adjustment of the Screen as a Canvas*

When the screen serves as a canvas, the perceptual distance between the viewer and the image undergoes a structural reorganization. In traditional oil painting, light enters the pupil after diffuse reflection on the canvas surface, and the thickness of the pigment layer and the gloss of the varnish form specular highlight areas that vary with the viewing angle, so the viewer needs to adjust the body orientation to capture visual information from different angles. The screen, however, uses a backlight module as its light source, and the light evenly penetrates the liquid crystal layer to directly strike the eyeball. The perceptual distance is compressed into the optical path between the luminous plane and the retina, lacking the depth cues produced by pigment accumulation. This compression renders the tactile gaze ineffective, and the viewer cannot distinguish the foreground brushstrokes from the background glazing layers in the image through head movement.

Embodied adjustment is reflected in the recalibration of the creator's body schema. Traditional oil painting relies on the large-amplitude swinging of the shoulder and elbow joints to drive the brush, and the vertical or slightly inclined plane of the canvas provides a motion reference with gravity compensation for the arm. In screen-based painting, the horizontal placement of the graphics tablet and the vertical display of the screen create a sensory-motor decoupling: the small displacement of the hand on the horizontal plane is mapped to a large-span movement of the cursor on the vertical plane, and the body needs to re-establish the scaling factor for hand-eye coordination. The touch screen further eliminates the intermediate tool, and the fingertip directly contacts the glass surface to produce sliding friction, yet it lacks the fiber resistance of the canvas and the shear-thinning properties of the paint. The

creator must suppress the long-formed tactile expectations and instead rely on the delayed closed loop of visual feedback to adjust the amplitude of movement[5].

### *3.2 The Redefinition of the Aura of the Original Oil Painting Work through the Digital Archiving Process*

Digital archiving encodes the material traces of the original oil painting work into a data stream that can be infinitely replicated. The spatiotemporal uniqueness of the aura is replaced by the creation timestamp and the checksum hash value in the file metadata. During the high-precision scanning process, the height of pigment accumulation on the canvas surface is converted into pixel value variations in a grayscale depth map, and the ultraviolet fluorescence characteristics of the varnish layer are decomposed into intensity distributions in separate color channels. The archiving operation itself is an act of selection: the optical resolution of the scanner determines which micron-level brushstroke edges are preserved, and the choice of color bit depth controls the quantization steps of the transitional color bands. The uncaptured submicroscopic structures disappear from the accessible information of the work, and they are replaced by the color profiles and compression algorithms set by the digital archive manager.

The redefinition of the aura also involves the identity drift of the archived image in circulation. The same digital file presents differentiated gamut mappings and gamma curves on different display devices, and each screen rendering produces a visual version that slightly deviates from the material state of the original work. The dissemination of the archived image eliminates the ritual of viewing distance: the viewer does not need to visit the physical space where the original work is hung, nor does the viewer need to follow the gaze rhythm under specific lighting conditions. Digital restoration techniques can perform pixel-level filling on damaged areas in the archive, completing missing brushstrokes or restoring faded color blocks. This intervention transforms the aura from an unalterable property of the original work into a negotiable result of data editing. When multiple restoration versions coexist in different databases, the original work no longer possesses a single authoritative state, and the aura disperses into a series of mutually referencing digital copies[6].

### *3.3 The Creative Modality of the Distributed Author under the Algorithmic Collaboration Mode*

The algorithmic collaboration mode deconstructs the creative subject from the intentional center of a single artist into a distributed network across nodes. The weight matrix of the neural network model encodes the statistical regularities of a massive number of images within the training data set, and each brushstroke form generated by the algorithm implicitly contains the clustering of handwriting features of anonymous creators in the data set. The artist ' s operations in this mode are limited to hyperparameter adjustment, loss function selection, and latent space traversal of the generated results, and the creative decision-making power is dispersed across multiple preceding steps, such as training data cleaning, model architecture design, and random seed setting. This distributiveness makes it difficult to map the attribution signature of the work to a single conscious subject; instead, the work presents itself as an intertextual product between the algorithmic framework and human choices.

The creative modality of the distributed author also alters the temporality of the creative act and the signature mechanism. In the process of algorithmic collaboration, multiple creators can input parameter modulation commands sequentially through a shared model instance, and each parameter update changes the probability distribution of subsequent generated outputs, with previous creative contributions being cumulatively encoded as incremental adjustments to the weights. The painter ' s signature, which serves as a declarative act of closure for the work in traditional oil painting, loses its counterpart in the algorithmic collaboration mode, because image generation can continue indefinitely, and there is no mandatory boundary for a final draft. When the discriminator and the generator in a generative adversarial network are alternately optimized, the adversarial relationship between the two itself becomes a source of creative drive momentum, and authorship further diffuses into the adversarial logic of the algorithmic architecture. This mode gives rise to a decentralized network of authors, where each output image is a snapshot of the interaction among nodes at a specific iteration step.

## Conclusion

Media transformation drives the language of contemporary oil painting from a fixed material entity

toward a computable and interactive information system. The material substrate and tactile representation undergo dematerialized compression in the digital interface, and the grammatical translation between pigments and pixels still requires solutions for the restoration accuracy of spectral response and rheological behavior. Parametric design and real-time rendering technology endow brushstrokes and colors with generativity and temporality, while interactive installations make image derivation rules a part of viewing. In the cross-media field, the screen reconstructs the creator ' s embodied perception, digital archives dilute the unique aura of the original work, and the algorithmic collaboration mode disperses the creative subject into a network of nodes. The temporality jointly encoded by bodily actions and material aging in traditional oil painting is replaced in real-time rendering and dynamic derivation by a reversible and editable frame-sequence logic, a transformation that both preserves the recognizability of oil painting language and expands the evolutionary dimensions of its visual structure. Future directions can focus on more accurate physical simulation algorithms for pigments (such as particle sedimentation models based on the discrete element method), quantitative modeling of color psychological responses in real-time rendering (involving the coupling relationship between chromatic aberration and gaze duration), and the design of metadata protocols for work attribution signatures in distributed creative environments (covering contribution hash chains and version tree structures).

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