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

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Abstract: *With the changes in society, many new media have appeared, and as a result, the language of contemporary oil painting has moved away from material description to information presentation. Oil painting is a type of art that uses pigments, oil and a support as materials, and it is a combination of light and mechanics that gives oil paintings a rich texture and three-dimensionality. A digital interface is a pixel array and an algorithm that construct a painting surface and create an intangible area of visual space. Grammatical translation takes place between pigments and pixels; that is to say, subtractive colour mixing and continuous media are converted into additive colour mixing and discrete units. The Goal of the Fluid Simulation Algorithm is to model the Rheology of Oil Paint Virtually. Parametric Design, real-time rendering and interactive installations have all changed the form of brushstrokes, the temporality of colour and the rules for creating images. A Screen is the Canvas for Adjusting Perceptual Distance and Embodied Adjustment. Digital archives have changed the mood of the original work, and with the development of algorithmic collaboration, a new type of distributed author has appeared.*

Keywords: *Media Transformation, Language of Oil Painting, Materiality, Dematerialisation, Grammatical Translation, Parametric Design, Real-time Rendering, Interactive Installations, Aura, Distributed Author*

Introduction

With the spread of digital media in recent years, the language system of contemporary oil painting has been changing. The old way of creation and viewing is material-based; now there are problems with algorithmic logic and interface operation. There is a theoretical need to explore new ways for the language of oil painting from the perspective of media transformation, and this paper will help clarify the conversion mechanisms among pigments and pixels, tactile and visual, static and dynamic, and provide an analytical basis for the legitimacy of oil painting in cross-media. Determine the Perceptual Distance of the Screen Canvas, the temporal extension of real-time rendering, and the transformation of authorship in algorithmic collaboration to see how the language of oil painting disembeds from its material carrier and creates new visual structures. Help us find out why the language of painting has developed 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 basis of oil painting media consists of pigments, oils, resins and fabric, and it has a certain thickness and dries to leave visible brushstroke marks. Tactile representations are not only caused by the mechanical force of brushes and palette knives but also by the shrinkage and cracking of pigment layers at different drying rates; thus, paintings can be regarded as sedimentary bodies of time and matter. Translucent Glazing in oil painting is achieved by applying many thin films of different refractive indices in the medium to create an optical grey colour. In fact, this is the control of the propagation path of light in a heterogeneous medium, and together with the microscopic undulations of the painting surface, a kind of visual depth is created. The Texture of the support fabric and the absorbency of the ground layer together determine the resistance coefficient to pigment spread. Regular undulations in the linen warp and weft threads will cause vibration feedback at a certain frequency

when brushed with a brush, and experienced artists have indirectly used this mechanical coupling relationship to control the boundary of a brushstroke[1].

The support material of the painting will also affect how it changes with age. Oxidation of the metal ions in the pigments will change the colour of the work of art, and fluctuations in relative humidity will cause the canvas to expand and contract unevenly. The above physical attributes are necessary parts of the language of traditional oil painting; that is to say, every colour and texture is associated with a particular way of handling materials, and it cannot be realised without a support. Tactile representation can be used to enhance the sense of sight; for example, one can stack piles of pigments on the surface of a painting to create a sense of virtual touch and combine visual perception with imagined touch to achieve an aesthetic effect based on the substantiality of materials. Refraction at the interface of the varnish and the lower-index material causes some pigments to be out of sight at other angles. Angular dependency cannot be seen by sight alone; one also needs to move the body and tilt the head to fully grasp the information in the picture, thus forming a viewing ritual at the time of encountering the original work.

1.2 The Trend of Dematerialisation for the Painting Surface under the Influence of the Digital Interface

The Digital Interface converts the output of the oil painting into a pixel array on the screen, and the original thickness of the pigment and fluctuations in brushstrokes are compressed into a planar distribution of RGB values. Dematerialisation is not a reduction in the size of the image; rather, it is a change in the number of colours and resolution. The microscopically enlarged edges of the brushstrokes are jagged or smoothly interpolated in shape, and thus the generation logic for accidental textures in traditional oil painting has been modified. The slide gesture of the touch screen is also a substitute for the physical resistance of a brush, and the visual focus is no longer on the direction of pigment accumulation but on skipping along the trajectory of the cursor.

The wish for dematerialisation can be observed in the editable attribute of the painting area. A digital interface can be employed to skip some levels and change the texture filter of the oil painting image; cracks or brush-drying marks in the original canvas can also be freely erased or enhanced. Therefore, the object of art is no longer a fixed material but can be altered through information. Zooming can be used to see the fine details of the brushstrokes that are too small to be perceived with the naked eye in traditional viewing; however, in doing so, we also lose the sense of orientation provided by the canvas warp and weft threads and the reflection of the varnish layer on the original work. The backlighting of the screen is not natural diffused light, so the highlights in the pictures will also change according to the position of observation. The stationary luminous plane does not have the specular reflection area of the oil painting surface and is therefore uniformly diffused. Rotation and scaling commands for multi-finger gestures are used to change the shape of the picture and move it. The composition order initially set by the rectangular boundary of the canvas is divided into a layer stack and can be freely cropped, stretched and mirrored.

1.3 The Grammatical Translation Mechanism for Pigments and Pixels

Pigments and pixels are the two kinds of organisations for information, that is, continuous media and discrete units. The grammatical translation of the two should cover the basic difference in colour mixing rules for pigments and the additive colour mixing logic of pixels. Colour mixing in oil painting is subtractive; that is, a physical combination of various coloured powders in an oil medium results in a non-linear spectral response, and the colour generation of pixels is achieved by independently varying the luminance of the red, green and blue sub-pixels, which falls under the category of additive colour mixing. Lookup tables or neural network fitting are generally employed in the translation process to map the gamut boundaries of the two, but they cannot fully reproduce the characteristic metallic luster and iridescence of some mineral pigments, as these optical effects are dependent on the direction of reflection and the crystal structure of pigment particles.

The Encoding Rules for the Dynamics of a Brushstroke are also in the translation mechanism. The variation of acceleration and the pulling behaviour 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, and then these can be converted into convolution kernel parameters for image processing algorithms. At the same time, although the edge detection operator of the pixel array can obtain the direction of the trajectory for a virtual brush, the resulting brushstrokes do not have the

characteristic of surface tension shrinkage of real paint after drying. To solve this problem, some algorithms have added the Navier-Stokes equations for fluid simulation to determine the spread characteristics of paint, treat pixels as computational nodes instead of the final output unit, and thus reconstruct the rheological behaviour near that of traditional oil painting in the digital world. However, the simulations have not yet been able to reproduce the sedimentation and stratification of pigment particles of different sizes during the drying process, and the latter has a relatively large 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 Reshaping of Brushstroke Morphology and Movement Trajectory by Parametric Design

Parametric Design divides a brushstroke into a number of adjustable parameters, such as the gradient of pressure, velocity vector, angle of direction and pigment flow coefficient. Change the range of numbers and the mapping curve for this parameter, and then the brush motion stored in muscle memory can be expressed as an editable mathematical model. The beginning, change, continuation and end of a brushstroke are no longer determined by the physical elasticity and paint load of a brush; instead, they are given by periodic functions or noise algorithms in parametric equations. Many different variations in the form of brushstrokes that are difficult to achieve with traditional tools can be created, such as a thickness distribution that decays logarithmically along the path of movement or brush deflection behaviour based on the simulation of the gravitational field. Random seeds and fractal dimension parameters have been added to the variable space, and the edge of the brushstroke can have a self-similar texture that is neither controlled nor random; its statistical properties can also be changed by modifying the frequency and amplitude of the noise algorithm.

Another way to change the Path of Movement is to modify the time relationship of the brushstrokes in a parametric system. The change in acceleration of a single brushstroke can be controlled precisely by the time function of the velocity parameter, and the order of superposition for different brushstrokes is determined by the parametric hierarchical structure to decide on covering logic. Parametric Design can be employed to map external data, such as the amplitude of sound or ambient temperature, to the width and torsion angle of a brushstroke, and thus a cross-modal generative logic for movement trajectories can be obtained. A brushstroke in traditional oil painting is a direct depiction of body movement; every change in the parameters of the brushstroke can be traced back to historical values of independent parameters, and thus, it is de-subjectified and reversibly analyzable. Constraints in the parametric system can be used to limit the maximum value of curvature and the minimum interval for brushstrokes to simulate the deformation limit of brush hair; thus, it is possible to keep the generative freedom of the algorithm and avoid producing pseudo-brushstroke shapes that fall outside the recognizable range of oil painting language.

2.2 The Temporal Extension of Oil Painting Colours in Real-time Rendering Technology

Real-time rendering technology is used to change the display mode of oil paint colours; therefore, both the hue and brightness will not be fixed in the dried pigment layer but will change continuously according to the rendering frame rate. Modify the RGB value of every pixel in all the frames based on the time variable t in the shader. In the past, the optical mixing effect had to wait for the glazing layer to dry; now, it can be achieved by calculating the mixing function iteratively at the millisecond level. This extension of time will give the colours of oil painting a reversible evolutionary path; that is to say, the colour temperature will change periodically, and either the saturation will decrease or increase linearly with the timestamp. The static harmonious relationship of the traditional colour system has been replaced by a dynamic equilibrium in the dimension of time.

Real-time rendering can show several independent time streams in a single frame, so the speed at which colours change for the foreground brushstrokes and the speed at which they change for the background area can be different. For instance, a hue shift caused by a noise function will result in yellowing in a certain area; it is similar to pigment degradation, but the original colour values will not change in the rest of the image. Interpolation and anti-aliasing algorithms will be employed in the real-time rendering technology for inter-frame interpolation to smooth out the colour transition, and thus there will be no sudden changes in hue. Increase the length of the colour break to break the time logic of "drying as fixation" in traditional oil painting, and instead present a continuous, unfinished state of the image; each rendering output will be a snapshot of the colour parameters at a particular

time[3].

2.3 Dynamic Derivation Rules for Oil Painting Images in Interactive Installations

Interactive works of art are based on the idea of an oil painting but are not fixed; rather, they are dynamic systems that change according to derived rules and people's interaction with their environment. These rules are generally in the form of state machines or particle systems, and a trigger condition is set based on the location and motion speed of a person's touch, body distance, etc., to cause changes in the arrangement of brushstrokes, colour blending, texture layering, and other parts of the oil painting image. The Design of Derivation Rules needs to be both predictable and flexible; on the one hand, it should be possible to determine the result of a person's operation, and at the same time, it should keep the autonomous generative space of the algorithm open to avoid mechanical repetition. Random weight factors in the rules can produce many different visual effects for the same viewer input and thus increase the expressiveness of the work.

Dynamic Derivation Rules also need to handle the management of the temporal depth of the oil painting image. Every interaction is a new image state, and the previous states can be compressed and saved as historical layers. Reverse the operation to get back to the beginning and draw randomly; this will be your freehand drawing. At the technical level, the generation of the oil-painting image is based on real-time image synthesis and differential update algorithms, and only partial repainting in the interactive area is carried out to keep up with the frame rate. The boundary conditions in the derivation rules (such as the range of colours or the maximum density of brushstrokes) will not be visually chaotic, and they can still be regarded as the language of oil painting. Therefore, the interactive installation shows the picture of an oil painting as a set of options, and each option is an example of one of the paths in that set. Multi-modal input is the combination of sound frequency and gesture acceleration mapping; a large number of derivation rules can be set up to change the oil-painting image according to environmental changes, and it appears as if it is an organism[4].

3. 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

Since the screen is a Canvas, the perceptual distance between the viewer and the work of art has been reduced. Light enters the pupil after diffuse reflection at the surface of the canvas in traditional oil painting; thus, there are areas of specular highlight formed by the thickness of the pigment layer and the gloss of varnish, and one needs to change one's body position to observe the visual information from different angles. However, the screen is a backlight unit that emits light uniformly, and then this light reaches the liquid crystal layer and directly shines on the eye. Decrease the perceptual distance of the optical path length from the luminous plane to the retina and do not use the depth cue of pigment accumulation. Compression does not allow for tactile gazing; that is to say, one cannot distinguish between the foreground brushstrokes and the background glazing layers in the picture by moving one's head.

Embodied adaptation is a modification of the body-schema organisation of the creator. Traditionally, to paint with oil, one moves the shoulder and elbow widely to swing the brush, and the vertical or slightly inclined plane of the canvas serves as a reference for motion; gravity compensation is applied to the arm in this way. Screen-based painting has a sensory-motor decoupling effect because of the horizontal position of the graphics tablet and the vertical placement of the screen; that is, a small displacement of the hand in the horizontal direction is mapped to a large-span movement of the cursor on the vertical axis, and one needs to adjust the scaling factor for hand-eye coordination in their body. A touch screen does not need an external device; to obtain the sliding friction effect, one can touch the glass with a finger, but it lacks the fibre resistance of canvas and the shear-thinning property of paint. The creator should not remove the long-term expectation of touch, but rather, a delayed closed-loop of visual feedback can be used to change the amplitude of motion[5].

3.2 Redefinition of the Aura of the Original Oil Painting Work in the Process of Digital Archiving

Digital archives will save the material trace of the original oil painting work as data and can make an unlimited number of copies. The Spatiotemporal Unicity of the aura is replaced by the creation timestamp and the checksum hash value of the file metadata. A high-resolution scanner can be

employed to obtain the height of pigment accumulation on the canvas by analyzing the variation in pixel values of a grayscale depth map, and the ultraviolet fluorescence properties of the varnish layer can be decomposed into intensity distributions of different colour channels. In fact, archiving is selection; the optical resolution of the scanner will determine how many micron-scale edges of brushstrokes are saved, and the selection of colour bit depth will set the quantization steps for the transition in colours. The uncaptured submicroscopic structures are not shown in the available information of this work, and they have been replaced by the colour profiles and compression algorithms set by the digital archive manager.

Redefinition of aura also means that the identity of the archived image in circulation has changed. The same digital file has different gamut mappings and gamma curves for various display devices, and the rendered results on each screen are slightly different from what the material state of the original work looks like. Dissemination of the archived image removes the ritual of viewing distance; that is to say, one does not need to go to the place where the original work is displayed, and one does not have to observe the rhythm of the gaze in a particular light. Digital restoration technology can add back the missing pixels in the damaged parts of the archive and restore the lost brushstrokes and faded colours. Change is no longer a feature of the original work; rather, it is the result of changing the data. When there are many restoration versions in different databases, the original work no longer has a single official edition, and its charm is spread among a series of interconnected digital copies[6].

3.3 The Creative Modality of the Distributed Author in Algorithmic Collaboration Mode

Algorithmic collaboration mode moves the creative subject away from the will of one artist and spreads it among many nodes. Based on many pictures in the training set, there is a statistical regularity in the weight matrix of the neural network model, and each brushstroke shape produced by the algorithm implicitly contains a cluster of handwriting features of anonymous creators in the data. The operation of the artist in this mode is limited to hyperparameter tuning, selection of the loss function and traversal of the latent space of generated results; the power of creative decision-making has been distributed among several previous steps, such as cleaning the training data, designing the model architecture and setting the random seed. Due to this distribution, it is not easy to attribute the attribution signature of the work to a single conscious subject; rather, the work appears as an intertextual product of the algorithmic framework and human choices.

The creative mode of the distributed author also changes the time of the creative act and how it is signed. Algorithms can be used to send repeated parameter modification commands for the same model instance from many creators, and each modification of the parameters will change the probability distribution of the next generated result; at the same time, previous creative contributions will be added as incremental changes to the weights. Traditionally, the painter's signature is a positive affirmation that ends the work in oil painting, but in algorithmic collaboration, it has lost this counterpart because image generation can be continuous and there is no required end to the final draft. Optimise the discriminator and the generator of a generative adversarial network to create a kind of adversarial relationship between them that drives generation, and authorship can also be distributed in the adversarial logic of the algorithmic structure. This is the mode of a distributed network of authors, and each output image is a picture of the interaction among nodes at a particular time step..

Conclusion

As society has changed, the subjects of modern oil painting have moved away from real objects and turned to ideas and emotions. Although the material substrate and the sense of touch have been dematerialised by compression in the digital interface, the grammatical translation of pigments and pixels still needs to address the problem of restoration accuracy for spectral response and rheological behaviour. Parametric Design and real-time rendering technology can be employed to introduce generativity and temporality to brushstrokes and colours, and interactive installations can have rules for image generation that are part of the viewing experience. Cross-media works reproduce the sense of embodiment for creators on screen; digital archives reduce the particular atmosphere of the original work; and algorithmic collaboration disperses the creative subject across a network of nodes. Temporality in traditional oil painting is shown by the combination of body movement and changes in materials; now, this will be added in real time and dynamically derived through reversible and editable frame-sequence logic to expand the scope of evolution for this type of visual system while retaining the recognition ability of the language of oil painting. In the future, we will develop more accurate physical

simulation algorithms for pigments (such as particle sedimentation models based on the discrete element method); we will build quantitative models of colour psychological response in real time rendering (including the coupling relationship between chromatic aberration and gaze duration); and we will design metadata protocols for work attribution signatures in distributed creative environments (covering contribution hash chains and version tree structures).

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