Theses

Texture: Recurrent image structures in the art of the "age of the computer" The relationship between contour and pattern in video art and virtual space

In this thesis I shall examine the recurrent image patterns of the age of computer imaging in terms of the history of science and art. Repetitive, similar elements are so frequent in early computer images generated by algorithms that in the approach of some curators these patterns, these texture-like images, represent the whole of computer art, because they are built up according to algorithms, and computers also use algorithms. In these images the "trace" of the algorithm (insofar as we conceive of it as the rhythmic appearance of modular elements) can clearly be seen. One example of this is the 2018 exhibition at the Victoria and Albert Museum, where images consisting almost exclusively of elements in modular repetition were on view, and to a large proportion of them Sklansky's definition of texture could be applied. This approach to presenting the field that can be termed "computer art" (a term the exhibition organizers may themselves have shrunk from, choosing instead the title *"Chance and Control: Art in the Age of Computers"*) is in my view a very one-sided approach, because creative humans have been using serial elements for a very long time. Contrasting with this, in many computer-generated images, suffice to think of *Agnes Denes's* picture *The Crystal Fort*, *Yves Netzhammer*'s metaphysical animations, or any vector drawing, for instance *Saul Bass*'s logos, to touch on applied art too, this feature is not perceptible.1

However, if we examine the digital history of patterns, and textures, the algorithm is an indispensable element which becomes a relevant question in the context of art history too, and we are faced with the intersection of science and art disciplines. Image synthesis, the "calculated" image, which is the medium of virtual artworks in the digital age, from a scientific perspective goes back to the images generated in order to investigate human perception. The programmers working under *Béla Julesz*2 generated images from random points for their work. In these images algorithmically created, recurrent, simple image units, points in rows, had "inequalities", which could not be familiar to human visual perception: "there is no structure, shape, form, and no manner of monocular signalling movement"3. The opportunity in their unfamiliarity (in other words, that the monotonous image noise of the mass of points concealed a shape that could be revealed with spatial vision) was that it became possible to examine more fundamental processes in researching perception. These so-called random point stereograms brought a breakthrough in the neurological field of spatial vision4 and proved that the processes of stereopsis, perception of movement and discrimination of texture are bottom-up, low-level processes. Their appearance can be linked to artistic endeavours such as abstraction and kinetics, characteristic in the 20th century, a time striving for continual renewal and

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[1] "A region in an image has a constant texture if local statistics or other local characteristics are constant, change slowly, or are approximately periodic." Martin Hassner, Jack Sklansky: The use of Markov Random Fields as models of texture, Computer Graphics and Image Processing, Volume 12, Issue 4, April 1980

[2] Ed Ghilbert and Jonathan Victor

[3] Patrícia Gerván, Ilona Kovács: Látod?... [Can you see it?...], Magyar Tudomány, 2007/02 p. 173.

[4] RDS – Random-dot Stereogram, Julesz first used this in 1960 in experiments on perception

artistic experimentation. Since their genesis, the medium of synthesized textures has been the screen, the moving image; at the same time in their purest form they are non-figurative. Such images were made not only to examine stereopsis, but also to investigate texture discrimination, in which Julesz and his staff measured how large and what nature of change is sufficient in each pattern (and thus generally in the process of vision) in order for the difference to be perceptible to the human eye.5 In order to create these images, it was necessary to apply the stochastic and deterministic duality, to generate mechanically, and to partially control and “restrict” the random. This duality is constantly present in the history of digital textures, whether we study in the field of video art or observe synthesized patterns to cover 3D forms.

Julesz himself took part in an art show in April 1965, with *Michael Nol*, in the *Howard Wise Gallery* in New York, though he informed viewers that the works exhibited under his name were not intended as works of art, but had been created for scientific purposes. The time spent in the Bell Laboratory link *Vera Molnar* and her psychologist husband 6*to Julesz*, whom they knew personally. From the fact that repetition, and within that modulation (changes in the pattern), which characterize the work of *Vera Molnár*, are also a tool to examine the human mind as it perceives the world, it follows that the differences in the texture and the shapes that can be traced from the alternation in structure (using the growing technological apparatus) lead to the field of artistic image creation, and can be profited from in the domain of art. One of the earliest examples of this is the appearance of a random point stereogram in one of Dali's pictures showing Christ; in terms of artistic movements, the link to Op art seems clear.7

The texture patterns, and within them the image creation method displaying shapes with inequalities (differing texton gradients) can also be found among the tools of video art. This can be seen in the work of *Steina* and *Woody Vasulka*, and *Peter Callas*, which can be considered as videographics that push at the limits of possibility of perception. In his 1980 work *Artifacts, Woody Vasulka* uses a texture-discrimination process based on temporality: it operates with an out-of-phase depiction of the TV white noise on the edge of a diagram, through which the edge of the region vibrating in a different rhythm becomes visible, and perceptible.

The Australian video artist *Peter Callas* also uses texture discrimination to form simple signals in his 1986 video *Communication*, in which he also gives direction to the units forming the patterns; his approach is more contoured, and he uses the opportunities afforded by digital patterns: at times he covers a video image with texture, at other times he forms concise, symbol-like icons.

The characteristics of images made in a virtual 3D space is that they take on the texture of spatial models. These textures are aligned to the forms of each model. During our research, we conducted experiments in this field, and created a drawing tool with which targeted synthesis can be realized. It is necessary to "pack" the 3D forms into textures in order to be able to depict forms virtually in a way that appears as natural as possible – when this is the goal. During this, experiences related to texture perception arise in practical situations too.

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[5] *Julesz: Visual Pattern Discrimination*

[6] François Molnar

[7] a machine imaginarie, and generally her creative method.

The organization of the structure of synthesized textures, and the image analysis preceding the synthesis (in other words the search for similar structural units within the pattern) is a practical, applied problem, during which analysis gives parameters for image synthesis. One of the aims of this, used in digital image creation (an applied art goal, so to speak), is the creation of textures whose appearance seems natural.

Julesz's concept of the texton, though it is a quale-like unit, in other words an unmeasurable quantity, rather a more subjective feeling, relating to quality, regularly appears in recent publications related to texture synthesis. The reason for this is that in texture synthesis, during which algorithms create from a small input pattern an enlargeable output of any expanse with a similar appearance and structure, it is important that the units forming the output match up in a life-like, natural way. The perception of *cues*, the borders appearing in texture recognition or different "texton gradients" can be compared to the practical goal that textures created through synthesis must appear natural, with no manner of artificial image, or mechanical repetition. The synthesis method used in our experiment, the patch based cutout, can be simply described as an algorithm cutting around the characteristic texture units, and rebuilding them, filling up a surface of any size tiling them one against the other. This ideally contiguous, continuous pattern we make editable with traceable directions, partly to make it possible to match the textures to the extended surface of the 3D models, and partly because this way graphically independent images can be created. An experimental tool that aids creation: the graphics presented in my masters dissertation are examples of this, and an applied example is the installation element made for the show Keretek Közt [Framed] in the Hungarian National Gallery.