

UNIVERSITY OF ART AND DESIGN CLUJ-NAPOCA

Field of doctorate degree: Fine Arts and Decorative Arts

**DIGITAL CULTURE AND
THE AESTHETICAL VALUE
CREATIVE WAYS TO USE A COMPUTER IN ART EDUCATION**

THE SUMMARY OF THE PHD THESIS

Scientific coordinator:

Prof. Radu-Călin Solovăstru, PhD

Candidate for the PhD degree: Loredana Daniela Tomşa

Cluj-Napoca

2013

SUMMARY

A look at the history of culture shows us that if literature, fine arts and humanities in general have given rise to a long period that extends from Greek and Latin antiquity to the Enlightenment, then the last historical sequence of more than two hundred years has manifestly been dominated by the great adventure of positive science and technique. The relationship between art and technique is, therefore, not a new theme in philosophical discussions, while it finds various ways of visual expression in twentieth century artistic vanguards.

The first philosophical and aesthetic works that have dealt with “cybernetic art” emerged in the nineteen-sixties, but only during the last decades scholars have begun to approach the issues raised by digital art as a cultural product of an increasingly computerized society. Born as a postmodern genre after 1970, digital art refers to the approach of classical artistic methods and means of using digital technologies. Virtual installations, interactive fractal art, algorithmic art, imagery and 3D animation are just some of the forms digital art can take. In this thesis I shall specifically refer to algorithmic art generated with the use of the LOGO programming language and I shall propose a creative use of the computer in art education, which I shall call pixel art.

The computer operates simultaneously as a medium and as a creation tool. This study (from the perspective of an artistic pedagogical approach) is highly topical and has rarely been undertaken in our country’s artistic and educational landscape. Using ICT in school is part of the natural evolution of learning and it yields an inherent solution to contemporary challenges that the students are faced with in their learning process. Integration of new digital media arts in high school, within the framework of the teaching-learning-evaluation process, is an opportunity that should not be ignored.

This paper will discuss these issues and it will propose specific artistic practices that are designed to integrate information and communication technology in the artistic curriculum for secondary schools and high schools. Related to this, I put forward the idea that the art teachers should feel free to innovate their teaching methods, so they can respond creatively by using the new technologies. One cannot ignore this under any circumstances if one wants to communicate adequately with students of the digital generation. Therefore, the teachers in general and the art teachers in particular should be involved in the research process and they

should also be actively connected to the cognitive paradigms of the society. They should become responsible and aware of their own heritage within an increasingly globalized economic, political, social and cultural climate.

The thesis statements of the paper in hand referring to the study of creative methods of computer use in visual education have led to the formulation of the research problems, which are presented as the following questions: is art today truly undergoing a mutation by the even more profound penetration of technologies within the creative process, or are we dealing with the mere twitching of an evolution which has started long ago, in which new technologies are inserted, without us being able to recognize a radical transformation? Is the immersion of computers in contemporary culture, including art, a phenomenon of automatization of creation, freed from its essential human virtues? Can aesthetically valuable work be done by using new media and news means of expression? Are the new media releasing the artist from the materiality of artistic traditional practices and media, or rather, do they subject the artist to some different sorts of –subtler- constraints? Can information and communication technology improve teaching, learning and evaluation of art? Which are the ways of integration of new creation media (and of the artistic products of digital culture) in contemporary art education at pre-university level? Can computer generated art revolutionize the way we conceive and produce art?

These statements are being discussed in the chapters of the paper, presenting the pros and cons formulated by the leading art theorists, aestheticians and specialists concerned with the phenomenon of digital art, opinions of acknowledged artists who successfully use this innovative artistic practice. My approaches in the sphere of computer-generated art will also be presented. The motivation behind the development of this paper stems from my earlier study of mathematics and computer science as well as from my own artistic pursuits focused on finding a way to express my own sensibilities by the use of the computer as a medium of artistic creation. Logical thinking, generalization and mathematical abstraction are therefore part and parcel of my personality and my self-defining anchors that have helped me operate and successfully apply the suitable IT-vocabulary in order to complete the PhD thesis. But beyond the computer, exact sciences and their abstract concepts (groups, algebra, matrices, topology, Euclidean or non-Euclidean geometries) lies a perfectible world, which is at least equally fascinating (the world of intuition, imagination and artistic creation), which I have explored in recent years with the same persistence, both as an artist and as an arts teacher.

The use of the computer as a working tool and as a visual interpreter of the artist's "inner voice", could be – in my opinion -- an infinitely liberating experience. Order, chaos,

infinity, immortality, the idea that there is something beyond what we know, something bigger than our existence, but perhaps something as simple as a line code; these concepts fascinate me and they underlie my interest for algorithmic art – computer-generated art.

To me creation of art and arts education are first of all a display of superior knowledge, of an intellectually controlled expressivity rather than a fruit of the instinct. There is a myriad of possible worlds governed by order and beauty but also by deterministic chaos in a dormant state, encrypted in the diverse systems and mathematical formulas. By using the computer and algorithmic procedures we are able to make them visible. The works that I have created through digital art, “speak” about spirituality. Creating these codes of algorithmic images simply made me feel in touch with life forms beyond the mysterious realm of thought; shapes yet unimagined gave me the opportunity to probe the depth of visual schemes, of radiant introspection of my own rhythms and accents transposed in visual images, ancestral patterns and sacred images; shapes shrouded by light and shade, that dwell in all of us.

The output of my artistic explorations alludes to a part of what art history has collected over time in the domain of imagery; it converges the pointillistic effects of oil painting with the black and white contrasting effects of photographic art, pop art, decorative art (ritual art), abstract art, op art, conceptual art, minimalism, alphabet art, graphic design and advertising, communication technologies and the eclectic visual culture of postmodern times.

The methodology of the research involved the use of: theoretical methods (research of the ideas, concepts, definitions, methods of computer-generated art, analysis, synthesis, comparison, systematization of the artistic practices of programmer-artists, renowned creators of computer art and the graphical illustrations of the concepts and ideas presented here); my own artistic practices (the creation of art algorithms in the LOGO programming language); practical methods (conversation, observation, my own case study “Once upon a time there was a dot and they called it Pixel”, and so on) and experimental methods (the artistic pedagogical experiment launched during the three editions of the inter-county competition “Pixel-Art” of unconventional art techniques, followed by evaluating student’s work).

The case study “Once upon a time there was a dot and they called it Pixel” was based upon an experimental painting class at *Clubul Copiilor Dej*, where I currently work as a teacher. More works by the children from the schools who participated in the three editions of the inter-county competition “Pixel-Art” of unconventional art techniques also underwent observation, research and analysis. These visual works on paper are presented online on www.clubdej.sunphoto.ro

Keywords: abstract art, algorithmic art, conceptual art, visual communication, artistic creativity, regular division plan, graphic design elements, computational aesthetics, fractals, visual grammar, digital image, artistic language, programming language, teaching method, minimalism, traditional motifs, op art, pattern, pixel art, plotter, postmodernism, artistic practice, digital print, creative process, creative product, interdisciplinary collaborative project, the psychology of form and colour, repetition, rhythm, symmetry, similarity, communication and information technology.

Contents of the thesis

In the Introduction the topicality of the paper's theme is argued and the research problems together with the research purpose are defined: can aesthetically valuable works be produced using new media and means of expression? Which are the ways of integration of new means of creation (and of the artistic products of digital culture) in contemporary art education at pre-university level? Can art created on a computer revolutionize the way we think and produce art? In this context the contents of the thesis chapters will also be presented.

Chapter 1, DIGITAL CULTURE AND THE AESTHETICAL VALUE examines and systematizes ideas, concepts, principles and theories on "digital culture", departing from the research problems. Referring to the writings of communication specialists such as Marshall McLuhan, Lev Manovich, Abraham Moles, Radu Bagdasar I will discuss concepts such as new media, digital culture, digital art and some of the consequences of profound changes introduced into the sphere of culture, as a result of the cybernetic impact on the act of creation.

The profound changes that digital technologies have brought about in art are changes affecting the creative process, the production and the exhibition of art objects and eventually the aesthetical characteristics of the new artistic products. The western cultural model has hitherto been characterized by sequential and original (or non-reproducible) artworks. The decisive breaking off in art from this model is inherent to the technological and the digitization process. Presentation of the artwork changes within the advent of virtual museums and galleries, which are offering the viewer a different relationship with art. And presentation of the works has dematerialized art, whether it concerns a reproduction of paintings and old works of art, or, on the contrary, "immaterial" works directly conceived and produced for the internet.

At the intersection of art and new media we also find, among many other new artistic techniques, generative art and algorithmic art. Generative art is a form of artistic expression that uses algorithms to design new artistic forms that generated in an autonomous manner. It is basically a creative system that is capable of producing according to predefined rules. It produces complex compositions, which, unlike the traditional works of art, are not static; they can evolve. And they can change depending on a variable of the instrument, captured by sensors or based on some random values, on chance and on the basis of recursion. They can also evolve infinitely departing from their own algorithm. Then, as we will see in a short historical overview, generative creation systems based on orderly or disorderly rules based on chance and on randomness can be identified throughout the history of art in all artistic genres of traditional arts.

Little by little the field of art takes over procedures of scientific investigation as well. Starting from from the sixties of the last century, a host of artists have begun to use the computer in their artistic oeuvres: Manfred Mohr, Torsten Ridell, Michael Noll, Vera Molnár, François Morellet, Roman Verostko and many others. By using the computing power of computers and of the algorithmic procedures artists began to generate shapes that had striking, visual qualities. A vast uncharted territory was waiting to be conceptualized and materialized. As any art form, the creation of algorithmic art involves synergistic action of artistic inspiration interwoven with execution techniques and the ways in which the artistic product is presented. This subject will be discussed in the second chapter of the thesis.

Chapter 2, MY OWN CONTRIBUTION TO ALGORHITHMIC ART, presents and discusses the theoretical benchmarks of using digital media in developing contemporary artistic creativity. It also captures and analyzes the stages of my own creative process. The artist's algorithmic approach to art is aimed at creating original graphic routines, which has as a result the display of possible shapes, random sampling by introducing parameters and even interactivity (by creating a simple interface with interaction buttons). These allow users to observe changes in certain parameters and visual changes produced on the generated images. The original graphic procedures written in the Logo programming language offered me a virtually infinite field of exploring ways to permute shapes, which Abraham Moles mentions in his book *Art and Computer* (1970).

The section *Generative procedures: visual language elements* presents my own work done through the process of algorithmizing the fundamentals of visual language. In the algorithmic compositions the dots or lines of different shapes and colours are being "released" from their materiality. They become meta-signs, codified binary signals that unfold in a

structural manner, but the unfolding appears to happen accidentally; planned but spontaneously; organized but freely, on the surface-interface of the working environment (screen, monitor, etc.). Relations between the elements of the visual language can be clear, rigorous, deterministic and then the appearance of the work is rather static, or conversely, by introducing a random variable the relation can acquire a degree of indeterminacy. Perhaps more than in any other type work of kinetic character, inspired by op-art, colour-field or minimalist inspiration, the images based by algorithmizing visual language elements are open to various interpretations, and their playful nature is more evident than ever.

The section Generative procedures: forms and archetypal symbols presents my own work aimed at probing the form that belongs to the archetypal cosmos situated on the edge between the figurative and the abstract. Archetypes have a secret power, because they are built on sacred geometrical structures that have a particular, emotional impact on each human being. Ancient symbols like mandalas can be described in computer generated art as a central motif obtained by symmetrical repetition, a mirror effect and translation of shapes, geometrical figures, decorative motifs, etc.

The section Generative procedures: decorative motifs in Romanian folk art reveals the feasibility of investigating the Romanian folk art motifs as found on traditional fabrics, by using communication and information technology. In *Semiotica matematică a artelor vizuale* (1982), edited by the academic Solomon Marcus (who also wrote the preface to the volume), the scholars Sorin Israil and Liviu Olaru show that the totality of Romanian folk ornaments displays analogies to the structure of IT languages by superimposing combinatorial elementary motifs onto an infinite number of rules, enabling the possibility to describe the artistic “message” in a grammatical manner. After having drawn some geometric motifs from a traditional graphic image, which I then entered in the Logo software as graphical parameters (procedures), the combination gave rise to original visual compositions.

The section Op Art encounters: the moiré effect is an outcome of my investigations on combinatorial techniques of Escher's art, especially concerning the regular division of space. The regular tessellations of this brilliant graphic artist, his hyperbolic spaces, the generating of periodic patterns and series of figurative-nonfigurative forms that are metamorphosing into others, paradoxical spaces and optical illusions, isomorphisms and the recursion that we find in the theory of fractals, all lead to the idea of representing infinity, but also of other parallel universes that appear strange and ambiguous.

These visual ambiguities are explored by Op Art on a more formal - we could say minimalist - level based on moiré effects. My compositions generated in the Logo computer

language capture the encounters with Op Art (the moiré effect), due to overlapping of two opposite directions of two networks of differently coloured circles with progressively decreasing rays that cover the entire space. The visual images that somewhat surprisingly and unpredictably arise from the chain of circles and webs have the appearance of very delicate lace and embroidery, which sometimes appear interrupted, then reconnected with other elements; sometimes harmonious, sometimes discordant, at a quasi-periodic rhythm of occurrence suggesting infinity and perpetual motion.

The section “Creative explorations in graphic design: digital writing” comes as a continuation of my research in the domain of alphabet art and graphic design, which have resulted in the elaboration of my written work for obtaining my final teaching certificate (degree I) in 2007, of which the theme was “Graphic design, domain of creativity”.

The electronic environment offers unlimited possibilities for experiments in the domain of graphic design, which were not available in traditional printing due to the constraints imposed at the time, by the limited technological possibilities. A substantial conceptual change occurred with the introduction of digital design, which treats letters as information and not as (typo) graphic fonts. Here, on these fertile grounds, I began my visual experiments, playing with the shape of fonts, which have now become elements of visual poems of computer art made by the Logo language.

The section entitled Generative procedures of 3D anaglyph images includes a series of visual experiments related to the creative three-dimensional manipulation of space. An anaglyph is an image taken by a stereoscopic process in two complementary colours, which when viewed with special glasses (with the red filter on the left eye and the cyan filter on the right eye), give the viewer the feeling of watching a three-dimensional space in which some elements approach the viewer, and others move away from him.

What is specific to these anaglyphs taken from my own work, is that they are generated algorithmically by the use of computer codes. Therefore, the virtual character is even more accentuated since the anaglyphs appear as mathematical and geometric relations encoded in computational codes, which have been applied in order to generate a purely aesthetic form. I have proposed an interactive artistic way to conceive space. This would open up new perspectives for the perception of space, the relations between shapes within this space and of spatial illusions. It will lead to the formulation of novel concepts about ourselves and the world we live in.

In validating Postmodernism, no other subject has raised as many contradictory discussions than the one regarding the qualitative leap forward of the convergence between art

and science. However, a paradigm shift must take place in art criticism in order to assimilate the ramifications of nonlinear aesthetic activities of our days. These activities include computer art, scientific visualization, net art and 'telepresence' and they reflect many aspects discussed within the framework of the postmodern discourse, such as computer generated art and the synthetic images of our society of the 'simulacrum' type.

In Chapter 3, the Case Study "Once upon a time, there was a point and they called it Pixel", is testing the impact of new technologies on the everyday life of a student target group and the way in which these technologies can be integrated into contemporary art education. It is no news that the apparition of digital culture and its influence on the forms of art and on art education appears to be extremely significant. We are witnessing today an epic cultural shift from the age of printed books as corporal objects to the digital age of immaterial hypertext.

Art and images (digital or not), assail us from everywhere, and manipulation by means of images has become commonplace for consortia that have interests in persuading us to perform a certain act, or to buy a particular product. The importance of a research conducted in the domain of contemporary art education while capturing the relevant paradigm shifts particularly for artistic pedagogy of the information society, can be most pertinent in this context.

Along the same lines, the third chapter of this paper sheds light on the idea that, with the advent of internet and computers, students must think and communicate like graphic artists and designers. They also have the opportunity to work in the new creative industries, which just started to develop in our country.

"Once upon a time there was a dot and they named it Pixel" is a case study with pupils from the painting workshop of Clubul Copiilor Dej, and with a number of about two hundred pupils from partner schools from Dej in March-April 2010. Focused on gathering and interpreting information about the creative use of digital media by the pupils in arts education classes in school or in an informal setting. The study shows that even in a not too distant future homework will almost entirely be done by the help of the computer and its accessories like the webcam, printer, scanner and the graphic tablet. The children are not visually literate so as to be able to use new media for artistic purposes.

As an art teacher I appreciate the introduction of information and communication technologies in visual education classes, within some optional curricula of transdisciplinary activities. I think one of the roles of specialists in visual arts - even though not all teachers look with detachment and enthusiasm at the use of the complete range of digital technological tools in the development of artistic creativity - is to familiarize students (and sometimes

teachers of visual education) with the new means of artistic creation. Unfortunately, this familiarization of the students with the new means, which can become tools of artistic creation, has for various reasons not yet taken place in our educational curricula, as shown in the case study “Once upon a time there was a dot and they called it Pixel”.

To this ruling idea the fourth chapter of the thesis is dedicated, where it shows that the computer can become – and actually is - a valuable medium for artistic creation.

Chapter 4: “CREATIVE WAYS TO USE A COMPUTER IN ART EDUCATION” shows that digital technology provides the art educator with various tools to help students learn in an active, creative and participatory way about visual concepts and visual communication and presents a method and an artistic educative practice based on the use of pixels as a structural component of artistic images.

Manipulating the computer as a tool of artistic creation, the students can take risks and explore multiple ideas more widely because now they will have the opportunity to save different versions of the work and to easily return to previous actions; experimenting with image and colour options reduces the cost of time and resources compared to using traditional ways and materials. Children can create online artworks with digital tools for drawing / painting and then they can invite their parents or friends from all over the world, to the “virtual” gallery of the school or to their own personal galleries where one can view the works on display online.

The proposed teaching method, “Pixel Art” was developed and piloted over three school years in the three editions of the inter-county contest of unconventional visual techniques, also named “Pixel-Art”, which was released in June 2011 by the painting workshop of Clubul Copiilor Dej. The completed school assignments belong to the domain of digital art and they are a fusion of art and IT. The method with which these assignments were completed has constructivist origins and it can lead, in my opinion, to the development of new possibilities of artistic expression and to the advent of some original point of view – experimental - in pedagogy and in artistic creation.

Chapter 5, CONCLUSIONS, reintroduces the idea that the dissertation answered the following thesis statement: are there creative ways of using computers in education and artistic creation? Nowadays the computer serves as an invaluable tool for graphic designers, and artists and may add new dimensions to the creative process. But the computer can also be used as a medium (the art algorithms) for bringing about precision, rigour, repeatability, generating infinite visual versions, complexity, interactivity, emergence, etc.

Historical research of the sources in this field has shown that using the computer as a means for creative and artistic education today, can be achieved through the adoption and implementation of innovative language which belongs to the interdisciplinary field of digital art. For creative personalities, the creative process with the computer represents an interaction of interdisciplinary training (lifelong professional formation) and of the transparent artistic / aesthetic creativity process. And the generated product of creation is an immaterial code, purely conceptual and spiritualized with a new, original value, different but not less from traditional artworks.

The development of the artistic creativity of students with the help of the computer is a complex didactic process that involves: teaching strategies / methodologies of work, revision of school plannings in the arts curriculum, and implementation in pre-universitarian education of some optional classes with interdisciplinary content (such as “Art and Computer” enabling students to practice creative ways of using computers in visual art education). The more these students will be visually literate, the more they will become more aware and more critical (in a constructive way) in the assessment of aesthetic products of the contemporary digital culture.

The computer-generated images, i.e. the aesthetic products of postmodern art, fascinate us with their beauty and complexity. Their autogenerative creational system is similar to the old form of ritual art from which were born strongly archetypal universal symbols and the abstract decorative motifs we find in traditional arts. The strength of the creative process and of the tool (the computer, which extrapolates computing power and the human act of imagination) lays in the fact that by applying a series of graphical transformations, combinatorics and permutation algorithms to some simple shapes - seemingly trivial - extremely clear images can be realised. These shapes, pure by their conceptual minimalism are in the same time complex and elegant, and have been developed in practically infinite series of artistic visual formulas and they are carriers of deep meanings.

At the end of the thesis there is presented a list of references and a list of pictures and annexes referred to in the paper.

Elaboration of this thesis was made possible by competent guidance and constant encouragement received from my scientific manager Prof. Dr. Radu Solovăstru, to whom I express my feelings of finest gratitude. I also thank my family for their unconditional support, Marcel Bas for assisting me in the English translation of the summary, and I send thanks to all those who supported me during the conceiving and the writing of the paper.