STUDENTS OF ACADEMY OF ART LEARN AND EXPLAIN THE CIRCULAR ECONOMY THROUGH CREATIVITY AND COMPUTER ART

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Abstract

As part of the Computer Art course, students were assigned the exercise of developing a digital artwork that illustrates the "Circular Economy". The aim of this project is to raise awareness in society about the reuse of waste, the so-called "closed cycle" or "regenerative cycle", through creativity and Computer Art.

Through examples and direct experience, students were encouraged to learn to solve the problems of multimedia design and to develop a creative process. Through new media they "organized" their idea, and took the following steps: research, observe, analyze, experiment, create a prototype, make test and evaluate the communicative capacity of the work, using "ingenious and open attitude" to be able to reach the set objectives.

Students have been encouraged to develop shared skills in teamwork and to collaborate: communicating with others to achieve goals on schedule and according to the project guidelines.

Students, through their artworks, have tried to make the theme of recycling accessible and simple to a wide audience, especially to children, who are able to absorb information easily.

Students interpreted the theme by composing a fantastic story, illustrated using new technologies, and tried to focus on the information. They made short films, virtual and printed illustrations, interactive games with augmented reality.

The idea was to disseminate the contents in elementary schools. The students of the Academy of Art interacted with the children through their artworks, noting the communicative capacity of their artworks.

In a first phase the children learned about the "Circular Economy" through short films, illustrations, interactive games, with the students of the Academy of Art.

In a second phase with the respective teachers, each classroom became a small "class recycling" workshop. Any packaging used was recycled and regenerated. It is the concept of transformation that "from everything can be born a new thing".

In each class the children learned what the packaging is and after having recycled them in categories, for example, paper, aluminum, plastic, they reused them creatively to create new objects displayed in a showcase of "class recycling".

Keywords: Education, Circular Economy, Computer Art, Game, Augmented Reality.

1 INTRODUCTION

The aim of this work is to spread the Circular Economy through creativity and Computer Art.

In the first part, I am going to introduce a brief history of Computer Art and what the Circular Economy is.

The second part, it is regarding the implementation of theoretical concepts in a practical work done by the students in the classroom and the analysis of the results obtained through images of students works.

In the conclusion, I am going to describe the work that will be done by students of the Academy of Fine Arts in the elementary schools.
2 METHODOLOGY

What is Computer Art?

The first experiments with Computer Graphics began in 1962 at the American Boeing Company. William Fetter, computer engineer of the Boeing Company, was the first to grasp the importance of the computer, as a new medium in the world of visual representation. Boeing, an aircraft design company, wanted to experiment with a technology to scientifically visualise a series of calculations, then simulate a project with a scientific method. The first image developed by Fetter was that of two pilots in the cockpit.

In 1968, the image of Fetter's two pilots was exhibited in one of the most important exhibitions dedicated to Computer Art: Cybernetic Serendipity, curated by Jasia Reichardt for the Museum of Contemporary Art in London, alongside works by classical artists such as Jean Tinguély, or more technological like Nam June Paik, musician and one of the main exponents of video art. There were also the first images, both static and animated, generated by the computer, by those who today are considered the pioneers of Computer Art: Michaell Noll, Ken Knowlton, Larry Cuba, John Whitney.

In Homage to New York, in 1960, Tinguély recycled engines, mechanical and electrical parts, making them become essential organs of his works. First he started with objects with manual movement, then driven by water power and in the 1950 powered by electric motors. The technology and mechanisation that determine the speed in human work is transferred to the sculpture that moves, inspires terror or fun, self destructs and becomes human in a formidable automaton. He created new machines of different nature with machine parts. Tinguély donated a visible motor heart to unarmed objects.

Michael Noll, an American engineer, used the computer to create artistic models. In Ninety Parallel Sinusoids, the upper sinusoid was expressed mathematically and then repeated again and again. The result is very close to Bridget Riley's Op art painting.

Larry Cuba is widely recognised as a pioneer in the use of computer art animation, and was one of the hybrid artists / technologists. He describes his work as:... consist [ing] of experimenting with algebraic structures to generate visual material that is unpredictable in its form. By that I mean that it was not designed, imagined or otherwise pre-visualized. The results are only known after the program is run, the computer executes the computations and produces the animation. [1]

John Whitney, started building his own analog computer in the 1950s with unique effects. Later he combined music and moving images like the Arabesque, exploiting the geometric skills of the first computer systems to produce a shimmering carpet of intertwined shapes on a screen, accompanied by Arabic music.

The debate on the relationship between Art, Science and Technology, already started in the Fifties on the wave of interest in a new discipline such as Cybernetics, was receiving a strong impulse precisely from the impact of new information technologies on the market and from the use of computer as a visualisation tool. The same years were also crossed by the Fluxus artistic movement, born in Germany and extended in the United States through the interventions of artists such as Wolf Vostell, painter, sculptor, video artist, proposing to undermine the rules of official art and to desecrate the world of media, inventing new expressive linguistic codes. The artists of Fluxus distorted the analogical image of the small screen with rudimentary equipment, treated it and manipulated it by hand, creating a style that would then find full development with more sophisticated technologies such as the computer.

At the end of the fifties the Programmed Art was also born, which theorising new ways of making art based on the concept of democratisation of art, on the redefinition of the role of the artist and the user, proposed mathematically constructed, dynamic works, in their own way interactive with the public.

This movement greatly influenced, during the 1960s, the research of those who experimented with computers as a visual representation technique. In 1963, Edward E. Zajac, a mechanical engineer, made the first computer-generated animation at Bell Telephone Labs, the New Jersey telephone company. It simulated the movement of a satellite around the earth. A clock counted the orbits. It caused a sensation, also because the development of the computer as a scientific visualisation tool was already realised. Indeed this has remained one of the most interesting and innovative fields of synthetic animated images.
In the first decade of computer graphics, engineers and computer scientists worked closely with artists coming from visual art, such as Lillian Schwartz, painter and prominent figure in the New York underground scene, or Vera Molnár, female exponent of the Parisian programmed art group Grav.

It is no coincidence that Ken Knowlton, who along with Ken Harmon was appointed in 1967 to create a mural for the offices of the Bell Telephone, thought of producing something in the idiom of a modern art, that is the computer science. Knowlton created a mural of over three meters in length using alphanumerical characters and thus started a series of visual research based on the rules of perception: textures, depth and movement effects through specially designed software. The new grammar of synthetic images took shape. Knowlton wrote: *It is possible to experiment with new visual forms ... The computer allows us to explore some new aspects of human perception.* [2]

Also at that time the foundations of human-machine interaction were laid, both through technological innovation (the studies of Ivan Sutherland, the well-known computer scientist who developed computer interface systems such as the light pen or the first Virtual Reality helmet), both through a more cultural research.

In Japan, in the 1960s, the Computer Technique Group, CTG, operated a series of interactive installations, such as *Computer painting machine N1*, which allowed the public to create a synthetic image on a large screen simply by moving in the gallery space.

The first decade was characterised by a strong wave of aesthetic linguistic experimentation, conducted in parallel with technological evolution; and contrary to what happened in the 1980s, technicians and artists were equally involved in the original writing of the programs.

It is difficult to trace in this period a line of demarcation between computer graphics developed for industrial or scientific purposes and those born with aesthetic purposes.

One of the most active centers in the field of computer graphics and computer animated films was also the Department of Art of Ohio State University, which in 1970 celebrated its centenary with an exhibition dedicated to interactive audiovisual systems. The creator of this event is Charles Csuri, one of the most active supporters of expressive computer research and one of the first to develop animation programs.

At the beginning of the Sixties, Csuri focused on animation techniques such as interpolation, the transformation of one sign into another, of one image into another: his *Hummingbird*, 1968, transformation of a Chaotic drawing in a hummingbird, first morphing of history.

Csuri is also involved in the field of three-dimensional computer animation, which already in those years began to interest both the scientific and industrial world and that of communication.

In 1976, Steve Wozniak and Steve Jobs founded Apple and Bill Gates founded Microsoft: computer science industries are born. The fabrication of the new systems that allow to model and animate three-dimensional images on the screen, brought the artistic context in search of realism. The rendering and animation functions very quickly become standard functions proposed by all computerised system manufacturers and thus mark the beginning of a wider diffusion of techniques for commercial exploitation that finds the maximum development in the following decade.

In 1981, Jim Clark founded Silicon Graphics; In 1984 Apple launched the Macintosh; In 1985 Commodore puts on the market the Amiga, a very flexible personal computer with high video quality. Amiga becomes a widespread phenomenon among young people, who find a friendly and simple tool in this medium. In 1984, Wavefront had released its first three-dimensional effects creation software. The research comes from the centers dedicated to experimentation. The language of synthetic images meets the market and is democratised.

In 1981 the Pac-Man video game was released of Namco.

The first video games are only two-dimensional, but they prove to be an excellent laboratory for technical experimentation and for spreading taste. This leads on the one hand to the growth of the personal computer market and on the other it opens the door to interactive digital production. The world of three-dimensional computer animation proceeds in parallel. The research of computer labs, especially university ones, focuses on the development of algorithms for animated representation. The aim is to define the synthetic language: lights, shadows, surfaces, natural elements. The Siggraph, the world's largest trade fair dedicated to the sector, follows the evolution of this language from the point of view of technology and expressiveness.
The grammar of the new visible progressively invests advertising, cinema and art itself. The first 3D animations are tests that show the results achieved in specific research. These are usually very short, short productions that still require a very long time to complete and large investments. In 1975 Benoit Mandelbrot appeared at the Siggraph with a book that was the result of twenty years of study, A Theory of Fractal Sets, where his fractal calculations are used to represent clouds and mountains, to outline mountainous landscapes or intricate forests. The results of these researches are exemplified in the first short film by Pixar, then still a division of LucasFilm: André and Wally B., 1984, another product that does not want to be only a demonstration of the representative capacity of fractals, but also a real cartoon.

What is Circular Economy?

The circular economy is an economic system designed to be able to regenerate on its own by playing with two types of material flows, biological ones, able to be reintegrated into the biosphere, and technical ones, destined to be upgraded without entering the biosphere.

Posing as an alternative to the classic linear model, the circular economy promotes a different conception of the production and consumption of goods and services, which passes for example to the use of renewable energy sources, and focuses on diversity, in contrast to the homologation and blind consumerism.

The name "circular economy" derives from the mechanisms present in some living organisms in which the nutrients are processed and used, to then be reintroduced into the biological and technical cycle. Economic systems according to the circular economy, should imitate this concept of "closed cycle" or "regenerative".

Since it was born, the circular economy pursues the same goals adapting them to the ever-changing reality in which it remains and is inherited from generation to generation as an idea and ideal. The major objectives of the circular economy are the extension of product life, the production of long-term assets, reconditioning activities and the reduction of waste production.

In summary, the circular economy aims to sell services rather than products. According to the circular economy waste is "food", it is nutritious, so in a sense it does not exist. If we mean a product as an assembly of biological and technical components, then it must be designed so as to fit perfectly into a cycle of materials, designed for dismantling and re-proposing, without producing waste.

Respectively, the biological components in a circular economy must be non-toxic and can simply be composted. The technical ones, polymers, alloys and other artificial materials, will in turn be designed to be used again, with the minimum expenditure of energy. In a world in which the circular economy reigns, we reason by favouring logics of modularity, versatility and adaptability, so that each product is longer-lasting, created and even thought before to be updated, adjusted, repaired. A sustainable design in name and in fact.[3]

The aim of this project is to instil and spread the principles of the Circular Economy through creativity and Computer Art.

Students of the Computer Art course have addressed the topic assigned with enthusiasm and have worked hard for the success of their project.

We tried to create a collaborative environment by focusing on experiential learning. The students were supported and helped to share their experience in the form of dialogue and to review it from different perspectives, creating a collaborative environment and offering ideas for a multi-angle view of the experience lived by the individual subjects.

We tried to instil confidence into the students, to encourage them in their learning path with the freedom to express themselves and their experiences. We tried to support learning by helping the students to recognise the limits and strengths of their works, trying to make the organizational culture understandable, so that the students internalises the values and reflects on their role. [4], [5], [6], [7].

Students were encouraged to develop shared skills in a team work and in a collaborative environment: communicating with others to achieve the objectives on schedule and according to the guidelines of the project to achieve the objectives on schedule.
3 RESULTS

The results obtained were very good. Students, through their artworks, have tried to make the theme of recycling accessible and simple to a wide audience, especially to children, who are able to absorb information easily.

Students interpreted the theme by composing a fantastic story, illustrated using new technologies, and tried to focus on the information. They made short films, virtual and printed illustrations, interactive games with augmented reality.

Here are some pictures of student’s work.

Figure 1. Monica Vallerossa, Roberta Giglio, Elisabetta lo Greco, Salvatore Garufi, Giulia “Dirty Soul”, 2019. Video.

Figure 2. Marzia Salerno, Gaja Marano, Mauro Zagarella: “Ascoltare la natura”, 2019. Video.


Figure 5. Oriana Failla, Deborah Cavaliere: “Nuova vita all’olio”, 2019. Video.

Figure 7. Valeria Pagliarisi, Elisa Nicastro: “Un Gesto per il mare”, 2019. Video.

Figure 8. Salvatore Pace, Giuseppe Antonio Gullotto, Federico Trigilio, Sergio Chillemi: “Paper Life”, 2019. Video.

Figure 10. Arcidiacono Adriana, Palmisciano Maria Vittoria, Grasso Giovanni, Vincenzo Alba: “L’Ultima Risorsa”, 2019. Video.

Figure 11. Marianna Musumeci, Giulia Fonte, Francesco Arena: “Under the Sea”, 2019. Video.

Figure 13. Sortino Paolo, Sortino Andrea, Gaetano Sferrazza, Shoba La Porta, Anita La Porta, Alessandro Macrillo: “Dan e Bea”, 2019. Interactive Book.


Figure 15. Asia Colombo, Chiara Grasso, Vera Coco, Denise Lo Presti, Felice Agozzino: “Viola e Odo”, 2019. Interactive Book.
4 CONCLUSIONS
This project is in progress. The idea was to disseminate the contents in elementary schools. The students of the Academy of Art interacted with the children through their artworks, noting the communicative capacity of their artworks.

In a first phase the children learned about the “Circular Economy” through short films, illustrations, interactive games, with the students of the Academy of Art.

In a second phase with the respective teachers, each classroom became a small "class recycling" workshop. Any packaging used was recycled and regenerated. It is the concept of transformation that "from everything can be born a new thing".

In each class the children learned what the packaging is and after having recycled them in categories, for example, paper, aluminum and plastic, they reused them creatively to create new objects displayed in a showcase of "class recycling".

It was been decided to disseminate this content also to classes of the Primary Comprehensive School in Torrenova, (ME), in October 2019.

REFERENCES


