

The Development of Robot Art

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Abstract

Going through a few examples of worldwide recognized robot artists, we try to analyze the deepest meaning of what is called Robot Art and the related art field definition. We also try to highlight its well marked borders – like kinetic sculptures, kinetic art, cyber art, and cyberpunk. A brief excursion on the importance of the context, the message and its semiotic is also provided, case by case, together with few hints on the history of such a discipline, under the light of an artistic perspective. Therefore, the aim of the paper is to try to summarize the main characteristics that might classify Robot Art as a unique and innovative discipline, and to track down some of the principles by which a robotic artifact can be considered - or not - an art piece, in terms of social, cultural and strictly artistic interest.

Introduction

Nowadays, we can find robots in science and technology, architecture, art, video clips, cinema, literature as well as in our own homes. Their presence is fast growing in all fields and sectors and is becoming pretty consistent in industrial production and, especially, in medicine and entertainment.

Probably, that's because robotics incorporate within itself few charming practical and intellectual issues that are able to elicit the interest and the curiosity of many philosophers, artists, scientists, technologists and, overall, ordinary people.

Indeed, apart from the practical issues, a marvellous way to describe the hi-tech human being condition was given by Vilém Flusser [1] in 1996: "We are no longer the objects of a given objective world, but projects of alternative worlds. From the submissive position of subjection we have arisen into projection. We grow up. We know that we dream". This philosophical approach is very realistic and can be seen in many circumstances, from virtual worlds through cyber artefacts to robotics and more.

In this paper, we try to depict part of such an evolution towards "alternative worlds" which leads humans to building science and art robots.

Further, we try to get a closer and more specific look to what we call (in a pretty wide range) robot art, to try to understand the differences which can be found between the conceiving and the designing of pure scientific and/or commercial robotics and art oriented robotics. We do that although, as the same Vilém Flusser [1] suggested, somehow "Scientists are computer artists *avant la lettre*, and the results of science are not some 'objective insights', but models for handling the computed".

In fact, contemporary robotics is the field in which the comprehension of human mind materialises. Because it is a topic that has always been transversal to scientific and human disciplines alike, and that has brought together research fields into neuroscience, engineering, computer science, biology, mathematics, psychology, and philosophy. Indeed, from literature we know that embodying the biological brain in to machines (and machine bodies) is one of the most attractive and challenging "dreams" humans deal with. It is an ongoing effort which, besides technical difficulties, raises crucial scientific questions and more general philosophical issues like: how far we can push artificial learning, acting, and interacting? How will we relate with artificialities in future? What laws, what rights, what social status, what responsibilities these robots and artificial life creature shall have? And how all the conception of aesthetics will be renewed accordingly to these new dimensions of artefacts (e.g.: artefacts produced by other artefacts)? What is the role of the scientist? And what is the role of the artists under this new perspective? Although, in last few past years, we already went through many of these topics - like for example in the Alive Art [2] and Polymorphic Intelligence [3] manuscripts – we will try to look at things under a historical point of view to summarize and synthesize in one single vision the resulting paradigm and conceptual approach, by focusing, specifically, on Robot Art.

Historical paths

The research in this field started in the 1950s with, for example, the Cybernetic Serendipity at London's ICA [4], and, today it is hosted in many contemporary artistic and cultural events – as, for example, it happened in the specialized art events like Robodock, Pescara Electronic Artists Meeting, Robots at Play, ArtBots, and in more generalist art events, like in the last two Venice Biennale, etc.

In 1956 Nicolas Schöffer executed and showed in the actual *Theatre de la Ville* a spatial composition in steel and duraluminium, into which an electronic brain, developed by the Philips Company, had been incorporated [5]. Named CYSP 1 (Fig. 1) - a name composed of the first letters of cybernetics and spatiodynamic - it can be considered the first "spatiodynamic sculpture" having total autonomy of movement – it travelled in all directions with two speeds, as well as it had an eccentric rotation by setting in motion its 16 pivoting polychromes plates.

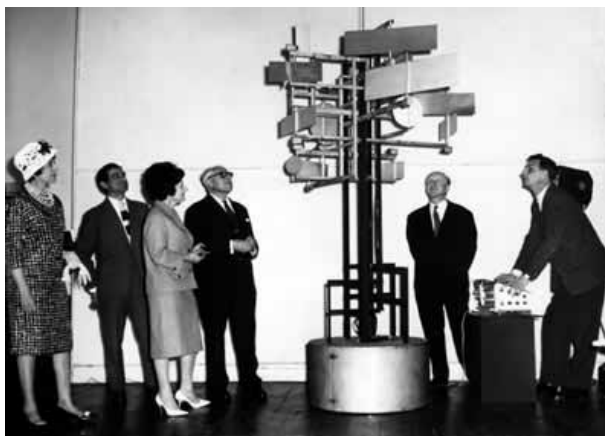


Figure 1. Visitors admiring CYSP1 at the Institute of Contemporary Art, London (UK), in 1960.

Because of CYSP 1, Nicolas Schöffer is considered as the father of cybernetics art, the milestone who signs the passage from mechanics and electronics, kinetics and robotics.

Nevertheless, it must be noticed that in 1955, Akira Kanayama - a member of the hyper active art group *Gutai Bijutsu Kyokai* (Gutai Art Association) which was founded by the artist Jiro Yoshihara and that in the word "gutai" (composed of two signs, "gu" meaning tool and "tai" meaning body) resumes its finalities – had already developed an electro-mechanical process that enabled him to create a 71x109 1/4 inch painting. He originally presented this Robot Art piece in the context of the "First

Gutai Indoor Exhibition", October 1955, in Tokyo [6]. The fact that the painting emphasized the role of the electro-mechanical device in detaching the hand of the artist from the work was, artistically speaking, striking, and absolutely crucial.

Further, within the same group we can find many different examples of robotic art pioneer works. One for all, the Atsuko Tanaka 1956 masterpiece called Electric Dress - a combination of the tradition of the Japanese kimono and modern industrial technology (Fig.2) - which can be considered, under all circumstances, the ancestor of all the cyborgs and cyber culture.

The "Electric Dress" which the artist herself was used to wear in her actions, such as stage performances, consists entirely of wires and more than one hundred coloured light bulbs and neon light tubes that flash every two and a half minutes.



Figure 2. Atsuko Tanaka, member of the Gutai Art Group, wearing her Electric Dress in 1956.

Later on, in the 60s, a few examples of cyber/robotic art raised and three of them were very important since they deeply influenced all the following artistic production and, in particular, the conceiving of Robot Art. They are *K-456* [6] by Name Jun Paik and Shuya Abe (1964); *Squat* [6] by Tom Shannon (1966); *Senster* [5, 6] by Edward Ihnatowicz (1969-1970).

In short, with the *K-456* duet with Charlotte Mooreman - executing the Plus-Minus composition by Stockhausen - Name Jun Paik adds to Robot Art the mobility and the (remote controlled) user-interaction (Fig 3). These two characteristics became essential in what we call Robot Art today. Moreover, he depicted a scenario in which Art

Robots are to be seen as “funny” in the most human-like humoristic meaning of the term.



Figure 3. Name June Paik's remote controlling K-456 while it executes Plus-Minus duet with Charlotte Mooreman 1964.

Shannon's *Squat*, on the other hand, introduces the organic/inorganic principle in Robot Art. Indeed, his piece was a plant provided with electric circuits that, when in contact with humans (or other systems) reacted by changing its position in the space. It probably represents the first attempt of building a cybernetics interaction for organic systems, as we know them today.

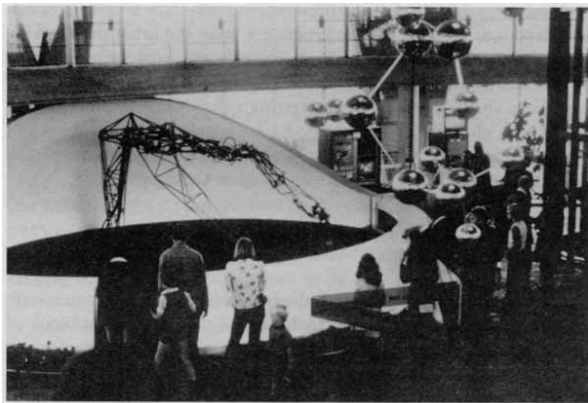


Figure 4. The Ihnatowicz' *Senster* exhibited at the Evoluon, Eindhoven, Holland. 1970.

Finally, the Ihnatowicz' *Senster* (Fig. 4), a giant robot strictly wanted by the Philips Company for their Evoluon space in Eindhoven. This 4 m tall robot, made of steel with a computer built-in, was able to detect and interact

with people and different inputs through a radar and a microphone system.

Besides its behavioral patterns, which nowadays would result primitive, this robot claims its space in the history of robotics because it is one of the first examples of a robot controlled by a computer that, in turn, mediates its reaction with the external space. In other words, *Senster* is one of the first autonomous computerized robots ever existed.

Along the same line of thought, clearly important was the work by Norman White who in 1974 realized *Ménage*, a Robot Art piece consisting of 4 robots installed in the ceiling, upon 4 different rail-tracks, and a fifth one on the floor. Each of the robots, on one side has a light bulb and, on the other, seeks for light coming from elsewhere (in a Braitenberg-like fashion). The resulting behavior is pretty complex and, apart from that, this artistic experiment was, as a matter of fact, rewarded as the first example of collective robotics in art.

White became well known in Robot Art also because of both the *Robot Helpless* [5] installation (1987) and the *Fukin Robot* [5] performance (1988). The first one is an interactive art piece in which the robot offers people help through a synthesized voice. (Later, he built *Facing Out Laying Low* in which he inverted the relationship by building robots who asked people's help). It is a funny exploration of human to robot interaction through the voice, which can be rewarded as the most emotionally effective output a robot might have. The second, *Fukin Robot* [5] built in collaboration with the artist Laura Kikauka consisted in building in two separate laboratories (one to him and one to her) two different robots, a male and a female. The two artists were in contact for negotiating about the robots sexual apparatus dimensions, only, and the two robots just met for the final performance.

It is also worth quoting the James Seawright *Electronic Garden #2* [6] (1983) five robot-flowers that interacted with people and habitat accordingly to climate parameters (i.e.: temperature and humidity), as well as with people through buttons and similar.

After the *Neuromancer* (1984) by William Gibson a whole world of robotics/cyborgs/art called the cyberpunk was born (the term was originally coined by Bruce Bethke in 1981) [7]. The Cyberpunk [8] is about expressing (often dark) ideas about human nature, technology and their respective combination in the near future. “Hi-tech and low-life” represent its basic. Although, amongst all the different meaning/sense of robot art, cyberpunk is surely the most abstract one - and has much more to do with literature and cinema than with artefacts themselves - it must be included in the robot art history because of great inspiration to it (e.g.: Akira, Blade Runner, etc.). Few artists following the genre

produced amazing artefacts and amongst those, the Mutoids Waste Company [9] founded by Joe Rush in the mid-1980s is to be quoted.

Contemporary paths

Getting closer to our days - from 1990s onwards - the number of artists (and artists/scientists) and the complexity of their artifacts grows rapidly and it becomes more difficult to track down what happened. There are certainly few authors and art pieces which must be included in this brief history, even if, in art, only the time will tell what was art and what was not.

For example for the tele-robotics art concepts the work from Ken Goldberg, *Telegarden* (1995) [10], is a turning point. Its tele-robotics installation allowed the users to control, watering and growing - thanks to a robot arm manipulated through a World Wide Web application - a real plant.

From the cyberpunk culture - today an active and famous exponent is Chico Macmutrie with his *Amorphic Robot Works* (from 1992 on) [11] - straight ahead we come across the cyborgs.

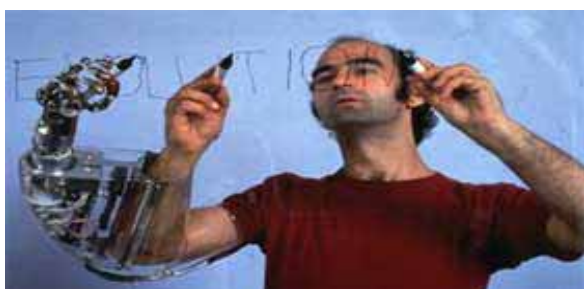


Figure 5. Stelarc writing the word "Evolution" with his famous cyborganic experimentation the *Thrid Hand*.

Amongst those, the most emblematic figure is Stelarc [12], who basically opened, more than ever, the use of robotics in (body)art and revolutionized the meaning of Robot Art. It is, indeed, a different way to look at robot art pieces. He is one of the most important contemporary artist and his art pieces (e.g.: *Third Hand Project*, 1976, 1981, 1991 Fig. 5) are strikingly innovative under all senses. Based on the cyberpunk vision, the Stelarc performances tilt the approach to robotics as an external device to strongly emphasize the human embodiment.

Another powerful artist, which embraces the same philosophy is one of the founders of the "*La Fura dels baus*", Marcel.lí Antúnez Roca, with his *Membrana Project* (i.e.: *Protomembrana* (Fig. 6) and *Hipermembrana*) [13], by which, as for Stelarc, he explores the layering possibilities of human-machine-media interaction and interrelation. Which is, indeed, one of the most *hot* topics in Robotic Art, at the moment.



Figure 6. Marcel.lí Protomembrana during Robots at Play 2007.

Pretty interesting is the *Haile Robot* developed by Gil Weinberg, Scott Driscoll and Travis Thatcher [14] because of its own way of exploring the concept of machine creativity and, parallelly, the ability of robots to cooperate and collaborate (in what the author calls musicianship) with humans while producing art, run-time. One more example of Robotic Art evolution can be found in the *Atron* (Fig. 7) module developed by Henrik H. Lund and colleagues [15]. It consists in an intersection between the Robot Art and Kinetic Sculpture art fields.



Figure 7. The *Atron* modules exhibited at Brandts Museum, Odense, Denmark, 2007.

Indeed, although at a first sight the Robot behavior and shape resemble the old definition, on the other hand, the independency of the machine movements explore possibilities in kinetic sculptures so original to deserve a new definition as, for example, Kinetic Robot Sculpture, Robot Metamorphic Art, or so.

A different example of the evolution of the human-machine relationship imprinted by Robot Art works is in the 'full-loop' realized in *LifeGrabber* by Luigi Pagliarini in 2003 [16]. A webcam mounted on a robotic arm, controlled by a software written by the artist himself analyzes the audio/video inputs run-time, through a population of Alife agents which, in turn, influences both the audio/video output and the robot arm movements (therefore the future vision of the robot, see Fig. 8).

While pointing at itself, this Robot Art piece give birth to a 'self-observing machine', facing one of the most fascinating topics for future computer based art works, the philosophical problem of self-consciousness.



Figure 8. The Robot Arm-Eye used in "LifeGrabber".by Luigi Pagliarini. 2003.

Also, it is worth to spot at the Ximo Lizana brand new research on 3D holographic projected sculptures (e.g.: the "Mid Air Shark", 2007. [17] Fig. 9). This technique opens a new horizon (we might name Virtual Robot Art or similar) to the robot art field here intended as a three dimensional object occupying a given physical space and interacting, by now in a naïve way - with the surrounding ambient.



Figure 9. A visitor interacting with the *Mid Air Shark* holographic projection by Ximo Lizana. 2007

Finally, there is a whole sector of Robot production and research that, more than Robot Art, could be defined as Art Oriented Robots. They are robotic application intended to serve the world of art (e.g.: the Gibson "Robot Guitar" [18]), which are a bit out of context here, but still not too far away from what we might want to call Robot Art, in future.

Conclusions

As can be easily understood by reading through these few and mostly incomplete historical examples - we've been trying to assemble in a pathway to modernity - the Robot

Art field mostly deals with the innovation and the exploration of the borders of human-machine relationship. In other words, Robot Artists focus on what we, formerly, defined as Polymorphic Intelligence [3], where the machine and humans bodies and minds melt together to shape a single "knowledge". Indeed, they are, to some extends, the blade runners which try to prefigure futuristic scenarios that might appear along the human being (and machine) development and in the upcoming world. By creating Robot Art pieces they somehow materialize what we defined as the Alive Art principles (of unpredictability and perpetual change) [2] and therefore assert themselves for being one of the most important avant-garde both in art and in science (i.e.: biology, psychology, philosophy, and etc.).

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