

Title: **Designing behaviors to interactively interlace natural language processing, text to speech procedures and algorithmic images**

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Abstract:

This article presents the artwork **Interlace** and its related application, **#ELIZA_Interlacements**, as a case study. Both are works in progress aiming to develop and explore an interface with ELIZA, a natural language processing software using text to speech – TTS—procedures interweaving them with algorithmic images. ELIZA was modeled as a pseudo Rogerian 'psychotherapist' and was created between 1964 and 1966 at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum. ELIZA is a very simple program but it is still quite entertaining and thought provoking. The new application created using ELIZA aims to design behaviors that interactively interlace natural language processing, with text to speech procedures, entwining algorithmic generated images with dialogues of ELIZA and the public. By interweaving images with onscreen dialogues obtained with 'talks' to ELIZA it is possible to experiment the visual poetic potential of such explorations and their immanent relations. These visual poetic results point to a potential symbiotic relationship between man and machine. This experimental artwork shows different aspects of the poetic, aesthetic and technical characteristics of the explored object for art and design aims. The application's interface is being developed using the IDE Processing. Autonomous bots, represented as images processed in real time are presented interactively with the dialogs in a graphic interface that will be shown in big projected screens in *site specific* installations and performances.

Keywords: Computer Art, Algorithmic Art, Virtual Reality, Natural Language Processing (NLP), Text-To-Speech (TTS), ELIZA

Introduction:

The action of making art is, and should always be, an act of opening the doors of perception, of showing new poetic and aesthetic characteristics, of unveiling sensitive organizations, of fighting stereotypes, of magnifying sensory aspects, and of intensifying the cognition of the lived instant. Thus, by emerging at the level of consciousness these actions can engender space-time configurations allowing changes and transformations due to the weaving of human actions with computer percepts.

The quoted application explores such field of possibilities using ELIZA [1], a natural language processing software [2], text to speech – TTS – procedures [3], and interweaving them with algorithmic images. ELIZA was modeled as a pseudo Rogerian 'psychotherapist' and was created between 1964 and 1966 at the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum. It was firstly developed by K. M. Colby aiming to make a software that would pass the Turin Test. The Turin Test is a procedure presented in 1950 by the British mathematician Alan Turin intending to be a test "about the possibility that the machine would think reasonably" [4], p 5. ELIZA is a very simple program but it is still quite entertaining, thought provoking, and works with such exit that it can fool users for some time.

By interweaving images with onscreen dialogues obtained with 'talks' to ELIZA it is possible to experiment the visual poetic potential of such explorations and their immanent relations as can be seen in Figure 1. These visual poetic results point to a potential symbiotic relationship between humans and machines and this experimental artwork shows different aspects of these characteristics for art and design aims. The application's

interface is being developed using the IDE Processing [5]. Autonomous bots represented as images processed in real time are presented interactively with the dialogs in a graphic interface that will be shown in big projected screens in *site specific* installations and performances, see Figure 2. Sometimes, the resultants dialogues are hilarious, which is a characteristic we intend to improve.

The application is based on the existing Java ELIZA code implemented by Charles Hayden [6], which was reimplemented to fulfill the goals of the present artistic research as it was defined by Kathin Busch in [7]. Analyzing a few dialogues one can say that the application unravels the program behind them. One might even realize while talking to ELIZA that they are performing a monologue and not a real dialogue. Such approach opens a field of inquiries that can not be focused here. But it would be very interesting to see some of these philosophical questions debated elsewhere.

Figure 1: preliminary on screen dialog images

Any uncompromising and aimless 'conversation' carried out with a program as simple as ELIZA points to the potential aspect of more natural forms of interaction exploring the relationship among humans and machines. Probably, with the development of natural language programs, text to speech, artificial intelligence as defined by Norvig [8], Brain Computer Interfaces (BCI) as described in [9], [10], [11], [12], [13] and with the development of quantum computing as presented by Penrose [4] we may foresee the day when one will establish much more complex dialogues with machines. Maybe then it will be possible to clarify hazy aspects of our own cognitive process, as well as the act of thinking or creating as it is extensively discussed by Eric Baum in [14].

Figure 2: simulation of installations

By reflecting on the processes involved in designing behaviors for such interfaces one can show how ideas and actions engender each other during the creative process. In Computer Art, actions related with the designing of behaviors and the programming computational interfaces give artists a broad field of choices.

The central role of computers for the genesis of Computer Art is an approach extensively developed by Bernard Caillaud in [15]. The resultant emerged realities widen frontiers, leaving us to foresee new conceptual models that will expand the linear field of verbal languages, extending them into new horizons. In this way, poetic articulations between natural, artistic and computational languages will also be amplified. The computational technology, when used for poetic and aesthetic exploration opens new experimental fields to artists, architects and designers who are thus immersed in a totally new territory. At the present moment, this approach allows the emergence of a melting pot of potential transformations for the art field. How artists, architects and designers will use this potential is a wide battleground for speculations.

Methodology

This article aims to show the art research in development for the interactive computer artwork **Interlace** and its application, **#ELIZA_Interlacements** as a case study. It reflects upon the poetic, aesthetic and technical aspects involved in such a study. It applies a methodology of successive approximations to the desired goals described in detail in [16]. The transdisciplinary intersection of art, architecture and design with computer science and mathematics has enabled the development of the present investigation. They allow the establishment of a fundamental set of strategies to formulate new dialogues and actions, enabling the future production of the artwork and its complementary products. The new formulated dialogues expand ELIZA's repertoires which was also translated into Portuguese.

Results and discussion:

As it was stated by David Norman the present time is a time of co-evolution of humans and computers [17]. In times such as these it is possible to observe that some groups in society, having a dystopic point of view, fear that humanity will lose power and independence. To fight such stereotypes the author has been developing hypothetical symbiotic systems among humans and machines, aiming to accomplish an anti catalytic effects over such ideas as can be seen in [9],[10],[11],[12], and [13]. **Interlace** is one of such projects. As it was said before, **Interlace** aims to establish dialogs with the public using a customized Java application to achieve a symbiosis among humans and computers. The former ELIZA's dialogs were broadened in order to include new sets of questions and reflections amplifying their previous characteristics.

Michio Kaku analysing computers says that, although digital computers are inspired in our brains they are not analogous to it [18], p 90. Digital computers are modeled using an intellectual model created by the mathematician Alan Turing in 1936-37, a subject Roger Penrose discuss in [4] p 31-80; this model is denominated as 'Universal Turin Machine' and is also intensively discussed by Eric Baum in the book 'What is thought?', a book that is "largely an attempt to spell out the details and ramifications of strong Artificial Intelligence (AI)" [14], p 6. The conceptual 'Universal Turin Machine' proposes an input for data, a processor that will manipulate these data and an output for the transformed data. Such machine can realize a staggering amount of calculations, something only very few humans can achieve. But there is no universal algorithm to decide when a 'Universal Turin Machine' will stop its calculations and this is considered by mathematicians as proof that not all problems can be solved by such machines [4], p 68.

By the other side, human brains are able to renew, constantly, their own circuits using a distributed net system of sensory organs within the body. This system do parallel processing and is able to establish connections by modes until now unexplained by sciences. Modes we call intuition or inspiration. Roger Penrose tells that these modes are related to non probabilistic problems (NP) that can not be computed by 'Universal Turin Machines' [19], p 104. Meanwhile one can perceive that it is possible to trace analogies among these modes; metaphors and analogies usually provoke ambiguities and, therefore, provide very interesting materials to be experimented from an artistic point of view. The art field propitiates the environment for such experimental works to be formulated. The present one aims to explore such materials. As it was said before the result can be hilarious, a characteristic intensified by the use of a masculine computer voice. Such characteristics allow the establishments of bounds with the public and therefore will be explored.

ELIZA follows a script which creates a set of possible choices for the answers it provides; answers that are, in general, other questions or provocative statements that instigate more questioning and reflections. The present set of collected questions, statements and reflections turns ELIZA in a much more believable agent which, except for its voice, makes its artificial characteristic much harder to be detected than it was in its previous version.

From poetic and aesthetic viewpoints, human-machine symbiosis are vectors pointing to the solutions we intend to reach: human minds affecting machine processes which answer as if they are changing their own behaviors. Therefore, the artwork looks for ways to integrate, interdependently, human and machine processes in such a way that they result in symbiotic process.

In the 50's, looking for ways to establish a partnership among humans brains and computers, J. C. R. Lickleder developed a mode of interaction he called as 'symbiotic relationship'. Lickleder defined symbiosis as "a state found in Nature in which two or more organisms act in complementary ways to achieve survival" [17], p 3. It would be a natural mode of interaction in which the final result could be a harmonic fusion among humans and machines for the combined development of tasks. He thought that we could have

much more interesting results if we combined these two systems [17], p 22-23. Researching such symbiosis some questions arise: Will these systems be able to interpret the environment and to communicate among themselves in different ways? Will human-machine symbiosis allow better interpretation and communication among these systems? Looking for answer to these questions we have to consider this mode of interpretation and communication within the context of Computer Art projects. Therefore, it is important to highlight that these projects have strong aesthetic and poetic goals. Goals that are essentially based on a set of elements such as:

- the public and the artists with their natural environment, sociocultural backgrounds, and their own modes of perception;
- the computational devices and their programs with their specific types of perception through sensors.

Due to the different manners in which humans and machines perceive their environment, these perceptions must be considered accordingly. "Perception provides agents with information about the world they inhabit." Perceptions in machines are mediated by sensors which are "anything that can record some aspect of the environment and pass it as input to an agent program" [8], p 863.

Otherwise, in humans the sensory system works simultaneously integrating several sensations. For example, the sensations of heat and cold may be influenced by other factors such as colors or previous sensations. If someone puts a hand in very cold water and after in normal water this last one may be perceived as hot. This does not happen with machines.

Humans are curious, unquiet, eager to learn diverse things in order to fulfill any lack of knowledge they have, and they are also able to react in unforeseen situations.

Computers are semiotic machines programmed to do something and, in general, they do not work well under unexpected situations. Therefore, both have different characteristics and implicit behaviors that need to be studied separately.

Machines do not tire because they are constantly subjected to perceptive stimulus. But humans and machines age; the materials of the latter may become old, oxidized, their rubber and plastic parts may brake and their screws may lose tightness to quote just a few problems that may arise. Different modes of lights and sounds, permeating an ambient, may provoke very different perceptions either in humans or in machines sensors. Signs and signals may also give diverse environmental evidence either to humans or to machines. This is because both have very different patterns of perception and behaviors for the acknowledgment of data.

Humans communicate intentions, share expressions and emotions that command actions. They provoke answers and may be unpredictable. Machines are predictable. The combined actions of these two systems point to a moist media development as it is defined by Roy Ascott [20], p 333-335. Moist media mixture wet biological systems with dry computer systems; and this is the kind of approach the present art research project aims to develop.

Conclusion:

As it was said in the Introduction any uncompromising and aimless 'conversation' carried out with a program as simple as ELIZA points to the potential aspect of more natural forms of interaction exploring the natural language and test-to-speech procedures to achieve a better relationship between humans and machines. In Computer Art the creative process for creating them is related to actions of designing behaviors and programming computational interfaces, actions that give artists a broad field of choices.

Nowadays, around the world, there are many artists and groups interested in similar approaches. It goes beyond the present article to point to such endeavors. But, as examples, we quote a few authors in Brazil who are studying them. Debora Gasparetto

states that there are more than one hundred Brazilian groups experimenting with digital technology [21]; Frago, Venturelli and the author's collected data due to the organization of exhibitions in Brasilia since 1987 show a staggering amount of researches by computer artists as can be seen in [22],[23],[24].

To widen the topic from outside Brazil it is interesting to talk about researches such as the one formulated by the Portuguese Eduardo Miranda who developed, at the University of Plymouth in the United Kingdom, a brain-computer device that allows individuals with severe disabilities to play music using only data achieved from their own brain [25]. Another stimulating approach is the research developed by the Chilean group EMOVERE that uses physiological parameters achieved through sensors attached to their bodies to deliver data from the body of each performer to devices used in spectacles [26].

As shown by these few examples the computer technology used for poetic and aesthetic exploration is opening new experimental fields to architects, artists and designers. By reflecting on the processes involved in designing behaviors and interfaces for such artworks one can show how ideas and actions engender each other during the creative process.

These new symbiotic realities widen the art domain, leaving us to foresee new conceptual models expanding the linear field of verbal languages, extending them into new frontiers. In this way, poetic articulations between natural, artistic and computational languages are also amplified. It is up to artists, architects and designers, in the coming years, to expand the field of Computer Art by bringing space-time, non-linearity, multiplicity, among many others relations, to the artistic research field. By symbiotically integrating computational environments with perceptions of the body in order to explore multimodal articulations and transductions one may also expand the conceptual, cognitive, poetic and aesthetic horizons.

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