NARCISS*US* : MACHINE LEARNING FROM MACHINE LEARNING FROM MACHINE LEARNING FROM MACHINE

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The installation *NarcissUs* is a critical and artistic approach towards the development of intelligent machines. The main goal is to unfold the emergent results that the learning process from artificial beings in mixed reality environments can encounter. It consists of a feedback loop between a computer generated portrait (*NarcissUs*), a camera, a moving mirror, a face recognition algorithm and an evolving learning machine seeking for self awareness. *NarcissUs* searches for its reflection, learns from it and evolves through expressive exchanges. The installation is a metaphor from the mirror-stage and the moment of self recognition, which is recognised by Lacan as an essential act of intelligence. Whether this act is also a symptom of consciousness or not, is open to discussion. *NarcissUs* intends to argue, to which extend artificial beings can be perceived as self-aware.

"Destiny without necessity, freedom without memory, existence without choice, causality without destiny"[1] (Deleuze)

1 CONCEPTUAL DESCRIPTION OF THE ARTWORK

The research body of *Narcissus* consists of the two major phenomena. The first is the mirror stage described by Jacques Lacan (Lacan 2004), who analysed the period in which young person is captivated by it's own reflection, and remarked the learning process that emerges through the interactions in which the person is engaged with itself. The second one is about the presence of self-referential systems in nature, as observed by Kurt Gödel (Goertzel and Pennachin 2007). Gödel made use of self-referential systems to prove the existence of complete systems that can be described or understood through mathematical means or any other forms of logical argumentations, concluding that any system would require in some point to refer to itself by intending any completeness, which would result into an incomplete description. In less formal terms the principle of self-referential systems has been named by the computer scientist Douglas Hofstadter (Hofstadter 1999) as "strange loops". He suggests that the awareness of the self is a recurrent idea which is self-referring over and over again until intelligence and consciousness emerges out of erratic repetition.

"*NarcissUs*" is an obvious word-game between the name "*Narcissus*" from the greek mythology and the word "Us", which refers to the human kind. The *Narcissus* in the Metamorphoses from Ovid (Ovid 1986) is imprisoned in a state where the only thing he is able to see is his own reflection. While not being aware of this situation, he falls in love with its mirrored image. His incapability to cut beyond that situation, has doomed him into an erratic behaviour. Eventually, he realises that the object of desire is literally unreachable and his self-love turns into frustration and despair, which ultimately leads him into self-destruction.

As *Narcissus*, we (human beings) are able to see our own "images" through mirrors, reflections, pictures, videos and in more abstract ways, through the descriptions that other humans make of us. Thus, we are unable to get more than projected images of ourselves. These images, which are only fragments of a complex reality, are used by others to depict us and to communicate with us. The concept of enaction introduced the idea of existence beyond a set of passive perceptual abilities. Rather than that we are actively being in the world and we are able to perceive ourselves and our environment not only through one exclusive sense, but with all of them at once. Each of these senses allows

us to perceive one or more sensorial stimuli (sound, touch and motion among others) and the multi sensorial experiences help us to build an image of reality. Therefore the processes of self-perception through each sense are uneven and biased by focus and relevance.

Senses provide us with partial and fragmented "images-sounds-smells-tastes-textures" of our selves while "being in this world". By gathering all those fragments and gluing them together in reference to the environment, ourselves, our experiences, our needs and our capability to remember, is how we tend to construct and reconstruct a "whole image" of the world and ourselves.

Deleuze's studies on perception and the senses, enlighten the paradoxes of the temporal states of being, the causes, the consequences and the dualisms from the corporeal and the incorporeal existences. He concludes that at the surface from things, the ideal and the incorporeal can only be "effect" (Deleuze 1993).

We suggest, as many others have done and also have inspired us (Noë 2004), that from the process of building the image of the world and-or from the process of constructing the image of the world and from being in this world, awareness and consciousness arise and manifest as an effect at the very surface of existence.

Taking the reflexions from Deleuze, Lacan and Gödel into account, we pursue the unfolding of the process of learning from the world, inside the world and from the self, by reproducing it through a simulation using technology and mixed media. In order to achieve this we propose a feedback-loop setup which integrates machine-learning processes, machine-perception and physical randomness or noise (motion and reflection), which continuously influences the learning process, the senses and the body from the machine.

NarcissUs intends a critical and artistic approach towards the development of intelligent machines. The issues and outcomes, which the learning process from artificial beings may encounter, are unfolded through this installation. The proposed setup displays the aesthetics of erratic machine behaviour through a technological mix of machine learning algorithms, virtual environment, physical computing and non-trivial behaviours. It materialises in a self-referential system the concept of computer self-awareness and the perceived emergence of artificial consciousness.

2 TECHNICAL DESCRIPTION OF THE ART WORK

NarcissUs is a machine-learning setup in a mixed media environment. It integrates elements within the virtual reality, such as a human-face model, with elements from the material reality such as a motorised mirror. This combination of elements opens a door to a third space composed by abstract elements and processes, which allow the emergence of perception-feedback loops.

On the virtual side an expression-able 3D Model of a human face is being displayed on a screen and is provided with agency by connecting it to the reality through a camera and a facial-expression recognition algorithm. On the side of the material reality a mirror is placed in front of the camera and the display, where *NarcissUs* exists as an image. This reflective device is attached to a motor with the purpose of providing *NarcissUs* with the possibility of searching for faces in its surroundings. The rotation of the motor is regulated by the same algorithm in charge of facial expression recognition, meaning that the search will stop at the moment *NarcissUs* finds a face.

NarcissUs looks at itself and constantly intends to copy its own expressions, falling continuously in erratic or random states. *NarcissUs*'s learning process is driven by the necessity of reducing stress to the motor and to stand by itself. The learning engine is written in Java and it is based on the deep learning and reinforcement algorithms (Kesha Patel, Patel, Hexmoor and Carver 2012).

The human face model, the expression control and the basic decision algorithms are driven by Unity 3D Engine and are written in C# and JavaScript. FaceOSC (McDonald 2012) is an open source algorithm based on Jason Saragih's Face Tracker Algorithm, which is in charge of the face tracking and expression recognition. An Arduino Micro-controller is used to drive the motor taking care of the mirror rotation through serial communication.

3 IMAGES AND DIAGRAMS OF THE ART WORK
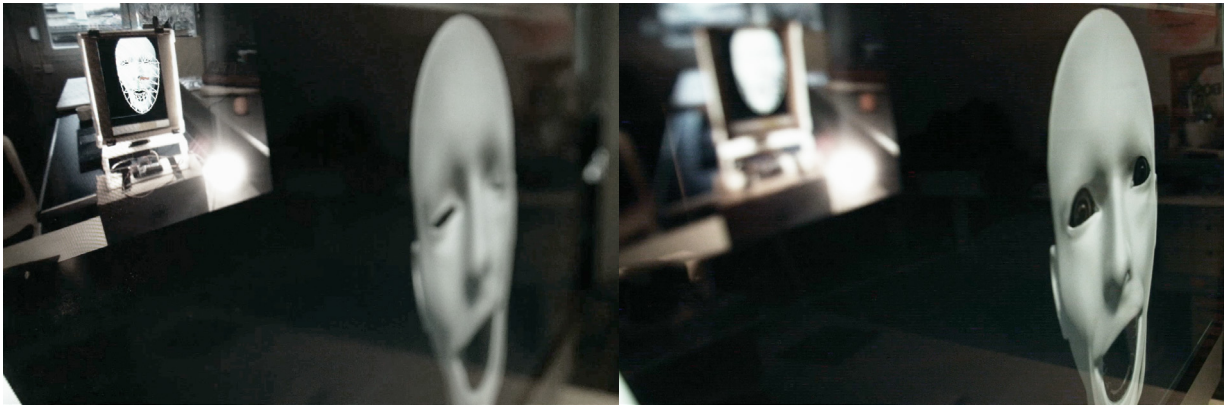
Fig. 1. *NarcissUs* Demo Setup –
Snapshots.

Fig. 2. *NarcissUs* Setup for Art Instal-
lation. Scale and dimensions from
the installation may vary according to
the allocated space and availability of
materials.
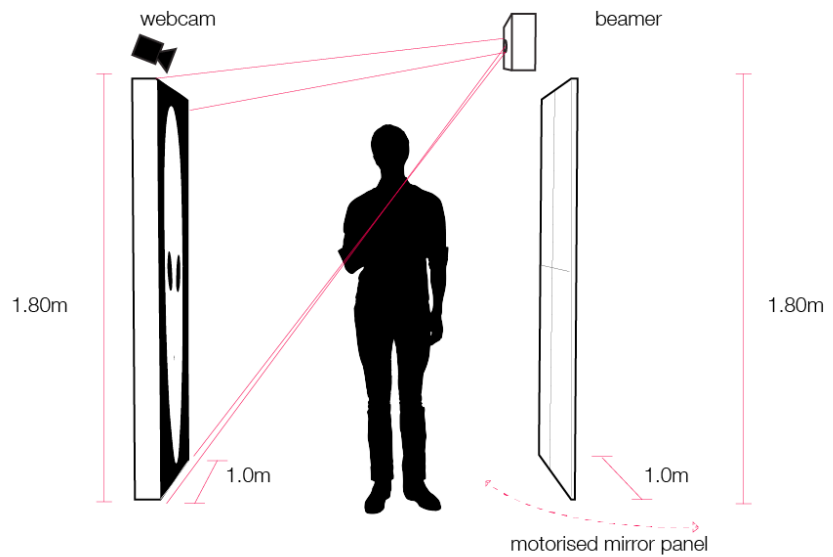
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NarcissUs, Project Demo and Small Frame Installation, Vimeo Video Links : https://vimeo.com/155235528 & https://vimeo.com/161004811