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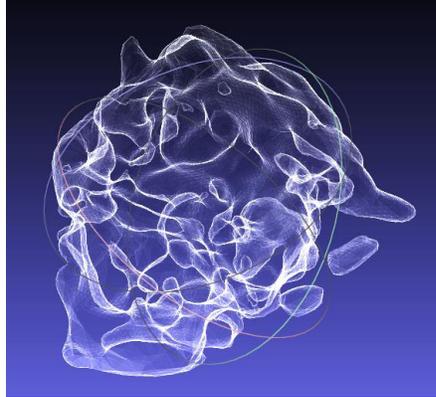
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Re-constructing memory using quantized electronic music and a “Toridion byte” quantum algorithm: Creating images using zero logic quantum probabilistic neural networks (ZLQNN)



A collaborative work by

Willard Van De Bogart and Scot Forshaw

Abstract:

Quantum theory applied to data analytics using a quantum computer has become the leading research endeavor to find a way to store and retrieve data using the nano-sized world of molecular structures. The ability to manipulate and change the positioning of magnetic fields in the sub atomic realms through resonant frequencies has provided new insights into how a probabilistic and indeterminate field of energy (quantum) can be utilized for storing and retrieving data. Much of the theorization that is applied to quantum computer development relies on a conceptual framework largely based on metaphors to understand the behavior of sub-atomic elements within a quantum field (Brookes, 2014). One aspect of the quantum field is the entanglement of elements whereby behaviors of two distinct elements respond to change independent of their location. The Toridion quantum algorithm was used to scatter pre-recorded sound into frequency amplitudes within a simulated quantum computer environment. The sounds were composed by using quantum cognitive meta models for the creation of electronic music compositions. The Toridion Encoder creates highly compressed ‘glyphs’ of the sounds whilst simultaneously creating a probabilistic quantum neural network within the cyclic mental workspace of the computer. By using sensory experiences as non deterministic search functions, it is explored how a quantum machine learning algorithm is able to unlock images, sounds, text or other media that is compressed into these small data packets called a “Toridion byte”. Because of the super positioning effect of a quantized state, in which a state can be in several locations at once, a reduction in size of the stored data is possible by using this compression technique. The compression of the data is further reduced until all that is left is a single packet of data within the quantum neural network. Images of prior events that are compressed and stored in a simulated quantum computer environment are then retrieved using encoded elements from the pre-recorded sound frequencies. This paper will explain how using a quantum compositional framework in composing electronic music orchestrations can aid in retrieving

lost memories of either images or verbal expressions. Also to be discussed are the implications for exploring a quantum language (exo-language) formed by self-organizing principles in the quantum field and interpreted using the Toridion quantum algorithm's search function.

Key words: Quantum algorithms, neuroplasticity, electronic music, memory, data amulets, quantum language.

Introduction:

Artistic and scientific sensibilities in the 1st quarter of the 21st century are experiencing unprecedented re-evaluation, re-visioning and reframing on how it is we can understand where consciousness fits into the grand scheme of things. One of the major contributing factors that have led to this quest for fabricating a new identity that expresses these new creative sensibilities is how the quantum world impacts on our lives. The micro worlds that are being peered into as a result of newer instrumentation such as the Scanning Tunneling Microscope (STM) or the Atomic Force Microscope (AFM) are revealing that our reality is interconnected with realms of existence once thought to be out of reach of human inspection, understanding and even the capability of altering elements in those micro worlds. Consequently, these new micro realms are now being given new classifications: neuroquantology, neuroplasticity, quantum consciousness, quantum computing, quantum neurobiology, quantum neurophysics and cognitive computing all of which are new frames of reference to help us navigate and build on these new quantum based discoveries. But it is the quantum realms that will be focused on to better understand how consciousness is currently seen as a part of the larger matrix of reality. Within the matrix of the quantum realm is stored information (Stonier, 2012) that not only can be accessed, but may in fact be a way of understanding a much more complex form of information exchange that will eventually lead us to a newer form of self-identity within the Universal Quantum Field. In short, how do we get from non-living matter to quantum neurobiology so our thoughts fit into a quantum substratum within our brains (Tarlaci and Pregnolato, 2015) along with newer classifications of the quantum world that are being integrated into other disciplines in an attempt to construct a cyclical mental workspace whereby the quantum field is integrated into the cognitive mental state (Meijer and Korf, 2013). To address the issue of consciousness or “the hard problem”, as David Chalmers refers to it, is determining how our subjective activity leads to becoming aware of reality not only in the classical sense, but also in the quantum sense (Chalmers, 1995). The information processing we undergo in our daily lives extracts electromagnetic impressions, magnetoception, (Tarlaci) and converts those frequency modulations into a code that eventually develops into a language. However, if consciousness is a reflection of the quantum field then this means that there is a connection

between quantum neurobiology and the existence of a quantum field in the space time matrix. The debate on whether there is a connection between quantum consciousness and the space time quantum field has been addressed with the recognition of what is called, “Bandyopadhyay Coherence”, which unites quantum biology and quantum physics ([Pereira, 2015](#)). Quantum theory has not only been the concern of physicists and biologists to answer the deeper questions about consciousness, but has also been addressed in the artistic community. The two most notable contributors to realizing new conceptualizations that combine the idiosyncratic behavior of the quantum field and the creative impulses generated by artistic expression in the quantum field are the late Spanish writer Gregorio Morales, to whom I dedicate this paper, and Roy Ascott. In 1994 a foundation in Granada, Spain formed an international group known as the Sal6n de los Independientes, and identified quantum theory as the spearhead of a new “revolutionary” aesthetics (Martinez, 2012). Then in 1999 the Spanish author Gregorio Morales formed the Quantum Aesthetics Group (Murphy, Caro and Choi, 2000). It was in the Morales group that the Manifiesto Del “Grupo De Estetica Cuantica” (Quantum Group of Beauty) was drafted which considered every aspect of reality to be constituted as mindful matter and that every facet of reality was intertwined. In its broadest sense the Quantum Aesthetic Manifiesto understood the enormous changes taking place in world cultures that were trying to incorporate the latest theories in quantum physics and how those theories were being expressed not only in art forms but in linguistics, politics, philosophy and so much more (Morales, 2002). Morales foresaw how the quantum paradigm would infiltrate every aspect of culture bringing about radically new ways of thinking. This juxtaposition of scientific discoveries in collaboration with the arts has had a long history (Turner, 2012) and contemporary investigations of the arts with the new sciences have been given many new definitions. Adding to this new paradigm as well is the multimedia artist Roy Ascott from the Planetary Collegium, University of Plymouth in the UK who has defined “technoetics” and “telematics” (Ascott, 2003). Ascott sees an overarching connectedness and coherence in consciousness. In Ascott’s view his term “Technoetic Art” is grounded in the triangulation of connectivity, syncretism, and field theory. In Ascott’s view our identity of self is changing dramatically into multiple selves as the quantum world (with all of its probabilistic and indeterminate behaviors) necessitates how we integrate our new self into the social matrix and more importantly how we define our place in the larger cosmos (Ascott, 2005).

As a result of these scientific and artistic movements, which attempt to integrate the quantum world with other domains of human activity, the two aspects I will discuss in this paper are the quantum algorithm developed by Scott Forshaw of Visicom Scientific Software, and the resonant frequencies developed from electronic sound synthesizers created with the aid of subjective models of the quantum field (Van De Bogart, 2015). Forshaw’s algorithm is used to compress stored data into a quantum medium (Forshaw, 2015) and encodes the electronic sounds to be used as a way to access the compressed data using scattered amplitude frequencies. Memories and traces of the compressed data are then accessed using the quantum consciousness models derived from the frequency modulations created on the synthesizer. The final retrieved data is represented by a 3D image map which appears in the neural network of the computer and called “data amulets” representing the computer’s subjective sense of creating a visual stimulus to help guide the algorithm to further interact within the quantum computer’s neural network to retrieve more of the compressed data. The

implications to which this kind of collaboration produces between a quantum algorithm designer and an electronic music composer are concepts which help better understand a cognitive bridge (Hameroff and Powell, 2009) into the quantum world of space time physics using the cognitive domains of humans and the neural networks of a simulated quantum computer. The process of creativity both in the scientific realm of accessing information in a quantum medium using quantum algorithms, and resonant frequencies created by being in a state of quantum consciousness that uses precepts of quantum aesthetics developed by Morales will be further elaborated upon as to what that sort of collaboration could lead to. The objective I am following in this collaboration is the emulation of the quantum contextual structure in human thought (Aerts, et al, 2011) which allows for creative ideas to emerge that can be embedded in a simulated quantum environment using quantum algorithms and even quantum thoughts that are external to both the localized human cognitive state as well as the autonomously created neural networks operating in a quantum computer. The implication is that there exists a simultaneity and symbiotic reality that exists between quantum processes in a computer and human cognition no matter how they are conceived or applied in human activity and discourse.

The Quantum Mental State:

A quantum mental state takes into account the behavior of the human brain acting in accordance with the behaviors that are detected within a quantum field. To better understand this quantum like behavior of the human brain, many new classifications such as quantum cognition, quantum consciousness and even quantum aesthetics have been developed to better develop a framework of understanding the quantum state. How a mental model is developed to understand a quantum state whereby super-causal mechanisms are able to integrate the many facets of the human brain leading to transposing those mechanisms into a quantum computer is now under investigation (Meijer and Korf, 2013). In a more detailed analysis of this integration of quantum physics and quantum neurophysics is the question of whether the rules in the quantum domains can interact with biological structures (Tarlaci and Pregolato, 2015). The discussion of how the quantum state influences other frames of references in the social sciences and especially in the arts was made popular by Gregorio Morales with his Quantum Manifesto whereby he saw all aspects of human consciousness interconnected with the universe leading to producing famous art works that emulated the quantum field (Caro and Murphy, 2002). The concept of immateriality in art (Lillemoose, 2006) or the quantum field acting as a stimulus for creating in the nano world (Horton, 2010) and even considered as the invisible dimension (Johner, 2014) have been explored in a new artistic discipline referred to as Technoetics (Ascott, 2005). It is in this subjective domain of the quantum (Hameroff, 2014) which utilizes conceptual elements of the quantum field such as superposition, non-locality, and entanglement that are cornerstone concepts driving an attempt to replicate quantum behavior within the discipline of computer science. The bridge between the quantum field in the universe and quantum cognitive states has now led to early developments of a quantum computer whose routines can simulate quantum states. The idea of a universal cognitive model which incorporates both quantum physics and consciousness has also led to a controversial concept of quantum consciousness which states that consciousness and matter are interconnected (Pal, 2014), (Gao, 2013). For this paper, however, the idea of encoding electronic sounds and using those encoded sounds with a

quantum algorithm that can simulate quantum behavior with an algorithm called a Toridion Byte will be the focus.

Quantum Sound Synthesis: Part I

Quantum sound synthesis is a concept whereby a mental model, imagining an aspect of the quantum state, is incorporated into selecting sounds when composing an electronic music score (Van De Bogart, 2015). Cognitive processes operate on a set of frequencies to represent a thought and at the same time that thought acts as a formative element in the way sounds are selected in the creative process to represent those thoughts. However, the listener also has to be considered because thoughts which come about from listening to the electronic composition will produce a state of consciousness conceived at the time of composing the sounds but may not give the listener the same cognitive experience (Camci, 2014). Camci points out that the constraints in listening to electronic music with prior associations made from prior experiences in the anticipation of notes and memories conjured up from recollecting past melodies is removed when the listener enters a musical landscape with no references to make associations from familiar memories or experiences when listening to electronic sounds. The idea of a gestural interplay using electronic sounds to allow the listener to follow these electronic compositional quantum-conceived mind gestures creates a new listening experience not based on familiar tonal structures but on a cognitive exploration into developing a new semantic relationship to sound similar to the way the Toridion Byte quantum algorithm seeks information. The interface of these gestural electronic sounds made by the composer that contain movement parameters based on the quantum thought constructs, Figure 1, conceived in the mind of the composer and using the Nave Wave Table Synthesizer will create an entirely new type of listening experience. When those same electronic sounds are then encoded into a Toridion Byte using a technique called Amplitude

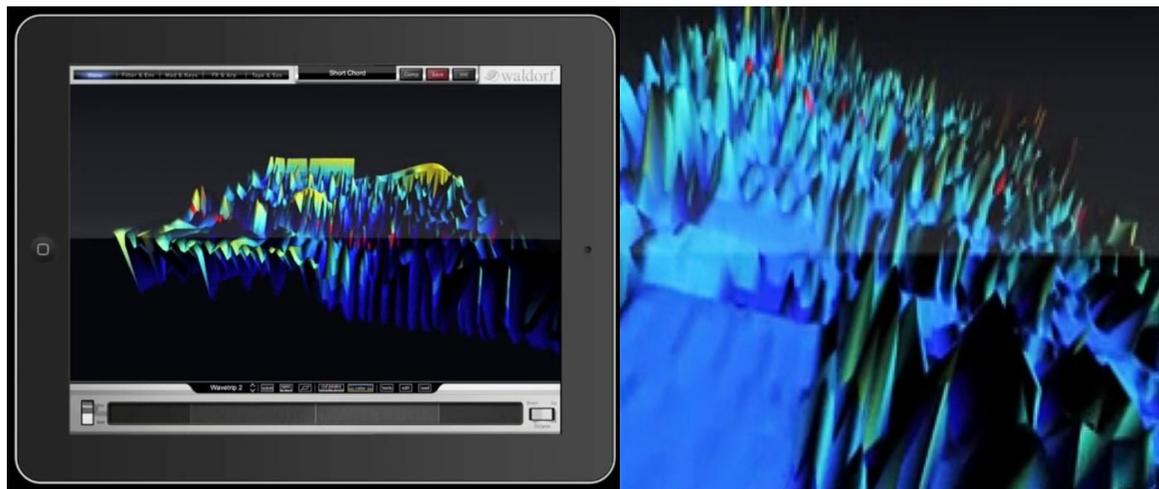


Fig.1. Frequency distribution maps showing voice and sound signatures using NAVE's Wave Table Synthesizer

scattering, elements of the sound become part of the simulated quantum environment and are used to look for elements in the compressed data using the Toridion lock and key algorithm. Memory that has been compressed and recalled by multiplying itself in the neural network by the behavior of an indeterminate algorithmic process using the amplitude scatterings of the electronic music composition finally creates an image in the neural network of the computer similarly to an image appearing in the mind's eye of a human counterpart.

The Quantum Algorithm: Part II

The term quantum algorithm is used specifically to represent some essential feature of quantum computation such as quantum superposition or quantum entanglement. In this paper the Toridion Byte, developed by Scot Forshaw, will be used to demonstrate how the Toridion encoder compresses information to simulate a quantum attribute which will become part of a neural network and act as a search function to seek out other data in the computer. In order for an external form of data to be used in a quantum computer, it must be encoded into a usable code created by a Toridion Encoder. The process is called amplitude scattering and for the Toridion Byte this means that several layers of frequencies are nested on top of one another and go about searching for bits of data to recall a highly compressed piece of information which only has less 1% of its original information left but has a resonant frequency attribute that can be phased with the Toridion Byte using one of the nested frequency layers as it looks for a phase lock or a lock and key procedure that allows the original compressed image to finally form a neural network image identifying the originally compressed image. Figure 2.

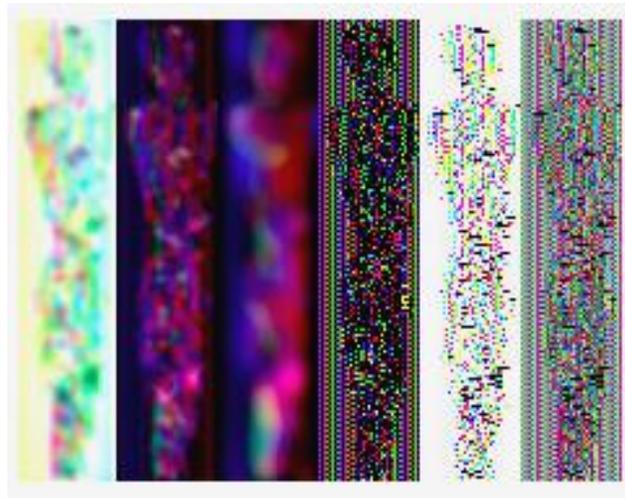


Fig.2. Reconstructed memory of original LadyVDB on far right with Gaussian filters going left

These neural network frequency signatures that create this image are called “Data Amulets” and it is from these neural networked images the Toridion Byte will seek further phase relationships in the neural network until it has exhausted all the pathways created for it. Toridion software possesses an instinctual learning process acting as logic extensions of the

eyes, ears, hands and auto response mechanisms expressed in human like terms. Toridion is so opposite as to be in another universe. Toridion software does not compare one answer to another in a binary tree; it is looking to form fundamental relationships and memories that are developed by cause and effect using frequency resonance. In a sense the Toridion quantum algorithm has a neuroplastic quality to it. This can also be referred to as “self-generated imagination” with the ability to store information and self-create the mechanism to learn and adapt within the stored neural network structure in a probabilistic fractal way. For this collaboration an interface was created using pre-recorded sounds composed from a quantum cognitive framework with frequency variations generated from multiple synthesizers as well as frequencies obtained from sonified protein frequencies (Sahu et al, 2014), (Gosh et al, 2014), (Gosh et al, 2015) and stellar acoustical frequencies (Kollath and Keuler, 2004). The frequencies were then scattered using the Toridion Encoder and incorporated into the quantum algorithm operating in the neural network which has a neuroplastic behavior similar to the behavior of the neuronal network of the human brain (Kak, 2013). The quantum algorithm functions in the neural network of a simulated quantum computer much like the exchange of information embedded in the neural network of the human brain. An example which demonstrates this interface of amplitude scattering was taking a 2min section of a pre-recorded synthesized sound to look for another Toridion piece of information, and then determine if the Toridion Byte’s encoding of the sound could locate the image of a digitized woman originating from an Apple 2e computer from the studio of Nicolas Schöffer in Paris, France in 1989.

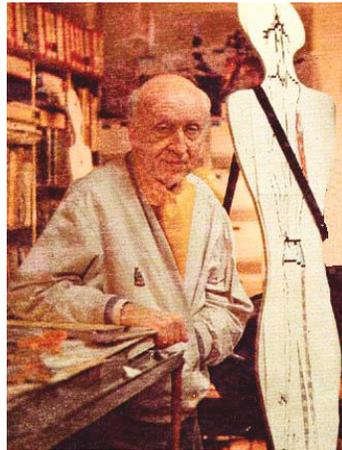


Fig.3. Nicolas Schöffer with LadyVDB Paris, France 1989. Photo by Van De Bogart

Schöffer is considered the father of cybernetic art and he used many quantum techniques in his work which incorporated statistical exploration of all possible combinations of inputs resulting in his “Chronodynamic” sculptures (Dataisnature, 2012). It was in his studio, figure 3., that a new approach to graphics was explored creating various images finally resulting in a digitized woman dressed in various types of accessories called LadyVDB (Van De Bogart, 1989). The stages of the reconstruction of LadyVDB using the Toridion Byte quantum algorithm can be seen in figure 4.

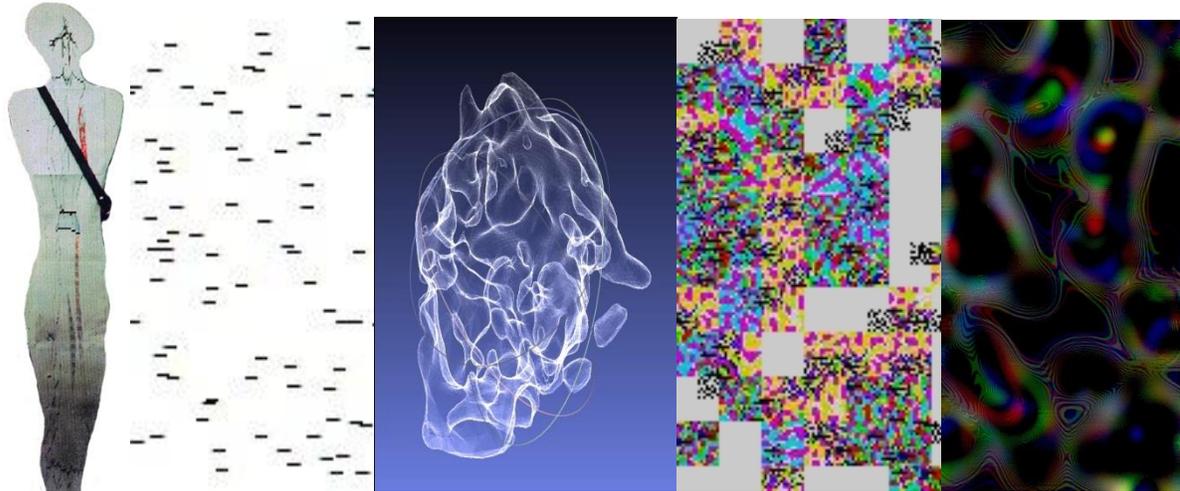


Fig. 4. Reconstruction of a compressed image of LadyVDB; far right and 4 visualizations of retrieved compressed images using a Toridion Zero Logic Byte (ZLQNN)

In this collaboration Forshaw took the electronic sounds originally composed using a quantum subjective framework and then encoded them so they would work in a quantum simulated environment using a Toridion Byte algorithm. What resulted was the entanglement of two separate sources of information working in the same neural network one seeking compressed information and displaying that information in the form of a Data Amulet and two, the frequency amplitude's from the electronic sounds to determine if the original compressed information was retrieved. Using different scattered amplitude frequencies would retrieve different information.

The Quantum Creative Process:

The immateriality aspect of the quantum field and the nonphysical nature of consciousness have led many to believe that consciousness is in fact a natural force in the universe along with electromagnetism, gravity, and the weak and strong nuclear forces (Penrose and Hameroff, 2011), (Hameroff and Penrose, 2013). Consciousness has recently been identified as a form of matter in the universe (Tegmark, 2015) and information theory has been applied across the board within all disciplines forming a state of consciousness (Bawden, D, 2007)(Forshaw, S. 2015b). Forshaw postulates that space itself or 'The Third State' might be woven into the informational fabric of the universe providing a bridge between all things. There is also the belief of an emergent consciousness that developed during the early inflationary stage in the development of the universe (Zizzii, 2014). Consciousness is also thought of as a collection of fields of energy which are all interacting in the universe, including acoustic fields (Grandpierre, 1996). These views of what constitutes consciousness in the universe were the inspiration in applying the zero logic quantum probabilistic neural network (ZLQNN) with electronic music composed from using concepts developed from quantum semiotics and quantum linguistics (Timev, 2006). By using sound elements of language such as phonemes and synthesized vocal recordings using speech synthesizers, combined with frequencies derived from protein molecules in the brain (Bandyopadhyay, 2015), an orchestrated electronic sound was able to produce a form of quantum linguistics which could also be used as a form of xenolinguistics (Slattery, 2015) (Van De Bogart, 2014)

in as much as the quantum field permeates all self-organizing systems. The zero logic neural network (ZLQNN) was developed by using a super positioning of the acoustic elements behaving in a neural network and acting as a state of quantum consciousness. When these two quantum concepts were brought together, the ZLQNN and the scattered quantum sound composition, the Toridion quantum algorithm would then extract memories of the compressed LadyVDB stored in the neural network. By using a quantum based algorithm and a sound signature made from selected frequencies using phonemes and sonified protein frequencies, which were obtained from the vibration of proteins within microtubules (Angelica, 2014), it was then possible to create a 3D image of LadyVDB. By using the quantum algorithm and the quantum synthesized sounds an attempt was made to extract memories which may not have existed in the computer but could have existed outside the computer in the quantum field. By allowing the field of consciousness to exist both inside and outside the computer the memories can then be visualized not only within the quantum neural networks, but could also be looked at as images coming from some other time, past or future, or even from some other universe. The Toridion Byte's search capabilities can also be further extended by adding subroutines in the algorithms search function to further enhance the matching capabilities in order to reconstruct the initial compressed image. These subroutines could look for frequency patterns that may even be in the form of an extraterrestrial language (Vakoch, 2014). The resultant images constructed inside the simulated quantum computer thus act like visual signatures representing spaces perhaps not from the time and space dimension we are from but come into existence by interacting with the search functions which have quantum realizations as their basis. The access routes made available to form a subjective query may be a way to impose a new set of identifiable thought forms into the search function, heretofore, never conceived of by human questioning.

Conclusion:

Realizations combining artistic and scientific enquiries:

In this collaboration of using a stored image of LadyVDB we were looking to see if the information in the frequencies of the electronic sounds could be used to find data in the compressed image of LadyVDB. It was established that by using a finite mechanism such as the Toridion quantum algorithm in conjunction with quantum sound synthesis and an imagined past reality (LadyVDB), it would be possible to store scenes of information and ultimately retrieve them with zero loss of the original information. A new method of interpreting artistic work was demonstrated by allowing the machine to have a thought (self-determined search function) that was based on comparing two distinct works and allowing the machine to autonomously create infinite search paths to retrieve visual representations of the original image.

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