Neurological Gaming Environments

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1 Abstract

It has been said by members of past generations that computer gaming is destroying the minds of young people who have become addicted to playing games on their desktop computers. The number of games available through the average computer is increasing on a regular basis, and computer gaming has become a favored activity by youth and business around the world. For this reason, I have combined today's gaming technology with brain wave research to create an intelligent gaming environment, that functions as a neurological learning tool for all ages.

Concepts discussed in this paper are based on fourteen years of research using the IBVA, Interactive Brain Wave Visual Analyzer, a brain wave interface system designed to facilitate the interactive brain wave control of multimedia. The research includes monitoring and analyzing brain waves of hundreds of conference attendees in exhibition settings, as well as participants in controlled environments. Concepts presented in the paper relate to evolutionary change that will move us from our current perception of reality to a broader understanding of multiple realities.

Survival in the future may require us to actualize latent capabilities that have not been taught in traditional education programs, that is, the capability for nonverbal communication, remote viewing, and self-healing. In order to effectively deal with issues that arise in the future, we need to draw upon these skills. Doing so requires more complete use of the brain to expand the human potential. This expansion will enable human intelligence to effectively deal with problem solving for the future. [Paras Kaul, "Brain Wave Interactive Learning: Where Multimedia and Neuroscience Converge", 2005]

The ability to perceive objects and events, beyond what is understood as our ordinary senses has been explored by physicists and metaphysicians, as well as by the federal government. Institutes as the Institute for Noetic Sciences, Consciousness Research Laboratory, Monroe Institute, Institute for Advanced Study at Princeton, and the International Remote Viewing Association, to name a few, have been formed to research these capabilities. Though the research is ongoing, it seems that some ideas are so paradigm shattering that they remain hidden in plain sight for many years. [D. Radin, Noetic Institute, 2001]

2 Introduction

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IBVA4, the Interactive Brain Wave Visual Analyzer, under development at Psychic Labs, Inc., by Masahiro Kahata since 1991, is a brain wave interface system unlike other desktop brain wave interfaces. The software component of the interface incorporates electroencephalographic, EEG analysis of neural signals with interactive biofeedback to measure amplitudes of brain wave signals, ranging from 0 to 20 micro volts, and also delineates frequencies into the domains of gamma, beta, alpha, theta and delta, ranging from 0 to 40 Hz. Neural signals input to the computer from both the right and left hemispheres of the brain are output as frequency and amplitude data and used to control multimedia.

Coherence between the left and right hemispheres of the brain is also monitored and output as statistical data for multimedia control. Since the region between the brain's two cerebral hemispheres is the corpus callosum, associated with intuitive processes, it is likely that the coherence data output from this part of the brain is related to the brain's intuitive processing, which may be representative of the brain's state of perceptual awareness in real time.

Neurological gaming provides an environment for exercising the brain. This type of exercise increases brainpower, which increases the brain's intuitive function by maximizing the brain's low frequency, coherent brain wave signaling. In his landmark book related to the future of medical treatment, Dr. Richard Gerber discusses that properties beyond the ordinary waking consciousness are activated when thought processes go from non-coherent random thought to coherent consciousness." [Richard Gerber, "Vibrational Medicine," 1955] Monitoring brain waves with IBVA4 shows that as brain wave frequencies and amplitudes lower, an increased focus of attention and relaxed physical condition occur in conjunction with greater coherence of brain wave activity.

Nonverbal communication refers to communicative transmissions that are received without spoken words, that is, vibrations that resonate within the brain and are projected directly from one being to another. According to the research and experience of Skip Atwater, a former secret counterintelligence, remote viewing agent for the army and current research director for the Monroe Institute, telepathy implies a type of mind-to-mind exchange of information. [F. Holmes Atwater, "*Captain of My Ship, Master of My Soul,*" *2001]*

The brain's harmonics are similar to the harmony of the spheres, harmonics produced by the natural movement of planetary bodies. Based on brain wave research using IBVA4, audio and visuals activated by low frequency, coherent brain wave signals, move in harmony with calm mental states and reflect how we think and feel without stress; whereas, audio and visuals activated by high frequency, non-coherent signals with random movement reflect agitated mental states. [P. Kaul, "Brain Wave Interactive Learning: Where Multimedia and Neuroscience Converge," 2005]

These results indicate that the process of quieting the mind lowers brain wave frequencies and amplitudes, which results in the coherent processing of mental activity. The idea that quieting the mind increases awareness of subtle cognitive processes is not a new concept, as it is the underlying foundation of eastern meditation techniques. Atwater expresses that the ability to quiet one's prosaic thoughts and focus one's attention might have a great deal to do with remote viewing. [F. Holmes Atwater, "*Captain of My Ship, Master of My Soul,*" *2001*]

Greater mental attention and clarity of thought help to strengthen natural precognitive abilities, which enable more complete understandings of the subtle aspects of perception, hearing what has not been spoken and seeing with remote viewing, a non-conventional communication where one is able to perceive objects or events beyond the ordinary senses, and at times cause activity from a remote or distant location. Remote viewing is the natural perceptual ability of using the mind to describe locations, activities, or objects without the use of our conventional senses. [F. Holmes Atwater, "*Captain of My Ship, Master of My Soul,*" *2001*]

Michio Kaku explains that human brains have evolved to handle objects moving in three dimensional space because that is what has been necessary for survival, but that one of the greatest conceptual revolutions for the future may be the ability to visualize hyperspace. [M. Kaku, "Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the Tenth Dimension," 1994]

3 Vibrations

What do communication and healing have in common, and how do they relate to remote viewing? The physical form is described as being intimately related to etheric and other subtle energetic interference patterns, which determine the flow of the life force. [Michael Talbot, "The Holographic Universe," 1991]. For this reason, systems of medical treatment, such as acupuncture, have evolved, which facilitate the flow of energy through the meridians of the body.

Toyohari is a form of Japanese acupuncture based on the concept that everything in the universe is energy, which concept can be understood as Quantum. According to this practice, emotions and thoughts are also energy, and blockages in these frequencies lead to disharmony in the frequencies of the physical body. [Ted Annenberg, "What is Toyohari?," 2005]

Vibrations are received through the nervous system as frequencies and amplitudes of electromagnetic waveforms created from the brain's electrochemical activity. Music and spoken words have waveforms with frequencies that are understood as sound signals that transmit audio information to the brain. Brain waves have low frequencies that are projected as subtle waveforms, which can be measured using electroencephalographic, EEG analysis of the brain wave signals. Thought forms produce subtle vibrations from the brain with frequencies and amplitudes that are received through the nervous system as vibratory signals carrying subtle information.

Dr. Masaru Emoto, featured in the movie "What the Bleep, Do We Know!?," explains his research findings related to the effect that thoughts and emotions have on frozen water crystals. His studies indicate that frozen water from clear springs exposed to classical music and positive thought contains brilliant, complex crystals with snowflake like patterns. On the contrary, his findings show that the same water exposed to violent, heavy metal music and negative thought results in fragmented and malformed crystals.

Since the human body consists of a high percentage of water, Emoto's studies are good indications of the effect that thoughts and emotions have on the body. These studies also support the concept that thoughts and emotions produce vibrations that influence the condition of the body. [M. Emoto, "The Hidden Messages in Water," 2004]

4 Brain Wave Gaming

Using the IBVA4 brain wave interface system, brain wave activity is used to animate 3-D objects in 3-D space, which demonstrates the ability brain waves have to animate matter. Neurological games using IBVA4 provide intelligent learning environments for interactive gaming. This type of gaming enables students to learn by increasing brainpower.

Increasing brainpower expands perception, which enables intuitive capabilities. Students at all educational levels interact with gaming environments by using brain waves to animate digital objects. As in other computer games, a predetermined goal needs to be established in the gaming environment. This goal relates to moving a designated 3-D object or objects from one position to a new position in the environment, based on conditions that are programmed into the game and controlled by brain waves.

This method of exercising the brain allows students to monitor their ability to animate multimedia objects using their brain waves. Part of the learning is to associate the physical and mental conditions required to facilitate optimal multimedia control with brainpower. A feedback loop is established between a student and the brain wave controlled multimedia objects. Students learn by self-analysis and by comparing early ability to control animated objects with later ability to control the same objects. They adapt to new ways of learning in order to develop new ways of thinking and problem solving.

As variables affecting the learning environment are monitored on a daily basis, they begin to see how their brainpower is influenced by these variables, and they learn to understand how to focus their attention to lower brain wave frequencies, which enables them to think and perceive more clearly.

5 Hardware and Software Advancements

More than ever in the past, new developments in Apple's hardware and software enable the Intel Core Duo processing power in the MacBook Pro and the new Mac mini computer to calculate data fast enough to keep up with human brain wave activity and to facilitate interactive programming for the brain wave control of animation in close to real time.

IBVA4 Bluetooth Input Device

A Bluetooth, wireless version of IBVA4 will soon be available, that replaces two IBVA4 receiver boxes with a single Bluetooth device. This development will decrease the number of 9-volt batteries needed from two to one and will make the setup faster and more efficient.

Kahata is consistently working to upgrade the original IBVA software to remain current with state-of-the-art hardware. The recent brain wave interface is the fourth version of IBVA, with ongoing development required to keep up with the continuous upgrading of Apple's OS X operating system.

Additionally, with the release of Apple's Tiger operating system, Apple's software developers have included the Quartz Composer application, which enables users to work with a visual programming language to easily create three-dimensional digital graphic environments. IBVA4 includes a number of IBVA4 plug-ins for the Quartz Composer application, which allows the application to be used in conjunction with the brain wave interface.

These developments in software also make it possible to create a Quartz Quicktime movie that can be viewed from a web browser. This advancement means that a person from a remote location, who has the IBVA4 peripheral devices that come with the brain wave interface system, can animate objects in the gaming environment from a remote distance. As computer processing speeds continue to increase, the remote control of multimedia by brain wave will be possible in real time.

6 The Dream Dreaming Game

"Dream Dreaming" is a three dimensional neurological gaming environment, which contains 3-D objects controlled by brain waves. Brain waves are input to the computer through a wireless headband that has three electrodes that rest on the forehead and receive signals from the frontal lobe of the brain. These signals are transmitted to the computer from a small hardware transmitter that is attached to the headband. Small antennas facilitate transmission of the signals to receiver boxes that input the waveform data to the computer, where it is converted by software to frequency and amplitude data using EEG.

In the "Dream Dreaming Game," when the brain wave frequencies are low and coherent, a boat is submerged into water. There are other objects in the environment, which objects represent varying aspects from the life of the person lying on the boat. Sustaining low frequency, coherent signaling enables brain waves to raise a spirit object out of the water. If the user is able to continue to maintain low frequency brain waves, while also maintaining coherence, the brain waves will move the other objects out of the gaming environment, and the spirit object will remain on its own and begin to rotate. As the brain wave signals switch to higher frequencies, non-coherent states, the boat comes out of the water and appears on the screen again, the spirit object disappears, and the objects from the person's life return to the screen.

This type of neurological environment provides an intelligent learning environment for gaming that enables students to learn in an experiential manner and to monitor their own ability for brain wave control of objects in the environment. Part of the learning is to associate physical and mental conditions that facilitate optimal multimedia control. A feedback loop is established between a student and the brain wave controlled multimedia events. Students learn by self-analysis and by comparing their early ability to control multimedia with later ability to control the same multimedia. They need to adapt to new ways of learning in order to adopt new ways of thinking and problem solving.

As variables affecting the learning environment are monitored on a daily basis, users begin to see how their brainpower is influenced by these variables, and they learn to understand how to focus their attention to lower frequencies, which enables them to think and perceive more clearly. The process of moving the boat exercises the brain, and as with any muscle in the body, the more it is exercised, the stronger it becomes, the greater the brainpower.

7 Quantum Computing

The programming used for this game involves quantum computing; whereby, calculations are made between fields of wave values and variable ranges of transformational values on the x, y, and z planes. Using Apple's Tiger operating system and Apple's Quartz Composer application, interactive objects and IBVA4 wave functions are programmed into object and function patches.

The act of willfully switching between gamma, beta, alpha, theta, and delta stimulates the brain's activity and facilitates the ability to switch to predominantly theta and delta states of mind, when required for awakened perceptual awareness. The regular practice of brain wave switching makes it easier to attain low frequency, coherent mental states when needed. Advances in the IBVA4 and Quartz Composer software are important for developing educational applications that enable this brain wave interface to be used in the context of innovative instructional techniques for learning.

8 Interface Design for Gaming Environments

3-D environments can be created for many disciplines and incorporated into gaming interfaces, whereby the goal is to effect change in the environment, while exercising the brain's ability to brain wave switch. This switching creates variety in the animation of objects in the gaming environment. A multidisciplinary aspect has to do with the potential to create a variety of gaming environments in different subject areas. In addition to training the brain to entrain to deep and focused mental states, students also respond to the images, ideas, and media used in the gaming environment they are interacting with. They learn to interact with multimedia in the context of education in order to accelerate the development of their brainpower.

9 Conclusion

Gaming environments can be created with objects representing many subject areas. Course content can be incorporated into the gaming interface. In addition to training the brain to entrain to deep and focused mental states, students also respond to the images, ideas, and media used in the environments they are interacting with. With the development of content driven environments, student interaction with multimedia can also accelerate their visual literacy. They can interpret and create visual information presented in the gaming environment while also developing their ability to perceive. Expanding perceptual awareness heightens intuitive processes, thus enabling learning by brain wave to awaken new perceptual skill sets.

The opportunity to add neurological learning to educational curricula is made possible as a result of the programming expertise and technical direction of Masahiro Kahata. IBVA4 is a robust system for developing many new kinds of applications for brain wave interaction. [M. Kahata, *IBVA4,* 2005]

Concepts presented in this paper have also been presented for the online conference of the International Conference on Engineering Education, Instructional Technology, Assessment, and E-learning, December 2005 and at the Hawaii International Arts and Humanities Conference in January 2006. Additional information related to this author's research can be found at *http://www.brainwavechick.com*.

References

KAUL, PARAS, "Brain Wave Interactive Learning: Where Multimedia and Neuroscience Converge," "Conference Proceedings," International Conference on Engineering Education, Instructional Technology, Assessment, and E-learning (EIAE 2005), an International Joint Conference of the Conferences on Computer, Information, and Systems Sciences, and Engineering, CISSE, December 2005.

RADIN, DEAN, "Foreword*," Captain of My Ship, Master of My Soul*, Skip Atwater, 2001, xix.

GERBER, RICHARD, M.D., 1955, *Vibrational Medicine*, 64.

ATWATER, F. HOLMES , 2001, *Captain of My Ship, Master of My Soul*, 68.

KAUL, PARAS, "Brain Wave Interactive Learning: Where Multimedia and Neuroscience Converge," EIAE , CISSE, December 2005.

ATWATER, F. HOLMES, 2001, *Captain of My Ship, Master of My Soul*, 84.

ATWATER, F. HOLMES, 2001, *Captain of My Ship, Master of My Soul*, 84.

MICHIO KAKU, 1994, Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the Tenth Dimension, p. 11.

TALBOT, MICHAEL, 1991, The Holographic Universe, 68.

ANNENBERG, TED, 2005, "What is Toyohari?," http://www.toyohari.us/toyohari.html.

EMOTO, MASARU, 2004, "The Hidden Messages in Water," *Prologue*."

KAHATA, MASAHIRO, 2005, IBVA4, Psychic Lab, Inc.