

Well-Being of Decolonizing Aesthetics: New Environment of Art with BCI in HCI

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Abstract. This paper presents that art with BCI (Brain-Computer Interaction) is decolonizing from the dimensions of action between politics *and* the aesthetic in traditional knowledge systems. In order to explore the creative power of art with BCI, it proposes the concept of decolonizing aesthetics. It critiques the beauty of art with BCI, through the reframing of aesthetic activities such as aesthetic objects, aesthetic attitudes, and aesthetic values in the view of psychoanalysis. Its aim is to find out a response for alternative perspectives of reference in HCI (Human-Computer Interaction) systems and alternative ways of understanding the relationships and collaborative actions between humans and new digital technologies.

Keywords: Decolonizing aesthetics · Art with BCI · Brain-Computer collaborative action · Beauty · Aesthetic objects · Attitudes · Values

1 Toward a Decolonized Approach to Art with Technology

To decolonize knowledge of art is to consider aesthetics in the ecology of networked knowledge enabling new forms of collaborations between sciences, engineering, arts, and design.¹ Art with technology contributes to the decolonization of aesthetics. One of significance quietness of art with technology is that the collaborative action of human and technology becomes artwork itself. When interactive artwork is constituted by the collaborative action of human and technology, there is no distinction between actor and spectator, human and non-human, artist and audience.

¹ Aesthetics is the philosophical study of beauty and taste. It is closely related to the philosophy of art, which is concerned with the nature of art and the concepts in terms of which individual works of art are interpreted and evaluated. The concept of aesthetics concerns an interesting and puzzling realm of experience: the realm of the beautiful, the ugly, the sublime, and the elegant; of taste, criticism, and fine art; and of contemplation, sensuous enjoyment, and charm. To provide more than a general definition of the subject matter of aesthetics is immensely difficult. Indeed, it could be said that self-definition has been the major task of modern aesthetics.

Especially, the beauty and its judgment of art with technology involve a decolonized approach to the relation of politics and the aesthetic. The relation of politics and the aesthetic has been claimed to be a mutual degradation between two opposing points of view. First is a use of aesthetics in politics: how politics has turned to the aesthetic as either a support or an ideological antagonism. Second is a use of politics in aesthetics: how the aesthetic has social and political meaning. Art with new technology undertakes a redefinition of the aesthetic that not only challenges the representational categories into which it has been placed but also redefines the aesthetic in terms of political existence. This challenge proposes a new definition of decolonized aesthetics agreeing with both politics and the aesthetic.

Decolonizing aesthetics of art with technology presents new possibilities for the relation of politics *and* the aesthetic in the ways that we humans and technology perform. Here politics *and* the aesthetic is a mobilization and thus, it ironically forgets its own movements. It is not just there because it is in the process of happening. It also can be addressed as utterance: systems of sensibility beyond two rigid systems of fixed thought and rigid action. In the collaborative action of human and technology, politics *and* the aesthetic becomes the performative with these non-representational links between different systems of meaning and action [1]. And, the 'We' attains collaborative relations without characterizing them in either positive or negative terms. It also pushes the realm of representational politics toward negation.

On the one hand, performative politics and aesthetic critiques politicize the historical ease with which the aesthetic has been and still is, confined to the ideological. On the other hand, it challenges the aestheticization of politics to account for politics with new forms of representation. This turn fuses the relations of politics *and* the aesthetic in the double determination of commonality and exclusivity. It establishes, at one and the same time, something common that is brought together out of shared and exclusive parts. This double determination of politics *and* aesthetic structures adduce networks so that everything possessing visibility is assigned a part. Such networks recall the ecology of networked knowledge enabling new forms of collaborations among sciences, engineering, arts, and design.

To put it differently, decolonizing aesthetics of art with technology embraces a place, or potential both "actors" (who act) and "systems" (which behave) in terms of Bruno Latour [2]. The relation of politics *and* the aesthetic is a contesting of collaborative balance and imbalance between actants in equal parts. Here, to become visible is that relation that takes place in equality. In order for mobilization to become visible, relations must unfold in place in equality. Contesting this collaboration is the eruption of politics *and* the aesthetic in decolonizing aesthetic of art with technology. Equality cannot be recognized as the object of politics *and* the aesthetic. Instead, it acts to give politics of leisure and liberation new reality in the form of specific time and space.

This performativity of contesting the collaboration between actants in networked knowledge adduces new ways of knowing provoked by technology. The performative dimension of art with technology constitutes a new focus on technology's continuous interrogation of the ground that supports our inadequate understanding of the efficacy of the arts. Decolonizing aesthetics of art with new information technology calls into question the production of knowledge in the Western world and its contemporary

mutations. This questioning also dismantles the all too often simplistic character of the relation of human and technology, politics and the aesthetic, and the beauty and its judgment.

2 BCI Is Changing How Art Is Made

Art with technology provides a chance to study a growing interest in the concept of decolonizing aesthetics. Like human-human communication, technology and humans act and react. In particular, computational technology is endowed with highly intelligent and perceptive qualities; has its own laws; and the system itself evolves. With the ability of autonomy and emergence, technology performs the autonomous and emergent action beyond human control. It becomes ‘an actor (a collaborator)’ collaborating with humans. Technology as a collaborator transforms the knowledge condition. The transformation indicates that knowledge of we humans is organized by collaborative actions between we humans and technology. It responds to the need for alternative frames of reference to inter-active systems design and alternative ways of understanding the relationships and collaborative actions between humans and new digital technologies.

Human-Computer interaction (HCI) techniques evolve from conscious or direct inputs. Especially, the computer game with Brain-Computer Interaction (BCI) shows that the collaborative action of human and technology involves both conscious and non-conscious inputs. It expands the collaborative action into a kind of biofeedback. It suggests the brain signal processing as a new way for the collaborative action of human and technology.

For example, Brain-Computer Collaborative Art, *Racing Car Game* (Fig. 1) is an ongoing research-led practice project about decolonizing aesthetics of art with BCI. The artwork is constituted by the concentration between human and computer as collaborators. The brain-computer collaborative action changes the car’s velocity; it can improve the attention state; when the collaboration between human and computer gets stronger, the concentration level goes higher.



Fig. 1. *Racing Car Game*: Art with BCI, Brain-Computer Collaborative Art: *Racing Car Game* designed by Bio-Computing Laboratory at GIST, Korea. EPOC and Carrera Slot Car.

In *Racing Car Game*, brainwave is the key measure. It represents the concentration as the degree of collaborative action of human and technology. Car’s velocity shows the concentration level using Electroencephalography (EEG). EEG is an electrophysiological

monitoring method to record the electrical activity of the brain. The concentration is observed in Beta wave and falls in the range of 14–30 Hz (Fig. 2).

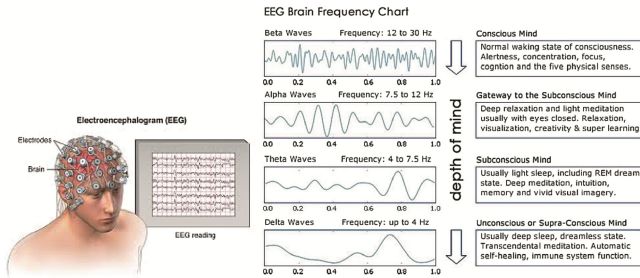


Fig. 2. EEG reading and four categories of brain wave patterns

3 The Creative Power of Art with BCI

The key point of Brain-Computer Collaborative Art is that the collaborative action through brain activities allows us a communication without physical and visible movement between human and computer (Fig. 3). Brain signals create a new philosophical and aesthetic dimension of art constituted by the collaborative action of human and technology.

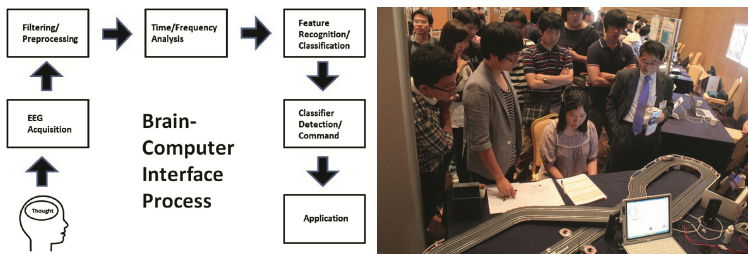


Fig. 3. Brain-Computer Collaborative Art, *Racing Car Game*: BCI Process and Exhibition (HCI Korea, 2012): Communication without physical and visible movement.

3.1 Art with BCI as Aesthetic Objects

Technology is redefining art in strange, new ways. Especially, BCI (Brain-Computer Interaction) triggers a whole series of basic questions that how does human thinks with a computer, what is the difference between animate and inanimate, human and non-human. In the work of art, *Racing Car Game*, BCI system is closer to a tool as an extension of the human body in that human provides the rhythm (Fig. 3). On the other hand, it is more independently active than a tool. It works automatically and imposes its rhythm on we humans. It presents that BCI system is nontransparent. It provokes a

discrepancy that nevertheless the computer is inanimate, in practice it acts as a living and thinking object.

Thus, art with BCI can be an example of the conflict between the civilization and its discontents in terms of Sigmund Freud's the diagnosis; it recalls the repressed in the paradox of prohibition of incest as what is simultaneously prohibited and considered impossible. For it is not possible for the computer to think on the grounds that it is ethically and morally dangerous. Here, the interesting point is that BCI functions as a fantasy-frame to prevent the abyss of the Real in the concept of Lacanian psychoanalysis. As early as 1954 Jacques Lacan points out that the computer is the paradigmatic case of symbolic bliss [3]. What we call reality is constituted upon the model of the symbolic bliss for the exclusion of the traumatic Real. The symbolic bliss is "the coming into operation of the symbolic function." It converts "a horrendous discovery" into "a sort of ataraxia [4]".

Sigmund Freud testifies the structure of art with BCI in his famous two dreams; the famous dream of Irma's injection and that of the dead son who appears to his father and addresses him with the reproach, "Father, can't you see that I'm burning? [5]". In these dreams, the symbolic bliss wakes up when dreamers encounter Irma's throat and the burning son as the traumatic Real. It enables them to escape from the Real. In other words, through the fantasy-frame of symbolic bliss, the dreamers can continue to sleep after the horrifying look into the Real epitomized by Irma's throat and the apparition of burning son [6].

Like Irma's throat and the apparition of burning son, art with BCI operates in a fantasy-frame of symbolic bliss. It constitutes what we call reality through the exclusion of some traumatic Real. In the artwork, *Racing Car Game*, BCI is no less than "the price we pay for our access to reality [7]." If we think that the computer doesn't think, the price for our access to reality remains un-paid, un-thought. It means that we can approach the reality of BCI art so long as we consider BCI as thinking and acting aesthetic objects.

It is of particular interest how the tension between schizophrenia and paranoid takes place in *Racing Car Game* created by BCI. Every program is code writing and it is the expression in the computer language of a series of action that the computer needs to take in order to solve a problem. What is really important in the programming is always how efficiently they run on the computer. Although its aims at complete control and mastery, it proceeds intuitively and creates the new. The discrepancy between means and effect is bound with the tension between schizophrenia and paranoid of BCI art.

The double structure of schizophrenia and paranoid provides the possibility to catch the eloquence of BCI as aesthetic objects. In the work, *Racing Car Game*, the schizophrenic aspect of BCI can be analyzed as the pleasure of programming as text. According to Roland Barthes, the literature work is a fixed writing depending on its author, while the text is arbitrary signs [8]. It plays in itself. More detail, the text itself plays as one plays a game and "the reader plays twice over as a practice which reproduces it [9]." Like the text of literary, BCI system also has the shifting from work to text and abolishes the distance between writing and reading as well as author and reader. This process concerns the schizophrenic aspect of BCI system. We humans cannot see the play itself of programming as text. We humans exist only a reader in the sense that we can read

the programming codes. That is to say, we humans become a second player in the art with BCI.

Although art with BCI operates on the basis of simulation of human's thoughts, its internal action is nontransparent. It indicates that BCI art is the paranoid by nature in terms of psychoanalysis. For the logic of BCI is far from a simple linear, closed, self-reflexive one. It follows an inconsistent logic which, caught in a snare of self-reference, can never be totalized. In this regard, art with BCI is self-evident as long as it loses the self-evident. The losing of self-evident in BCI is parallel to paranoid as an infinitely repetition (reiteration) of failed self-rescue.

Art with BCI is a process of ultimate abstraction; it is the abstract simulation of thoughts of we humans, in order to interpret and manipulate the real world. As a model for human brains, BCI system is only programmed, that it cannot in a real sense understand. However, when a thought is translated into a program, it loses the ability to live with the vagueness that thoughts normally employ. It shows us the other side of ourselves that we have never seen.

In this point, art with BCI gets the aesthetic originality. Georg W.F. Hegel points out that "in one respect, the originality is the most personal inner life of the artist, yet on the other hand it reveals the nature of the object and the special character of the thing itself [10]." The originality of BCI art can be considered as the nature of the object and personal inner life of we humans at the same time. It is linked with the uncertainty (autonomy) as the substance of art. Theodor W. Adorno notes, "it is self-evident that nothing concerning art is self-evident anymore, not its inner life, not its relation to the world, not even its right to exist [11]." The substance of art lies in not the arbitrariness of what simply exists but the endless losing of self-evident. A similar subversion takes place in the art with BCI.

On the one side, BCI art turns against itself, in opposition to its own concept. Only by the virtue of the separation from empirical reality, it achieves a heightened order of existence. In this sense, art with BCI refuses definition. The aesthetic identity of art with BCI seeks to the non-identical, which in reality is repressed by reality's compulsion to identity. Thus, the autonomy of art with BCI might be essentially internal like an art. On the other side, the non-communicative aspect of BCI art, however, occurs through the communication with what is external, with the world from which it seals itself off. For, insofar as BCI art is an object (artifact) as the product of social labor, the aesthetic force of production is the same as that of productive labor.

The aesthetic relations of production are no less than sedimentations or imprinting of social relations. It indicates that art with BCI is necessary to have a social relation, and to communicate with the empirical reality as reified external experience that it internally rejects and from which it draws its content. The double character shows the concrete mediating links between BCI art and the social structure.

Consequently, like the identity of art, art with BCI exists in both internal autonomy and external sociality. Hence, BCI meets art in the point of losing of self-evident. The meeting point has its foundation in the synthesis of the spirit-material dimension of works. In other words, the synthesis exists only in relation to its other as what it is not. Inasmuch as it is the process that transpires with its other, the point that they meet is no less than an active and communicative movement. The movement becomes BCI art

itself. It presents that art with BCI is decolonizing from the spell of the absolute of idealistic aesthetics.

3.2 Art with BCI as Aesthetic Attitudes

The artwork with BCI, *Racing Car Game*'s system is implemented under BCI2000 platform (general purpose software in BCI research). Graphical software visualizes concentration index, and hardware module controls the velocity of a racing car. BCI2000 is a general-purpose system for BCI research and development (Fig. 4). It can also be used for data acquisition, stimulus presentation, or brain observation applications. BCI2000 consists of a Signal Acquisition module that acquires brain signals from g.USBamp or g.MOBIlab+ devices (Fig. 4) These raw signals are visualized and stored to disks and submitted to the Signal Processing module. The Signal Processing module extracts signal features and translates them into the device command. Its commands are used by the Applications module to generate the collaborative action of human and technology. *Racing Car Game* shows that BCI is changing how artwork is made as well as how to see the artwork. It recalls the painter Paul Klee's meditation, "Now objects perceive me [12]."

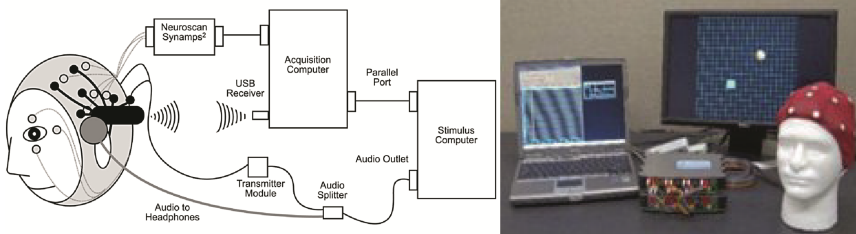


Fig. 4. *Racing Car Game*: BCI2000 Platform (BCI2000 has been used to replicate or extend current BCI methods in humans and has recently been used in a number of groundbreaking BCI studies. BCI2000 has been in development since 2000 in a collaborative effort led by the Wadsworth Center. BCI2000 is available free of charge for research purposes to academic and educational institutions.) and EPOC (14-channel wireless EEG system developed by Emotiv Systems).

Klee's intuition recently has become an objective fact. In the artwork, *Racing Car Game*, BCI goes back to the basic condition of art and through the observation of object shows institution about "the direct spiritual vision" of the object beyond the representation [13]. BCI reconstructs the traditional symbolic order and realizes the direct spiritual vision. The returning to the depths of the object is to break the symbolic order. Like "the child, the madman and the savage with special power," art with BCI can still, or again, look into the in-between world that exists between the worlds our senses perceive [14]. That is to say, it "does not reproduce the visible; rather, it makes visible [15]." It implies that BCI provides the possibility of achieving the sightless vision in the sense

that there is no such thing as fixed sight depending on the human eye's movement.² It assumes to the sharing of vision, of perception between the animate and the inanimate, in this case, human and computer.

The synthetic vision of art with BCI can be called the collaborative vision of computer and human.³ It is a new form of aesthetic attitude, free of any previous perspective. It is the shifting from "Small Optics" to "Big Optics," as Paul Virilio observes [16]. Small Optics is based on linear geometric perspective shared by human vision. It involves distinctions between near and far, between the object and the horizon against which the object stands out. It is the essence of the audio-visual perspective of old: to hear and see at the distance. Big Optics is aesthetic attitudes handled by the collaborative vision of computer and human. It is a real-time electronic transmission of information.

In the artwork, *Racing Car game*, BCI dissolves physical distances as familiar patterns of perception, the dimension of real space of linear geometrical perspective. It implies that we are moving towards "tactile perspective," that is, to "contact at a distance [17]." What may be radically new in the tactile perspective is that we can affect change on material reality over the physical distance in real time. It allows us to touch objects over distance. As new aesthetic attitudes, the collaborative vision of art with BCI reconsiders both a fundamental condition of human perception-spatial distance and the distance between the subject who is seeing and the object being seen; the observer and the observed or the spectator and the spectacle. It is "not an inferior representation of our reality, but a realistic representation of a different reality," and then "it is the result of a different, more than human, vision [18]."

At this point, art with BCI redefines the relation between subject and object of vision. It questions that 'when the vision is augmented by computer graphics, whose vision is it?' Art with BCI critiques the technological determinism reinforcing the binary of computer and human vision. It shows that now the different reality, the different vision is constituted by the collaboration of computer and human. The collaboration makes a new single vision as neither the machine vision nor human vision.

With regard to the problem of the subject in relation to the object, aesthetic attitudes of art with BCI fits well with Hal Foster's the reception of import of art in the view of psychoanalysis. The collective vision of art with BCI reframes the nature of the artistic activity and extends it into the fundamentals of aesthetics configuration. It presents a broken relation to subject (self) and the world as manifest in a dissociation of thought, action, or effect-as a disruption of subjectivity marked by a disruption in representation.

² Vision is the ability to interpret information from visible light reaching the eye. It is the result of visual perception, and it is also known as eyesight or sight. Perspective is the way in which objects appear to the eye based on their spatial attributes, or their dimensions and the position of the eye relative to the objects.

³ The collaborative vision is to merge two concepts of human vision in the field of human sciences and computer vision as the field of computer sciences. In general, human vision indicates the ability of visual perception to interpret information from visible light reaching the human eye, while computer vision is the science and technology of machines that see. As a new scientific discipline, it is concerned with the building artificial systems (computer vision systems) that obtain information from images.

According to the meditation of Freud, aesthetic attitudes of BCI art are overwhelmed by hallucinations that only deepen the sense of internal and external catastrophe. It constructs new systems to counter both catastrophes, with delusions of personal grandeur for the first and projections of world order for the second. The former focuses on a self-losing, while the latter deals with an ultimate failure of self-rescue. Both, however, are ultimately identified with a self-defense mechanism.

The collaborative vision of art with BCI evokes the collapsing of boundaries between subject and object, the observer and the observed; it merges the distinction into the disappearing (the breaking) of spatial and temporal distance between them. Shortly speaking, the distinction between subject and object is flattened in the art with BCI. That's why the collaborative vision of we humans and technology is perceived as an uncanny catastrophe that is suddenly estranged and hostile.

3.3 Art with BCI as Aesthetic Values

Idealism is based on mind, consciousness or perception.⁴ It refers to a tradition in Western thought that represents things in an ideal. In the idealistic knowledge, the form of an object is subordinated to an absolutely subjective sign system denoting subjective instinctual impulses. The meaning is supposedly hidden behind the form of the object. On the idealism, aesthetic values have been inferred from the aesthetic attitude as “the aesthetic interest or pleasure through the subjective aesthetic experience [19].” The aesthetic values concern the beauty. It is considered as a series of experience as an aesthetic pleasure. If we feel an intense aesthetic pleasure through an artwork, we have an experience as what is projected on the object. Then what we call the beauty, what we experience is the idea of beauty rather than the beauty itself.

Art with BCI critiques the alienation of object in idealistic aesthetics. It recalls Marx's fable that “One man is king only because other men stand in the relation of subjects to him. They, on the contrary, imagine that they are subjects because he is king [20].” Being-a-king is an effect of the relation between a king and his subjects. The subjects, however, think that they are subjects giving the king royal treatment, since the king is already in himself, outside the relationship to his subjects, a king. Like this distorted relation of a king and subjects, idealistic aesthetic assumes that there is an absolute beauty beyond a direct social relation between object and people as well as objects. As an already given to us, the idealistic beauty is in itself like a king.

Art with BCI considers the definition of beauty in a direct social relation between object and people as well as objects. For example, the artwork with BCI, *Racing Car Game* uses Emotiv EPOC as a headset that actually picks up on our brain waves (Fig. 5). The EPOC headset incorporates 14 extensions of electrodes (seven pairs), mostly centered on the front of the scalp. But rather than using the wires of traditional EEG tests, the headset is completely wireless, allowing the player free, natural movement.

Emotiv EPOC reads unique patterns of brain waves and interprets both conscious and unconscious thoughts as well as emotions. On the one hand, it attempts to close the

⁴ Idealism is widely used as the philosophical theory that the ultimate nature of reality is based on mind or ideas.

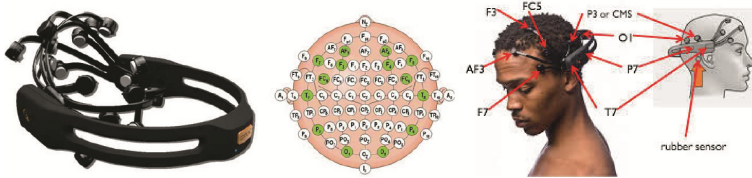


Fig. 5. Art using BCI, *Racing Car Game*: Emotiv EPOC system

gap further between the real world and the virtual world to create a more realistic experience, much like the Wii does. On the other hand, the Emotiv EPOC also tries to bridge the gap between human thought and the outside world to create an experience that's less like reality and more fantastical and dreamlike.

Thus, the beauty of *Racing Car Game* is in essentially unconscious projections of those who have produced them. It is nothing but facts like daydreams as well as objects of analysis. As an analogy of artwork and dream-work, art with BCI discovers the meaning of object itself as the linkage between the form of the object and its social relation. In an analysis of the form of dream as object, Freud defines that 'at bottom, dreams are nothing other than a particular form of thinking, made possible by the conditions of the state of sleep.' For it, he analyzes the self's dream, namely, the dream of Irma's injection. Through the analysis, he finds a repressed message in the relation to the connection of the form of a dream as an object and its social relation. The dream-work is the self's unconscious attempt to evade the social responsibility of the failure in his treatment of Irma as his patient.

According to Freud's meditation, the beauty of art with BCI is the attempt, the dream-work that creates the form of a dream as an object. It is realizing of a repressed unconscious desire of a dreamer in the linkage between the form of dream as object and its social relation. It means that the beauty of BCI performs in the form itself rather than a latent thought and manifest text. Insofar as the beauty of art with BCI is constituted in the form itself, there is no hidden meaning behind the form of art with BCI.

Art with BCI denies the very idea that the beauty is superior to the form of an object and emphasizes the form of object as movement in relation to object and its social relation. At this point, BCI art is connected to Hegel's dialectical aesthetics, which conceives the form as content. Although he also defines that 'the beauty is the Idea of beauty, he sharply distinguishes between the Idea and Concept.' The Concept articulates in the shape of object. It is the absolute unity of specifications, the mediated ideal unity of particular factors. It is a totality between object and its social relation in reality. The Idea reveals itself in the real (actual) existence of Concept.

In this sense, the beauty of art with BCI can be grasped as the Ideas as the immediate totality of the Concept with its reality. Insofar as the beauty is originated from the dialectic movement between Idea and Concept, it is regardless of its purported fullness in the satisfaction of needs, and the accidental nature. It is that we find out the object beautiful rather a subjective consideration of the object.

Freud also notices that when the beauty investigates the aesthetic attitude as the conditions under which things are felt as beautiful, it is unable to give any explanation

of nature and origin of beauty. He defines the beauty as attributes of the sexual object. According to him, “the love of beauty is a perfect example of a feeling (impulse) with inhabited aim... the genitals themselves, the sight of which is always exciting, are hardly ever regarded as beautiful [21].” The genitals themselves implies that what is eliminated by the prohibited object is the beauty itself. It testifies the essential lack of success of absolute that we can get the beauty, as long as we do not depict the site of sexual pleasure directly.

4 Invagination

As a case of art with BCI, *Racing Car Game* presents that the beauty is the moving. The beauty of BCI art requires the collaborative action of humans and computer. Here the interesting point is that we do not just see that things move in the artwork, but we see them moving in it, and this is because we ourselves move it. In other words, the beauty of art using BCI technologies is not the still of moving things, but the moving of moving things. There is no coherent and inherent relevance of beauty in art with BCI. The beauty that is not there challenges the way of knowing and decolonizes the power of traditional knowledge system.

Arthur Danto said that “We refer to Voltaire only with reference to why we see the cloud as we do, not with reference to why the cloud is the way we see it [22].” The ontological difference (or the existence) is caused by the experience of reality, but causality and reference are in front of undetermined (or being determined) experience. It is not undetermined causality and reference, but veridical experience. The beauty of art with BCI presents that we have to question the way of knowing, that is, the rule of the knowledge game.

In this sense, art with BCI has an ambivalence of politics *and* the aesthetic. The beauty created by BCI is originated from the collaborative action of we humans and technology. It critiques both knowledges of practical arts and practical arts themselves; it stimulates a network of conceptual relations rather than merely perceptions of the haptic and sensory aspects of interactive art. Thus, the artwork with BCI, *Racing Car Game* becomes a sociological imagination as “the vivid awareness of the relationship between personal experience and the wider society” for the decolonizing knowledge [23].

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References

1. Hyunkyung, C., Joonsung, Y.: Performative art: the politics of doubleness. *Leonardo* **42**(3), 282–283 (2009). The MIT Press, Cambridge
2. Latour, B.: *We Have Never Been Modern*. Harvard University Press, Cambridge (1993)
3. Zizek, S.: From virtual reality to the virtualization of reality. In: Trend, D. (ed.) *Reading Digital Culture*. Blackwell Publishing, Oxford (2001)

4. Lacan, J.: *Book II: The Ego in Freud's Theory and in the Technique of Psychoanalysis*. Cambridge University Press, Cambridge (1988). Tomaselli, S. (trans.)
5. Freud, S.: *The Interpretation of Dreams*. NuVision Publications, London (2007)
6. Zizek, S.: *Tarrying with the Negative: Kant, Hegel, and the Critique of Ideology*. Duke University Press, Durham (1933)
7. Zizek, S.: *From virtual reality to the virtualization of reality*. In: Trend, D. (ed.) *Reading Digital Culture*. Blackwell Publishing, Oxford (2001)
8. Barthes, R.: *The Pleasure of the Text*. Hill and Wang, New York (1975). Miller, R. (trans.)
9. Barthes, R.: *Image-Music-Text*. Hill and Wang, New York (1977). Heath, S. (trans.)
10. Hegel, G.W.F.: *Aesthetics*. Oxford University Press, London (1975). Knox, T.M. (trans.)
11. Adorno, T.W.: *Aesthetic Theory*. Minnesota University Press, Minneapolis (1988). Hullot-Kentor, R. (trans.)
12. Virilio, P.: *The Vision Machine*. Indiana University Press, Bloomington (1994)
13. Foster, H.: *Blinded insights: on the modernist reception of the art of the mentally ill*. **97**, 3–30 (2001). The MIT Press, Cambridge
14. Klee, F.: *Paul Klee: His Life and Work in Documents*. George Braziller, New York (1962)
15. Klee, P.: *The Inward Vision*. Harry Abrams, New York (1959). Guterman, N. (trans.)
16. Virilio, P.: *Big optics*. In: Weibel, P. (ed.) *On Justifying the Hypothetical Nature of Art and Non-identically Within the Object World*. Walther Koenig, Koln (1992)
17. Virilio, P.: *Speed and information: cyberspace alarm!* In: Trend, D. (ed.) *Reading Digital Culture*. Blackwell Publishing, Malden (2001)
18. Manovich, L.: *The Language of New Media*. The MIT Press, Cambridge (2001)
19. Rader, M., Jessop, B.: *Art and Human Values*. Prentice-Hall Inc., New York (1976)
20. Marx, K.: *Capital: A Critique of Political Economy*, vol. 1. International Publishers Co., New York (1967)
21. Freud, S.: *Civilization and Its Discontents*. W.W. Norton & Company, New York (1961). Strachey, J. (trans.)
22. Danto, A.: *Moving pictures*. In: *Philosophizing Art*. California University Press, California (2001)
23. Wright Mills, C.: *The Sociological Imagination*. Oxford University Press, London (2000)