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Beyond Cybernetics on Transductivity of Technology and Art

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Operation Transductive

Nam June Paik once blushed to read a critical article describing him as a "scientist, philosopher and engineer at once, the leading figure of the new artistic tribe." Today, nobody would think that this article overvalued him. Paik's capacity of thinking crossed the scholarly gaps between philosophy, science, technology and art. His works negated the conflicts that technology caused against nature, culture (art) and religion, and created a new mode of relation between mankind and the world which technology could provide. The relation between mankind and the world is an ensemble which embraces 'mankind' and 'the world' as the two terms, which is indeterminate and metastable. The way the two terms exist can alter depending on which mediator, which media they are related to each other through. Such things as science, technology, religion and art are all different modes of human imagination about the world and diverse means with which men make their relationships with the world. Paik introduced technological and artistic inventions as 'new media' through which men connect with the world. This is as if going back to the primitive flow 'before' demarcation, classification and categorization which had been fixed in our modes of thinking and existing with respect to the world, and inventing and generating new forms from the foundation of the pre-individual reality 'before' individuation of forms.

The artworks created by Paik are not simply 'composites of materials

and forms.' What this means is that they are not the result of the passive process of providing the preconceived shape (idea, intention, purpose) in the artist's mind with given materials. Nothing is predetermined. The form and structure of an individuated piece is 'formalized' and 'structuralized' as it is modified and changed in its relationship with the base. The base here means that which cannot be reduced to the substance as physical materials, and thus it includes natural and even technical environments. Also, since the shape in the artist's mind is concretized into a commensurate symbol from the mental base such as an inherent axiomatic system, this mental formula gets settled through the process of physical realization of the form. In other words, Paik's works cannot be explained with the substance-form formula which postulates the form and the substance as already determined terms. Rather it should be seen as a process of concretization in which a thing acquires form or structure in a metastable way through the kind of relationship in which information is changed between the creative mind of invention and the object of invention, and between the mental formulae and physical conditions (natural and technical environments) happens.

Paik says "the real issue implied in 'Art and Technology' is not to make another scientific toy but how to *humanize* the technology and the electronic medium, which is progressing rapidly — too rapidly." What does 'humanization of technology' mean here? And what is the role that art should play in the humanization of technology?

First of all, it seems Paik's thoughts on technology can be found in his statements "We are in open circuits"[1] and "I use technology in order to hate it more properly."[2] His argument of the latter is already expressed in the ‹We are in open circuits› manifesto, that "we can resist poison only through certain built-in poison, then some specific frustrations, caused by cybernated life, require, accordingly cybernated shock and catharsis." Here, technology is metaphorized as a kind of 'pharmakon'[3] which is both 'poison' and 'remedy.' This resembles Jacque Derrida's strategy to have something deconstruct itself by transforming the condition which makes it possible into the condition which makes it impossible at the same time. To sum up, he found a subtle resolution which traverses the boundary between

neorodite (excessive hatred of technology) and technocrasism (excessive faith in technology). It does not mean, however, that Paik deconstructed technology itself. Technology as pharmakon has a transductive ability to bring about changes. Paik uses technology as 'media transductive.'

How can 'poison' become 'remedy'? What happens when TV becomes ‹TV Garden› or ‹TV Fish›? Watching TV, men lose their contact with nature. Watching ‹TV Garden›, men remember the nature which they have lost and forgotten. While TV separates and alienates men from nature, which used to be the foundation of the human existence, ‹TV Garden› restores men's lost connection with the original nature and enables transindividual[4] communication among individual men. The process of TV (poison) becoming ‹TV Garden› (remedy) is constituted of disparate elements such as TVs, videos, trees, grasses and vines being put together as an ensemble. This process, in Gilbert Simondon's term, is 'transduction.'

Simondon is a French philosopher who was active during the time when Paik was creating 'Big Bang' in the history of art with his aesthetics expressed in «Exposition of Music — Electronic Television» (1963) and ‹Robot K-456› (1964). Like Paik, Simondon suggested a new philosophy of technology through his insights into cybernetics and electronic information and communication theories pertaining to the level of the technology of the time. 'Transduction' is an essential concept in his 'ontology of individuation' which was not well acknowledged until Gilles Deleuze commented on it. Transduction in brief is individuation, a process through which an individual is generated from pre-individual reality. The pre-individual reality is a system of metastable state which innately contains potential energy. When the equilibrium between diverse yet incompatible potentials is broken and a problem rises as a result, an individual springs up in a particular structure or form as a value that solves this problem. An example of this is crystallization: when you put a small piece of ice in a supersaturated solution under 0 Celsius degree, the whole solution gradually turns into ice. Due to the information coming from outside (ice), the system of metastable state is disturbed and the phase changes into a new structure and form (solid state). A new form or structure is generated as a solution, re-establishes harmony and coexistence among the different phases which have

Nam June Paik, <TV Fish>, 1975(1977), Nam June Paik Art Center Collection
© Nam June Paik Studios

become incompatible after the original equilibrium was broken, and keeps the inner tension. In other words, transduction is a process to invent a new metastable state by re-modulating the relationship between disparate terms.

The process of Paik's work is a kind of transduction. What can be taken as an example is ‹Scott Joplin, the First Digital Composer› that consists of Scott Joplin's music with slightly varied beats, the disorderly arrangement of small and big TV monitors which make a form of piano, the vivid colors repeatedly appearing on the monitors. Here sounds, forms and colors which belong to different realms, while retaining subtle inner tensions and analogic relationships are individuated as a new ensemble . The movements of fish swimming in water and the movements of a man dancing in the air, while retaining the relationship of analogic tension, are likewise transformed into a newly structuralized ensemble ‹TV Fish›.

It seems that Paik found the theoretically possible base for operation transductive in cybernetics. This is because cybernetics is "the study of pure relationship, or the relationship itself,"[5] and it treats "the information, in which a message was sent, plays the same role as the information, in which a message is not sent."[6] Whether something is meaningful information or meaningless noise, in other words, whether it is a 'remedy' or a 'poison,' can change depending on the mode of relationship, which is not pre-determined. Cybernetics implies an indeterminate and

non-essentialist way of thinking.

Furthermore, cybernetics drew Paik's attention because of its interest in the mechanism to 'modulate' relationships. The technology dominant in the 19th century was thermodynamics and power science. Its representative machine was the 'motor,' whose most important value was how to generate great power. Paik criticizes Newtonian physics by stating that it is "the mechanics of power and the unconciliatory two-party system, in which the strong win over the weak."[7] He paid attention to the invention of putting "a tiny third-party (grid) between these two mighty poles (cathode and anode) in a vacuum tube." He saw the advent of the vacuum tube which mediates and modulates the two opposing powers, as "enabling the weak to win over the strong" (in which the conveyance of information through current overcomes the physical power), which led to the birth of the 20th-century cybernetics. The strength of power is not important, but the modulation and transference of it is. In the theories on current, electron and information and cybernetics which he studied and explored in an hands-on way, 'non-unidirectional reflexive causal relationship' and 'modulation by feedback' play important roles in determining and transforming structure and form. The structure and form in Paik's works are always the result of relationships and they are always metastable. The technology Paik found in cybernetics is, above all, a technology as a mode of relation and a technology as a medium of operation transductive.

I believe that Paik's interest in cybernetics has to do with the strategy of 'humanizing technology' he envisioned. What does the humanization of technology mean? Would it be to use technology as instruments useful for human purpose? To make a machine that resembles a man? So that we have a machine perform human roles for us? Or, to make a man a machine? To connect a human body to a machine directly and produce a man who thereby becomes a robot or a cyborg? To create a man-machine hybrid? Do his robot series from his first ‹Robot K-456› to ‹Ancient Equestrian Statue›, ‹Video Scooter› and ‹Scott Joplin, the First Digital Composer›, and his performances with Charlotte Moorman such as ‹Opera Sextronique› and ‹TV Cello› demonstrate the birth of hybrids which deconstruct the boundaries between the biological and the mechanical, between humans and non-humans? In

my view none of these are the case. For Paik, technology and technological objects are neither useful instruments for anthropocentric ends nor are they located in the context of post-human machinism. Men and machines are not related as master and slave, and yet the difference between the two entities cannot be ignored. The technical and artistic inventions that resulted from Paik's operation transductive are structurized as an ensemble of 'human-machine' in which a man and a machine encounter each other as an equal collaborator respecting difference, and which functions as a new medium in the relationship between man and the world.

Technological Ensemble of 'Human-Machine'

Simondon provides the key to the understanding of this kind. He argues in *On the Mode of Existence of Technical Objects* (1958) that the confrontation between man and machine is only imaginary, and that the alienation of men in modern society is not caused by machines per se but rather by our misunderstanding of the essentials of machines. He affirms that the way to overcome the alienation of men is to integrate technical objects (machines) into culture and to consider the relationship of men and machines as that of equal collaborators to form an ensemble. According to him, it is imperative to correct our misunderstanding of and prejudice against technology and machines, and especially we should acknowledge the limits of cybernetics and ergonomics.

According to Simondon, Norbert Wiener's cybernetics and robot engineering and human engineering based on it identify machines with living organisms, conflate open machines with closed machines, and make it impossible to understand men and machines on the level of transductive ability. The myth of automatic machines, machines that resemble living organisms, and artificial intelligence robots, which realize perfect automatic control and require no human intervention any longer, easily conspires with technocracism, is anthropocentric, and causes the rise of distrust in machines. The convenience and yet anxiety caused by the idea that machines can be humanized and can replace men is well imagined and expressed in SF movies like ‹Matrix›, ‹Terminator› and ‹Ghost in the Shell›.

Simondon declares that machines like these imaginary robots do not exist. All technical individuals possess a functionally systemizing ability which differs in the level of automatic control, and essentially can never replace human beings even if their level of automatic control is close to perfection.

First of all, machines can be 'analogous' but cannot be 'identical' to living organisms. According to Simondon, a machine like a living organism has a mode of existence which goes through genesis and evolution appropriate to its unique inner necessities. Just as evolving organisms are individuals in metastable state carrying with them potential life force, evolving machines are individuals in metastable state carrying with them potential technological force. Technological force is not used up by realized machines, but evolves from an abstract to concrete state realizing technological force. 'Concretization' which refers to the evolution of machines is a process in which as the functional collaborative effect of the constituent elements of a machine increases, they establish inner compatibility and automatic control system to acquire unity, which is akin to natural or biological beings. The motivating force behind the evolving process or concretization of machine is not the demands external to the machine, namely, human need and usage or economic factors, but those completely internal to the machine. That is to say, when a problem rises because the functional convergence of the constituents does not adapt to the external environment and instead becomes supersaturated in an inappropriate way, the transformation into a new structure and form is required to solve this problem, out of internal necessity.[8] Transformation of a machine is not a simple adaptation to the environment but a creative takeoff, just as in a biological being. The genesis of an individual as a concretized machine is possible only when metastable structure and form are built and modulated through reflexive cause-and-effect actions in the relation between the internal environment (the world of technical elements) and the external environment (the geographical natural world). To sum up, a concretized technical individual is generated when it creates itself by simultaneously establishing a technical-geographical environment (the associated environment) which conditions itself, just like an arch-shaped ceiling is fully formed only when it is completed.[9]

What is indispensable in the process of genesis and evolution inherent to

a technical individual is a man. This is because the human action of 'invention' must intervene in the genesis and evolution of an individual technological object in order to process information in the relationship between interior and exterior environments and to modulate and converge functions. Right here is where new thoughts on the relationship between man and machine emerge, which do transcend anthropocentrism but are not reduced to machinism. The mode of existence of a machine (genesis and evolution) is analogous to that of a biological being (genesis and evolution). They are similar in the sense that both are individuated into a metastable form which retains compatible unity through mutual causation and automatic control in relation with the environment and with other objects. This does not mean, however, that the machine is identical with a biological being. A machine has an inclination to concretize whereas a biological being is a concrete being in the first place. A machine cannot accomplish perfect concretization by itself. The advent of new form and structure requires communication of information provided in the relation with the external world, but a machine cannot provide information.

Whether out of excessive worship or hatred of machine, the common misunderstanding is that the level of automation decides the level of perfection of a machine. What is 'automation,' though? It is the establishment of reflexive causal system that enables automatic control of the inner functions in the relation with the external environment. The ability of automatic control cannot be possible without sensibility vis-à-vis information coming from outside. An automatic machine, which is closed to itself so that it works only as it is designed, is not a machine in a true sense. A machine that realizes a high level of technology, a machine that evolves toward more concretization is an open machine that receives information from the relationship with the external world, controls its functions, and alters its functional arrangement. In an open machine, there is room for indeterminism so that it can accept information from the relationship with the external world. In the sense that it has room for indeterminism, an open machine resembles a biological being. All systems with room for indeterminism are 'transducers.' A transducer arranges the possibilities of modulation between input and output. It is a medium that transforms potential energy into a concretized form. Both biological beings

and machines are a kind of transducers. Biological beings, however, are transducers far more excellent than machines. A transducer itself cannot invent information, but biological beings provide information to a transducer. A machine cannot raise a question, but a biological being does and finds an answer to it. A machine functions according to a designed scheme of form, but a biological being possesses the ability to remember by which to interpret the unknown with the known and, as a result, receives information and issues raised in relation with the external world and actively brings out transformation.

Therefore, if the prerequisite of in-for-mation or transformation is information, an automatic machine in a true sense needs a man. Why? It is because a man has to play the role of discovering, interpreting, communicating and exchanging information among machines. It is a human job to extract new signification from the workings of machines, to change them into information and link it up to the invention of new forms. It is a man that modulates, maintains and communicates the relationships among machines, whether the relationship is among the constituent parts of a machine or among automatic and individuated machines in ensemble. Men exist together with and as equal to machines, as living interpreters and organizers of the functional mutual cooperation of open machines.

The analogy between machines and men should be found not in their corporeal functioning, but in the isodynamical relation between the mental functioning of men who invent things and the physical functioning of machines. Invention is a process which is transferred from the mental functioning to the physical functioning of a machine in a parallel way. That the mental scheme of a man is realized in the physical functioning of a machine is the ensemble of men and machines rising in the process of invention.

In this sense Paik's ‹Robot K-456› is a 'human-machine.' It is not a closed machine as a completed entelechy but a technical ensemble that functions as it constantly modulates, reinvents and rebuilds itself. ‹Robot K-456› is not a technical or artistic object because it 'talked, walked, crapped' like a man. It became a technical and artistic object only when it was with Paik who handled it with a remote control, or to the extent that "four or five engineers had to constantly repair it as it got

Nam June Paik, <Klavier Integral>, 1963, «Exposition of Music – Electronic Television» © Manfred Montwe

broken in every four or five steps." Likewise, ‹Klavier Integral› in which all diverse materials are put together is not an object perfectly actualized as it is; it could only exist together with Paik's constantly repairing and replacing some parts broken by visitors to the exhibition; only in the process of modulation and modification which causes transformation in the open relation with the external world.

Again, what is the 'humanization of technology?' It is to find things human, things pertaining to the source of humanness, within technology. A technical object exists only when it is accompanied by nature, its associated environment. And a technical object can function only when it is with men, in which the mental ability of men is inserted. It is therefore technical objects that can be the real mediator between men and the natural world. Paik's 'man-machine' ensembles, by reconnecting the human species and the natural world and paving the path for communication, play the role of a new mediator which contributes to the recovery from the alienation of men (separation from nature, the origin of human beings).

Aesthetic Ensemble of 'Technology-Religion'

Paik's cybernetic thoughts, well expressed in the statement "we are in open circuits," go far beyond technical thoughts that combine men and machines as an ensemble in an open relationship. He considered the revolution of a vacuum tube

to be a “Buddhistic third-way” which would transcend the opposition between the strong and the weak. For example, ‹TV Fish› is a ‘technical ensemble’ constructed by the interaction of the three factors: the functioning machines (video), the living nature (fish) and the man who invents and modulates their relationship. The ensemble of man-machine-nature is, however, an ‘aesthetic ensemble of technology and religion’ as well. Because of this, Paik’s work strikes us not simply as an expression of aestheticism within a particular artistic area as an institutionalized genre, but gives us the impression that it reaches more fundamental ontology.

Again, according to Simondon, the confrontation between theory and practice, science and ethics, which determines the way we think today, is all rooted in the confrontation between technology and religion. When technology and religion, the two fundamental opposing values, are reconciled, and when the perfection of the fundamental being before the division of technology and religion is evoked, men regain the ontological security and have aesthetic experience. The most primitive mode of existence through which men relate to the world is the magical relationship, in which men and nature directly exchange and communicate with each other at privileged spatiotemporal singular points, like the relationship between living organisms and nature. Since this primitive and magical unity, that is, the universe, was divided into figure and base, men began to have two phases of existence. Technology and religion are the two, which are the modes of existing and also of thinking in the human world. The primitive being was itself both figure and base (magical unity). When it was divided into figure and base, technology took charge of figure, and religion, base. From then on, men and nature had relationship through the mediation of technology and religion. In other words, men have their relationship with nature either through ‘technical objects’ or ‘religious priests.’

Aesthetic thinking, here, rises as an inclination to combine the two phases of existence, i.e., technology and religion, and to restore the universe of magical unity before the division. Aesthetic impression can be experienced only when the magical universe is divided into technology and religion, only when they are reunited and an analogue to the primitive unity is materialized. Things aesthetic, unlike technical objects or religious subjects which are detached from the universe, are inserted in the

natural and human world 'here and now.' It is works of art that awake the perfection of the magical universe inserted yet lost both in the natural world and in the human world. The connecting network of artworks, the singular points or key points, are the aesthetic universe resembling the magical universe.

Technology and religion are two separate phases of ontology, and they cannot directly communicate with each other, while they can within aesthetic inclination. In other words, when technical objects or religious activities are inserted in the world which is simultaneously natural and human, they can generate equivalent aesthetic impression. For example, a transmission tower built on top of a mountain, or a praise sung in a special religious ritual can feel aesthetically beautiful, when they carry out their functions in particular time and place, not just any time and place, generating certain signification for people. If technical thinking analyzes the structure of figure and applies it to nature (by hammering and sawing), and if religious thinking classifies the qualities of base and judges nature (whether the land is secular or sacred), aesthetic thinking interprets the qualities of base and newly establishes the structures of figure. That is to say, while retaining 'analogously' the relationship between figure and base, between two disparate and incompatible terms, aesthetic thinking creates a new coupling of figure and base. In other words, if there is base (potential energy of materials) and figure (skillful gesture dealing with tools) within the technical realm, and base (mystical behavior obeying the absolute orders) and figure (theological signs totalizing the world) within the religious realm, aesthetic orientation goes beyond the different areas of religions and technologies. It demonstrates the transductive ability to generate new inventions either by matching religious figure (theological signs) to technical base (material potentials) or by pairing religious base (mystical attitudes) with technical figure (tool-using gestures).

We will need more time if we are to analyze the analogous relations through which Paik's aesthetic ensemble of 'technology-religion' expressed in ‹TV Buddha›, ‹Electronic Moon›, ‹Beuys and Shaman› and the use of a dead cow's head at an exhibition were born as new constructions of figure-base. It is certain, however, that his 'technology-religion' ensembles provide aesthetic experience of singular points simultaneously inserted in the human reality and the natural reality. This is

Nam June Paik, <TV Buddha> 1974[2002], <Beuys> 1988, Nam June Paik Art Center 2011 permanent exhibition «Mediascape, à pas de Nam June Paik» installation view

done by way of going beyond technology and religion which attempt to mediate the two on the condition that men and nature are separated, and of evoking the primitive magical unity before the separation of men and nature.

Paik's works are technical ensembles of 'man-machine' and aesthetic ensembles of 'technology and religion'; his works are technical and artistic inventions drawn from the most fundamental ontological base, and are new media that create new modes of relationship between men and the world. Paik himself was an excellent transducer that perceives and invents metastable systems among disparate elements, and his works are valuable as a paradigmatic model for every operation transductive.

1 Nam June Paik, "We are in Open Circuits," 1965, in Dick Higgins, ed., *Manifestos (Great Bear Pamphlet series)*, New York: Something Else Press, 1966, pp.24-25

2 Nam June Paik, "Video Synthesizer Plus," 1974, in Judson Rosebush, ed., *Nam June Paik: Video 'n' Videology 1959-1973*, Syracuse: Everson Museum of Art, 1974, unpaged.

3 This is a concept which appears in Derrida's deconstructive strategy, which goes beyond the absolute dichotomy between poison and remedy, between evil and good. 'Pharmakon' caused the death of Socrates in reality, but at the same time it was a remedy that returned him to the transcendental world of *Idea*.

4 Transindividual communicative relationship is different from interindividual communicative relationship. If the general relation between individuated entities is interindividual, what is transindividual enables the collective connection on the level of pre-individual reality which runs through the individuals in common.

5 Nam June Paik, "We are in Open Circuits," op. cit.

6 Nam June Paik, "Norbert Wiener and Marshall McLuhan," 1967, in Judson Rosebush, ed., op. cit.

7 Nam June Paik, "We are in Open Circuits," op. cit.

8 Simondon provides its example in the vacuum tube, which evolves from diode to triode, to tetrode, again to pentode.

9 Simondon's example is Jean-Claude Guimbal's water turbine. An electric generator is put in a container with oil under high pressure and then is immersed into a water pipe. The turbine is powered by seawater. Seawater functions as a technical and natural environment in which seawater and oil interact and work together in multiple ways.

김재희

베르그손, 시몽동, 들뢰즈로 이어지는 표현적 유물론의 자연철학을 연구하고 있는 철학자이다. 서울대학교에서 「베르그손의 무의식 개념에 대한 연구」로 철학박사학위를 취득했다(2005). 서울대철학사상연구소 선임연구원, 대진대 학술연구교수를 역임했으며, 현재 성균관대 강사로 일하고 있다. 2010년 백남준아트센터 국제학술심포지엄 «백남준의 선물 3. 뉴미디어의 고고학»에서 발표한 바 있다. 주요 저술로는 「베르그손의 잠재적 무의식: 반복을 넘어서는 창조적 사유 역량의 회복」, 「물질과 기억: 반복과 차이의 운동」 등이 있으며, 가라타니 고진의 「은유로서의 건축: 언어, 수, 화폐」, 질베르 시몽동의 「기술적 대상의 존재 양식에 대하여」, 자크 데리다와 베르나르 스티글러의 「에코그라피: 텔레비전에 관하여」(공역)를 한국어로 번역했다.

Jaehee Kim

Jaehee Kim is a philosopher, whose research is focused on natural philosophy of Expressive Materialism, from Bergson to Simondon and to Deleuze. Kim took a PhD in Seoul National University in 2005, with a thesis 「Une étude sur l'inconscient chez Bergson」. Having worked as senior researcher for Seoul National University Philosophy Lab and as research professor for Daejin University, she is currently teaching at Seonggyungwan University. She was one of the speakers at the Nam June Paik Art Center's 2010 international symposium «Gift of Nam June Paik 3. Archaeology of New Media». Kim's publications include 「The virtual unconscious of Bergson」 and 「Matter and memory: Movement of repetition and difference」. She also translated Karatani Kojin's 「Architecture as metaphor: Language, number, money」, Gilbert Simondon's 「On the mode of existence of technical objects」, and Jacques Derrida and Bernard Stiegler's 「Echographies of television」(joint translation) in Korean.