Entanglement of Art Coefficient, or Creativity

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Abstract

While entanglement is a phenomenon discussed in quantum theory, it can also be found in art. We propose to connect entanglement to art's most fundamental question: what is creativity? For example, Marcel Duchamp found the essence of the creative act in the “art coefficient,” the difference and/or gap between the artist's intention and realization which is created. This paper locates the common sense understanding of entanglement in an inseparable whole that ensures difference between the intention and realization. Seeing the artistic act as actively designing entanglement within artistic production, we present examples of this from the work of the Japanese-style painter Nakamura, and present a concrete vision for an answer regarding the question of the nature of creativity.

Keywords Art coefficient · Entanglement · Heterogeneity · Gap · Internal measurement

1 Introduction: The Art Coefficient and Creativity

What is creativity? Marcel Duchamp, in his lecture “Creative Act (Duchamp 1957),” expressed creativity as the art coefficient. The art coefficient is the difference between the artist's intention and realization which is created. For his 1917 *Fontaine* while Duchamp planned to express “Fontaine”, a urinal was exhibited. A urinal is a ready-made product that cannot be anything but a urinal. Therefore, when a urinal called a “fountain” is presented at an art museum, art-experiencers are intensely jolted by the gap between the urinal and a fountain. In this gap enters the outside—for example, art-experiencers' interpretations. People have usually sought the significance of Duchamp's art coefficient in the happenstance encounter between artists and art-experiencers, and seen it as located in the unavoidability of the artwork being interpreted independently of the author's intention. However, the art coefficient can be seen as the difference between what one has planned and that which is realized in artistic production.

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The plan can be defined not only to painting but also other arts and even to cognition and perception by referring to anticipation and/or post-diction. It is a strategy for understanding an outside that is formed actively yet in a way that is not completely controllable (Gunji 2018). The artist is, in other words, one who actively designs an art coefficient that cannot be deliberately managed (Nakamura and Gunji 2018).

An example of something with an art coefficient of zero is a plastic food model (Gunji 2018). Food plastic models exist so that customers can imagine in advance what the food offered is like, and they are expected to be as similar as possible to the food actually served. One can enjoy eating unexpected dishes in an *omakase* (i.e., chef's recommendation) course. In this case, a creative attitude that enjoys the kind of gap present in *Fontaine* is sought from both the cook and the customer. In creativity, gaps are welcomed and the greater the coefficient the greater the possibility of an impact and deep thought. With that said, not just anything with a large difference is good. That would be simple unrelatedness. The great gap between the intention and realization can entail the alternative of the two. For example, if you display a urinal as a "fountain" to some of your friends who are not familiar with arts, they are surprised at the gap between a urinal and a fountain. Since a urinal and a fountain cannot co-exist, they can be alternative to each other. Sometimes it is regarded as a urinal, but sometimes it can be regarded as a fountain for your friends. If the gap for the experienter is too great to allow for the concepts to be alternatives to each other, they will instead be assumed unrelated.

In the case of *Fontaine* exhibited by Duchamp, the urinal and the fountain are different in nature. While each concept is different, they are inseparable and exist together. With his work Duchamp set up a "coming and going" between the urinal and the fountain. By falling into this difference (gap), even art-experienters—who are supposed to be unrelated to the production of the work—jump into and experience *Fontaine*, which they have been linked to without possessing any relationship to it. This kind of creation is the art coefficient. The core of this idea could appear in many other contexts. Since Austin (1962) proposes the idea of speech act, it is argued that the outside of a language is rushed into the language in the form of speech act. In our sense, various contexts and unpredictable meanings outside of the ordinal use of a word could rush into the gap between the speaker's intention and the listener's interpretation. Especially, the concepts of illocution and perlocution in linguistics is strongly relevant for our idea [e.g., (Cohen 1973)]. Many cognitive and/or linguistic illusion such as cognitive bias [e.g., Manktelow (2012)] and the liar paradox (Aerts et al 1999) could be interpreted in terms of the aspect of the art coefficient.

In quantum theory, entanglement refers to different pure states being tangled together (Gunji 2018). The art coefficient can be seen as entanglement in the artistic act. Therefore, artists show their skills in how they incorporate gaps into their work in an exquisite arrangement and how they introduce leaps to the outside into it. Below, we will present examples from three works of Nakamura, one of the authors of this paper, that give rise to artistic entanglement. Before presenting the examples, we explain the metaphorical notion of entanglement in the next section.

2 Metaphorical Notion of Entanglement

The notion of entanglement is used to describe states that are separated with each other but remain connected in a non-local way. Therefore, an entangled pair of two sets of states which is assumed to be expressed as a product of two sets that is strongly correlated.

We expand the notion of entanglement in a broader sense. In linguistic philosophy, Wittgenstein (1963) denied the meaning of a word and a sentence, and proposed the idea of performative sentence. Kripke (1980) took after Wittgenstein's idea, and showed that if the referent of the name, Kurt Gödel, is defined by the person who proved the incompleteness theorem (IT), and if it is clarified that Gödel himself did not verify IT and plagiarized the idea, then one can be faced with the situation in which the person who proved IT did not prove IT. That implies co-existence of "prove IT" and "NOT(prove IT)" in the form of the liar paradox.

In Kripke's argument, "NOT(prove IT)" is just one of the examples outside of "prove IT" (i.e., conventional referent of Kurt Gödel)". Various possible referents outside of the name, Kurt Gödel, can rush into the scene of performing the name, Kurt Gödel. In our context, various possible referents in the underlying context can rush into the gap between speaker's intention and listener's interpretation. It results in a paradoxical sentence in which NOT(prove IT)" is superposed on "prove IT". In other words, the sentence is entangled with underlying context which can contain various possible referents, and that entanglement can entail co-existence (i.e., superposition) of a specific conventional meaning and the alternative meaning of the sentence in an extreme case. However, entanglement of a sentence and context is unclear because context cannot explicitly appear.

In this sense perlocution and illocution play an essential role to understand the significance of entanglement in linguistic phenomena. When a sentence and its underlying context is replaced by a speech and an act, respectively, one can find illocution in the form of entanglement. The illocution can also entail a paradoxical speech such as, "Please speak in a small voice here" in a loud voice.

This idea is taken after by cognitive linguistics especially proposed by Lakoff (1987), in which the prototype of a given meaning is located at the center of the distribution of possible meanings, and the marginal area of the distribution is connected to the opposite to the prototype.

While co-existence of A and NOT(A) is one example of co-existence of different meanings, referents and contexts, co-existence of various things can be attracted by the gap between speaker's intention and listener's interpretation. We expand the idea of entanglement to contain such a broader sense of co-existence.

Especially, the mirror neurons could be strongly relevant for the notion of entanglement. It was previously considered that the mirror neurons of a monkey and a human brain can fire to the same act of both him/herself or of others (Gallese et al 1996; Rizzolatti et al 1996; Cochin et al 1998, 1999). Thus, it is considered that the sociality can result from the mirror neurons (Gallese 2003).

However, the notion of "the same" act can be misleading. How can one identify the same act for one's own act and other's act? The act cannot be separated from its goal, derived feeling, emotion, and so on. How can one determine the boundary of a specific act? Nobody can do that, and mirror neurons also cannot do so. In fact, it is recently reported that mirror neurons can fire not only a specific visual image of others which represents one's own act but also the image which can be relevant for the goal, feeling and/or emotions derived from the act (Bonini et al 2013; Urgesi et al 2010; Iacoboni 2009). The latter implies that representation of a specific act is entangled with its derived information processing such as inferring goal, feeling and emotion.

In our sense, information processing at a certain level cannot be separated from that at a higher level in the brain. The latter information processing is regarded as the information processing outside of the former one. Since information processing is interpreted as the interaction between a sender and a receiver of the information, we can consider that

the outside of a specific information can rush into the gap between the sender's intention and the receiver's interpretation. That is nothing but the notion of art coefficient and/or extended notion of entanglement.

As well as the origin of sociality resulting from the mirror neurons in the sense of entanglement (Sobhani et al 2012), the gap between the artist's intention and realization can entail the entanglement of the masterpiece and the outside of it. That is creativity hidden in the masterpiece featured with the gap between the intention and realization.

3 A Buddha Bug "*Buddhaptera*" Praising a Rapidly Ascending *Platypotus* and Glistening

Platypuses live in Australia. They have a flat beak, like ducks (Grant 1989). They look like moles, and swim with the agility of fishes. Furthermore, they have a single foramen, like reptiles and birds. Excretion, procreation, and the laying of eggs all happen through one hole. While they lay eggs like birds, the hatched babies are nursed by their mother, like mammals. This mixed up living thing is a strange harmonious unification of various aspects. Nakamura took a strong interest in the platypus because it is itself a mediator of heterogeneous elements—in this gap. She was motivated to create by her desire to express this heterogeneity of a platypus.

One summer, she saw a lotus growing in a pot at a temple. She was driven by the intuitive desire to mix this lotus with up a platypus. In reality, this could never happen in its home of Australia. However, for Nakamura a lotus and platypus pointed to a heterogeneity that foretold entanglement. She composed the work so that it would beckon them. However, if one just reconstructs a platypus and lotus as a mixed thing without giving it much thought, there is even the possibility of debasing the heterogeneity of the platypus by turning it into a strange monster. How can one bring out the heterogeneity of the platypus in a way that can ensure various patches as a whole, the platypus?

When she was struggling with regard to this, she saw a jewel bug nymph taking shelter from rain near a window. On its back was an unestablished iridescent marble pattern. All of a sudden, in it she saw a shape resembling a human. For Nakamura, this was more than an illusion of the eyes. It brought about in her an intuitive feeling that the phenomenon of seeing resulting from the interaction of an object and an observer. This was the perspective of an internal measurement. When we perceive something, we tend to adopt a perspective that is based on the separation between that an observer and an object. External measurement is observation that rises above to look over the world as a whole. It is objective, scientific representation. On the other hand, in the case of internal measurement, the observer exists within the world and cannot observe without influencing that which is being observed (Matsuno 2016; Gunji et al 1997a, b; Gunji and Toyoda 1997). In other words, in internal measurement the exterior (that which cannot be controlled) is also internal to observation, rendering ineffective—although not dissolving—the difference between the exterior and interior and mixing up different things. Therefore, the co-existence of and the gap between an unrelated bug and human become possible. This shares commonalities with finding the Buddha—if one holds that this mixing up is entanglement, if with the attitude of an internal observer one holds that the consciousness that sees a human in a jewel bug sees the heterogeneity of the platypus. A "buddha bug" descended to the gap between the platypus and the lotus. This is a strange connection. In a way the "*Buddhaptera* (buddha bug)" worships and glistens, and *Platypotus* (2015) was able to splendidly jump (Fig. 1).

Fig. 1 *Platyplotus—Sudden rise* 2015 Kyoko Nakamura Color on silk, 170 × 68 cm (Overall view: left; Enlarged part: right above and right center) and *Bud-dhaptera* 2016 Kyoko Nakamura Color on silk, 15 × 15 cm (right below)

4 An Entangled Meal

At one point, Nakamura saw the movie *Moby Dick* (1956), based on Herman Melville's novel. In the painting, a whale arises amidst the flashing of lightning in chaos. This is the signature of the whale depicted by Queequeg. It is the large, white whale named "Moby Dick" that was never to be captured. Beckoned by Captain Ahab, the crew goes towards the whale, who is reaching his end. At first Nakamura wanted to paint such a whale. However, after reading *Le nouveau monde amoureux* (Fourier, translated in Japanese, 2013), the theme of whale suddenly escaped her, and was driven by the impulse to depict a meal in the harmonious world that Fourier claimed. What is called, combined harmonization could consist of individuals' various taste and happiness. Fourier's dream on new society is the attitude to enable this harmonization, which can be implemented by the internal measurement consistent with Fourier's terminology, "infinitely small (infinitesimal)". On one hand, the internal measurement perpetually mixes the measured state with external perturbation. On the other hand, the infinitely small enables harmonization of intrinsically different things. Both of them can enable happiness

Fig. 2 *Sawachi de Moby Dick* 2016 Kyoko Nakamura Handscroll, color on silk, 34 × 1423 cm

resulting from entanglement (Nakamura 2018). Although we do not refer to Fourier further in this paper, there is a more important discussion about the idea between Fourier and Nakamura's works. We would like to discuss it at another opportunity. Nakamura found *sawachi dishes*, a kind of local cuisine from Kochi (the name of a place) Prefecture in Japan made at home for guests on celebratory occasions such as weddings and birthdays (Matsuzaki 1986).

Eaten in large groups, the food is placed on a large plate with a diameter of around twelve inches or more. This plate, which brings together hors d'oeuvre, a main fish dish, side dishes, and dessert, is a highlight of *sawachi dishes*. This style of dining originates in *naorai* (a ceremony held at the end of a Shinto rite in which participants would share

food that had been offered to the god). This tradition has been passed down across Japan as a traditional feast in which the god and people eat together, strengthening their connections. However, due to its popularization, its original premise was lost, leading to difference between what is planned and what is realized. There is no order of dishes or hierarchy between foods as there is in course meals. Guests eat what they like when they want to. While going ahead with their own meal on their own terms, they deepen their relationships with others. Also, in *sawachi dishes* people—the old, the young, men, women—are equal around the plate. In Kochi, holding such feasts is referred to as *okyaku suru*. Both people from the family who invited others as well as those who were invited sit around the plate. Therefore, the relationship of “entertaining” and “being entertained,” as well as the distinctions between leading and supporting roles, gradually becomes ambiguous. The meaning of the gathering in the end does as well, and it turns into just a drinking party. *Sawachi dishes* include lots of food with an emphasis on appearance: a plover-like arrangement of sea bream that appears to have gathered together in the ocean, and even bonsai tree-like plates. When the drinking party goes in full swing, people drink together while entertaining each other using chopsticks and cups, and guests become constitutive elements of the plate and fragmented, decorating the feast. Everything that comprised the meal becomes completely fragmented, and a style aspiring towards an infinitesimally small heterogeneity becomes a medium. Even the bites of mackerel sushi deliciously brought to one’s mouth take on a divine nature. In note at the end of *Sawachi de Moby Dick* (2016) (Fig. 2), Gunji says, “A god’s messenger-like frog and sparrow, who play the role of mediator, continually adjust a breaking set of things. While making the top of a plate be a background with the pieced together remaining offerings, each individual’s meal is continually combined and opened up as a site of summoning (Gunji 2017).”

The head of a mackerel that remains on the plate during a party was like a whale raising its head from the surface of the ocean. At this time, for Nakamura, the whale descended to the gap of *sawachi dishes*. However, on the plate was not a great, large Moby Dick, but a life-sized one. This the entanglement of humans (food) and whales reflected by a small yet divine plate.

5 Someone Digging Landscape—Known Againness

In the early afternoon when it’s still a bit chilly, one goes to the ocean shore at low tide. The bubbly sand feels nice and sticky on one’s bare foot. Using the gentle slopes of the rolling beach as a guide, one dips one’s legs in the sand, feeling the cold of the ground and something hard. It is a clam. Using one’s big toe, one carefully gets it out of the sand, and takes into one’s a hand a skyscraper (the pattern on the shellfish). While searching for various “landscapes”—peonies, running crows, snowstorms, piled umbrellas—one looks into the distance and finds the pattern in the shells of clam. Unknown views are more nostalgic than reality.

For Nakamura shellfish gathering itself is synonymous with nostalgic things. Just by hearing the phrase “shellfish gathering,” she experiences a time that is more nostalgic than reality, like gazing out into an unknown distant scene. In other words, shellfish gathering is time. Is not the sense of time also manifested by entanglement? There is a tendency to view time as always being fixed, going in one direction: from the past to the future. However, in reality this is not the case. Gunji proposed an inference system equipped with both

Fig. 3 *Someone digging landscape—Known againness* 2017
Kyoko Nakamura Hanging scroll,
color on silk, 109 × 88.5 cm

Bayesian and inverse Bayesian inference (Gunji et al 2016, 2017), showing the co-existence of “past experience/ ‘I’ of the past” and “present perception/ ‘I’ of the present (Gunji 2018).” Gunji sees this as generalized *déjà vu*. The everyday is filled with *déjà vu*. Time, which clearly extends the closer the memory is to one’s earliest memory from childhood and is supposed to be fixed, is felt to be shorter and shorter as one goes back to the present (Nabokov 2017). Amidst coming and going between Bayesian inference and inverse Bayesian inference, we invite the exterior that is time into the interior. With them co-existing, we are always forming time. Is pure time not entanglement that always descends into the gap from the exterior?

In Japan there is the superstition that mirages arise from the energy released by shellfish. The distant scenery seen by Nakamura while searching for various landscapes was the clam that creates a tower on its body and turns into a landscape. This landscape that is more nostalgic than reality is time itself in which things of different natures things co-exist. Shellfish, which go back and forth between manifest imagination and latent reality, were the ones searching for landscapes (Fig. 3).

6 Conclusion: The Universality of Heterogeneous Things

The entanglement in Nakamura’s artistic production discussed in this paper is very arbitrary. Throwing a platypus and lotus together, seeing a human in a jewel bug, a *sawachi dishes* feast facing Moby Dick, shellfish becoming a landscape—these are all only

meaningful for Nakamura. What is arbitrariness = heterogeneity for an individual only has meaning for that person. In principle, the meaning of arbitrariness hinders external evaluation (Gunji 2018). There is no universal value in arbitrariness, with respect to external measurement. The emotions of enjoying nostalgia and deliciousness are in the first place arbitrary and therefore completely different in nature from each other. One cannot share or exchange the same deliciousness. While different things cannot co-exist, exchange and fused, they can be harmonized because they can confront with each other. Confronting with each other is one of implementations of harmonization with respect to difference.

There is a major difference in “universality” depending on whether one sees homogeneity with invariance or sees heterogeneity with originality (Nakamura 2016). Because these emotions are different—unrelated and purely meaningless from the perspective of the world and only meaningful to this “I”—each person satisfies a universality that they can be confident is happiness. In the first place, was entanglement not the tangling together of pure states? This is the universality of things that are different in nature.

Heterogeneity in artist’s creative acts, is a sensual metaphor. Even Duchamp did not yield a concrete image of artificial coefficient. We here develop concrete image of artificial coefficient, by introducing entanglement compared to the entanglement in quantum mechanics. Speaking in our terminology, entanglement may not be consistent with the entanglement in quantum mechanics, since we focus on macroscopic creative acts. For instance, it is not easy to estimate the virtual dimension in biological time in terms of quantum mechanics. Although our discourse could contain some issues on biological and/or psychological problem, we consider that the essence of entanglement in quantum mechanics is based on the mixture of different pure states or harmonization of different things, which can yield the essential mechanism of creative acts.

In starting from Duchamp’s art coefficient, we propose the connection between entanglement and creativity resulting from the art coefficient. While entanglement in quantum mechanics represents correlated states which can be assumed to be independently separated with each other, we expand the notion of entanglement of which various contexts outside of a particular context can be attracted by the gap between the intention and realization in the particular context. Such an extended entanglement can be found in various fields, not only in cognitive linguistics but in brain science referring to mirror neurons. While we focus on the emergence of a masterpiece of art resulting from entanglement, the origin of sociality and/or language could be explained by the notion of entanglement. Various other notions that are part of the quantum epistemology such as contextuality, superposition, and emergence, might be useful to improve the notion of art coefficient and thus creativity (see also Gabora 2002).

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