“GEMOTION” for Performing Arts

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ABSTRACT
The "Growth Model" research began in 1975. It aims to "bring life" with computers in cyberspace. In this paper, the way of emerging the artistic "Artificial Life" in cyberspace is stated at first. Next, "Artificial Creatures" including "Media Creatures" or "Network Creatures" as self-organized art is mentioned. And then, it leads to the possibility of "Gemotion", which is growing, evolving, and hereditary emotional art.

Keywords: Gemotion, Wearable Performance, Artificial Life, Interactive Art, Growth Model

0. Artificial Creatures

The first problem is how to create the mysterious cyberspace with computers. It also means what is the self-emerging space. In that space, the color is set to metallic silver and filled with smooth, organic and complex stretched objects.

When we create the ecological artificial creatures in cyberspace, it needs the attractive “place” to live with self-increasing. And the place is also self-generating. It is like re-generated neuron network.

The artificial creature is a cluster like cells, and repeats meeting and parting. In cyberspace, self-organization begins from the liquid like life-soup. And it becomes to new creatures. They effect interactively and decide their own future. We just give parameter to them sometimes. The cluster repeats the generation and extinction with its interaction, creates various types of model. If there are a few, they may die because of very simple change. The more various models are created, the easier new can be born.

It means to bring a new life, which may have lived in ancient time or be born in the future. It is difficult to predict. That is the charm of cyberspace.

1. Artificial Creatures and Art

We have researched the way of making computer-generated creatures. It is based on the hypothesis if Intelligent Art is possible. It is to add human-level intelligence to the self-increasing growth model.

As the clue of intelligent Art, the new way of making creatures is considered at first. In this new world, each object generates, grows and evolves freely. These computer-generated intelligent objects are regarded as thinking mechanical lives, if they can communicate human beings. By setting the intelligence, these thinking mechanical lives will make development by themselves. Thus, we consider them as “Artificial Creatures”.

2. Artificial Creatures and Communication

The artificial creatures as new life with new heart can be thought to give a strong impact to the human beings in communication. They may begin self-reproduction and make community of new life in network. Their common language will be produced, begin communication each other. The rule which living creatures have originally, applies to intelligent life world generated by computers. In parallel with cyberspace with computers, modeling research of virtual robotics with networks will develop. Artificial creatures are new objects which can get the sixth sense instead of human beings. These intelligent objects have also the sensor to the stimulant outside, make reaction to it. They need self-reproduction to keep their own lives. It leads to the development of communication way of artificial creatures.

3. Artificial Creatures and Evolution

In intelligent life, the work should be made from its rules. It can be said on modeling, coloring and texturing. It also applies to animating. The evolution of artificial creatures begins from the step, which thinking process is converted to mathematic expression logically.

The evolution needs to produce many computer-generated intelligent creatures at first. At the same time, it is indispensable to consider the number of pieces as the group. The more they are, the richer the world is. And it leads to activate artificial intelligence logically. Second, the probability of mutation is needed for the process of learning and growing of itself. That is because the high-level amplification of intelligence may happen from it. Third, it is to make virtual space model. The problem is how to make the number of pieces increase or decrease in that space with time. Basically, it is better to increase the number for learning and evolving, for the group extinguishes not to keep its life if the number is small. But the extinction is also the characteristics of life.

Last, we have to create many kinds of intelligent

objects with sensor which simulate other living things in nature. Basically, living creature doesn't happen anything in itself. If the objects do action simply with intelligence given by human beings, it is just automatic mechanical robot. So it is better for each part of artificial creatures to do action together in response to the stimulant outside. Each part think by itself, get direction for evolution with repeat of its learning and the group not to get the right direction will extinguish.

The sensor we state here, is the same as the one of human beings. The evolution begins from sea, and leads to the protozoan, the amphibia, the reptiles, and the mammalia. The evolution of the sensor has much relation to it. If we regard the sensor of artificial creatures as sensory machine which responses to the sound, temperature and smell, it is many to learn from it.

4. Self-learning Artificial Creatures

The most remarkable thing for artificial creatures to react and think, is flexible sensor learning. It is necessary to have the cognitive model for stimulant outside, repeat their learning of reaction to it. There is intimate relation between intelligence and learning. The self-learning to develop the communicational function automatically adjusting the surroundings, is much important when we think the growing and evolution of artificial creatures. Self-learning of artificial creatures applies to the repeated learning in human beings. The more repeated we learn, the better we remember.

In point of memory, computers handling artificial creatures are superior to the living things. Computers never forget. In other words, their memory system is simple. For artificial creatures, the simple memory is not attractive. It is necessary to set the rate of memorize and forget to make them like living things. Thus, artificial creatures have their own characteristics.

For artificial creatures to really learn by themselves, the mathematical relation is necessary which connects to the reaction of many objects' groups set up in computer-generated image space. Whenever they do self-learning, intelligent amplification based on mathematical thinking is done by activating logical circuit of sight, hearing, touch, temperature and taste sensors. The artificial creatures as mechanical life based on stimulant of five sense, enrich intelligent life more and more through the super-algorithmic thinking by self-learning.

5. Self-renovating Artificial Creatures

It is not easy to make artificial creatures versatile. They may happen to the accident and lose their part of the body when they move in artificial life space. There is a problem if they do self-renovating at that time. When the modeling of artificial creatures is based on self-increasing algorithm, they may seek for the injured part by themselves and do self-growing on that part. It is possible to do self-renovating.

In the case of simple machine which human beings design, it needs to be repaired when it is broken. On fatal injury, it is impossible to be repaired. The more intimate the whole structure is designed to the part, the more difficult self-renovating is. Especially on the brain part of artificial creatures designed carefully, the loss is bigger. If there is no back up, we have to remake it from the first step. Then, the network around the body of artificial creatures plays an important role to find the injured point. This network can be thought from the partial one to the whole. In the case of the part of the creature is injured, it may recover to the original creature if it can do self-renovating. The end of the network needs sensitive sensor function. By catching the pain or comfort with sense of touch and telling it to the headquarters, it decides the way to deal with after.

But if it recognizes about surroundings wrongly, artificial creatures suffer a loss. When it is hit not to recognize any obstacles, its body suffers a big shock. To avoid such accident, it is necessary to have the ability to predict the danger and escape from there. It has to work the program to avoid the clash.

6. Artificial Creatures Recognizing Themselves

Here is a problem if artificial creatures can recognize themselves. It is doubtful whether it is enough for recognizing themselves to have five sensor like ones of human beings. Even human beings ought not know themselves well if they learn much about their parts of the body.

Artificial creatures can measure their capacity of their all sense precisely. But knowing themselves is different from knowing the capacity of their function. Human beings do not understand their own emotion well. We may have original emotion that others never understand. We can not measure it. It is an interesting point if artificial creatures have things like that of human beings.

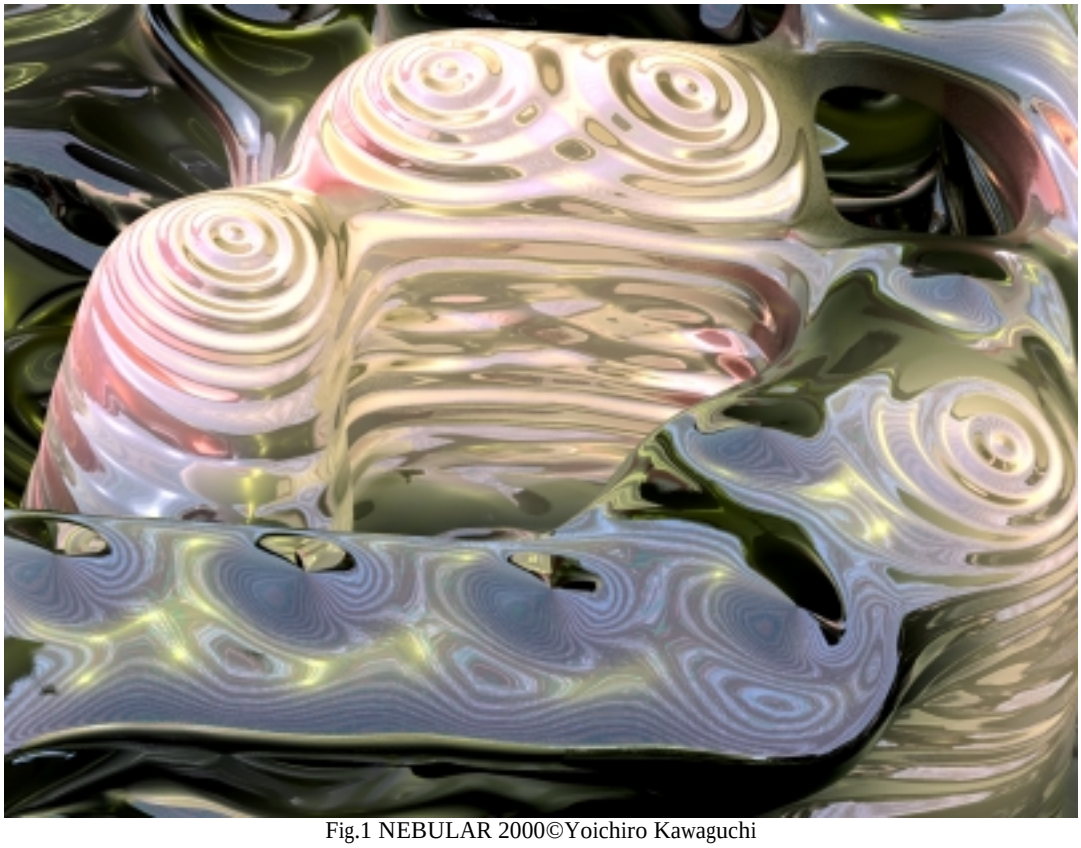

Fig.1 NEBULAR 2000©Yoichiro Kawaguchi

Fig.2 Four-Dimensional Fish 2004©Yoichiro Kawaguchi

Fig.3 Artificial Life Metropolis: CELL 1993©Yoichiro Kawaguchi

7. From another Non-physical Circumstances

The earth moving around the sun has produced many creatures in nature in the process of billions of years. The Mammalia has played an important part on the earth after the dinasaur had extinguished. Especially the most evolved in Mammalia is human beings. They invented various media technologies. Our research theme is to make new intelligent artistic artificial creatures with the most advanced media technology. Media makes it possible to emerge new non-physical circumstances, which rise above the physical one. In this non-physical circumstances, artificial creatures can live. They can produce another self-increasing non-physical circumstances that we have never seen before. They rise above the limit of generating, growing, and aging in the physical world, which include biological physical principles and rules in nature. They are living in non-physical media circumstances. And they are defined as media creatures. The media creatures in cyberspace produce another non-physical circumstances which rise above the human life one.

8. The Life Circumstances of Media Creatures

Media creatures do self-increasing freely in network with energy of the most advanced technologies. They evolve searching for another reality, widening their tentacles and repeating generation change. And they grow with self-organization moving between media.

They sometimes get poison which media gives as energy. And they evolve with mutation reacting their surroundings including biological principles. That means to continue scanning between different media.

Human beings have produced mysterious things with development of media technologies. Though media creatures can be seen as mysterious ones, they are really composed of the most basic biological principles on the idea inside.

Media creatures are another electronic lives living in the network.

9. Art works as Network Creatures

Various concepts of network are introduced to the process of making media creatures as art work. The new works make new logic. To introduce the concepts leads to make rapid progress in my way of art. It also means to unveil my works by mathematical network logic. And my works evolve more and more with network thinking.

Network thinking is not only to send images or sounds. It is also to exchange stimulant value at gene level with network, and change the works fundamentally.

It needs to strengthen this new thinking of art expression with network. It is possible to access from the back of the earth, exchange the genes of the work itself and input new stimulant value of the new idea. After that, it is active on repeating increasing, evolving and mutation by self-growing. It does not limit one person to access. Many people can access to the work. And the work always reborns repeating transfer and transformation.

The work is apart from the controle by one artist, it makes response to each person to access. It is excited to make high-dimensional matrix of each network connected as stimulant value of the work. In invisible numerous access, our interest to changing life generation, evolution and heredity is strengthen. The person to access has his own net-world by accesing with the favorite point of view. The network high-dimensional matrix has a role of image-converted machine in the brain. It is above the specific time axis by one artist. Through the network, we can enter the inside of the world which one artist makes, and share it. The complete refinement with network of creative emotion in time and space leads to the new image creation in our brain, and shows the various way of looking.

The idea of self-increasing of media creatures can be seen as the virtual self-integrated life circuit of transforming work, with energy of network stimulant value. The invisible self-integrated life circuit urges to activate media creatures in the networks, develops the brain thinking of the artist itself and does self-evolving. It promotes to share the individual expression of the artist and the universal mathematical principles. They are the creatures we have never seen in the history of human beings. They are the Network Creatures.

When these creatures really come out, the only thing to do for artists is to make seeds for them. And we should release them in the network.

10. Growing, Evolving, and Hereditary Emotional Art, “Gemotion”

Growth, Gene + Emotion = Gemotion

We state about interactive art. It means that image screen reacts to emotion of the work.

The problem is what meanings does three-dimentional reacting image screen have as new art. It is exciting to adopt our basic action, seeing, touching and reacting into the art. If we

face to the art with body action, gesture or any others, image reaction may enrich the art world.

We consider the example which we can see but can not touch. And it is also exciting that the screen suddenly changing its shape reacting to emotion of the work, for we believe the screen is static. When we touch the work softly, screen is calm. But if we touch it aggressively, screen itself begins to move violently. There is a problem how to express the violent level on the visual.

It is effective to change colors by itself with the basic reaction of living things. It leads to see interactive image reaction if the technology of interactive communication on animation is developed.

The most important thing is to realize the idea to touch the art as the system to see directly. It is not enough to hope to touch the image screen. It is not also enough to imagine the screen is changing like living things. When we succeed in performing it as the art work in practice, the new relationship between art and us begins for the first time. We never experience the art unless we make something in practice that the audience can really experience the reaction of the art work in real time.

The image in our presence really expands and shrinks. It needs the technology of producing such space to touch the self-increasing image. We must enhance the technology to high quality as art. Gemotion begins from confirming the way of generating the space that the work and the people can communicate interactively. It means how to harmonize the idea, technology and expression to react the art work through growing, evolving and heredity of the growth model images. It is necessary to make the interface reaction close to the one of living things as possible.

By changing the common sense of the image art works till now and making images physical ones, the edge between real space and image space is broken. And also by transforming emotion of the art work into the physical, it is possible to create another new world and bring new life. It is the very beginning of Gemotion.

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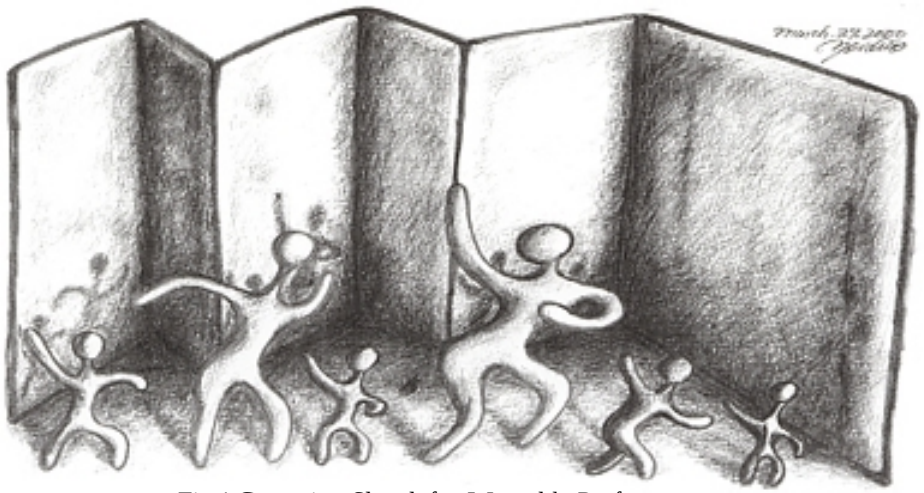

Fig.4 Gemotion Sketch for Wearable Performance

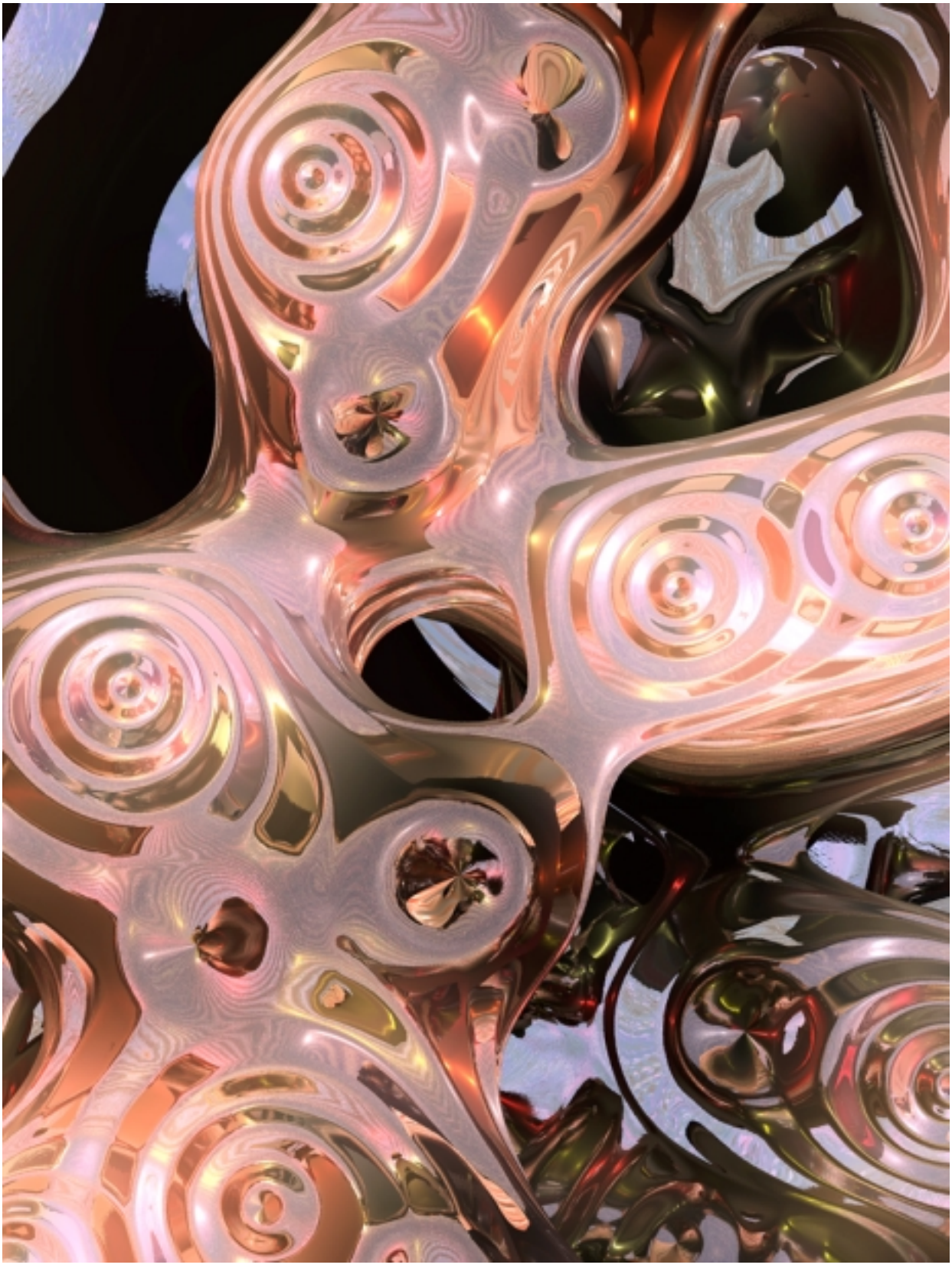

Fig.5 Topolon 2001
Surfaces created dynamically, using positive and negative metaballs.

Fig.6 Gemotion Sketch 2001

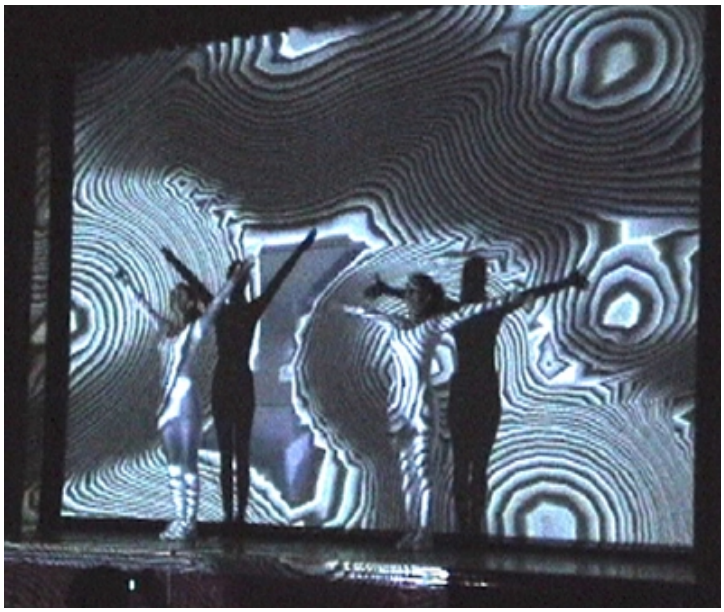

Fig.7 “Gemotion” Wearable Performance
At the SAKE-barrel Opening, SIGGRAPH2001

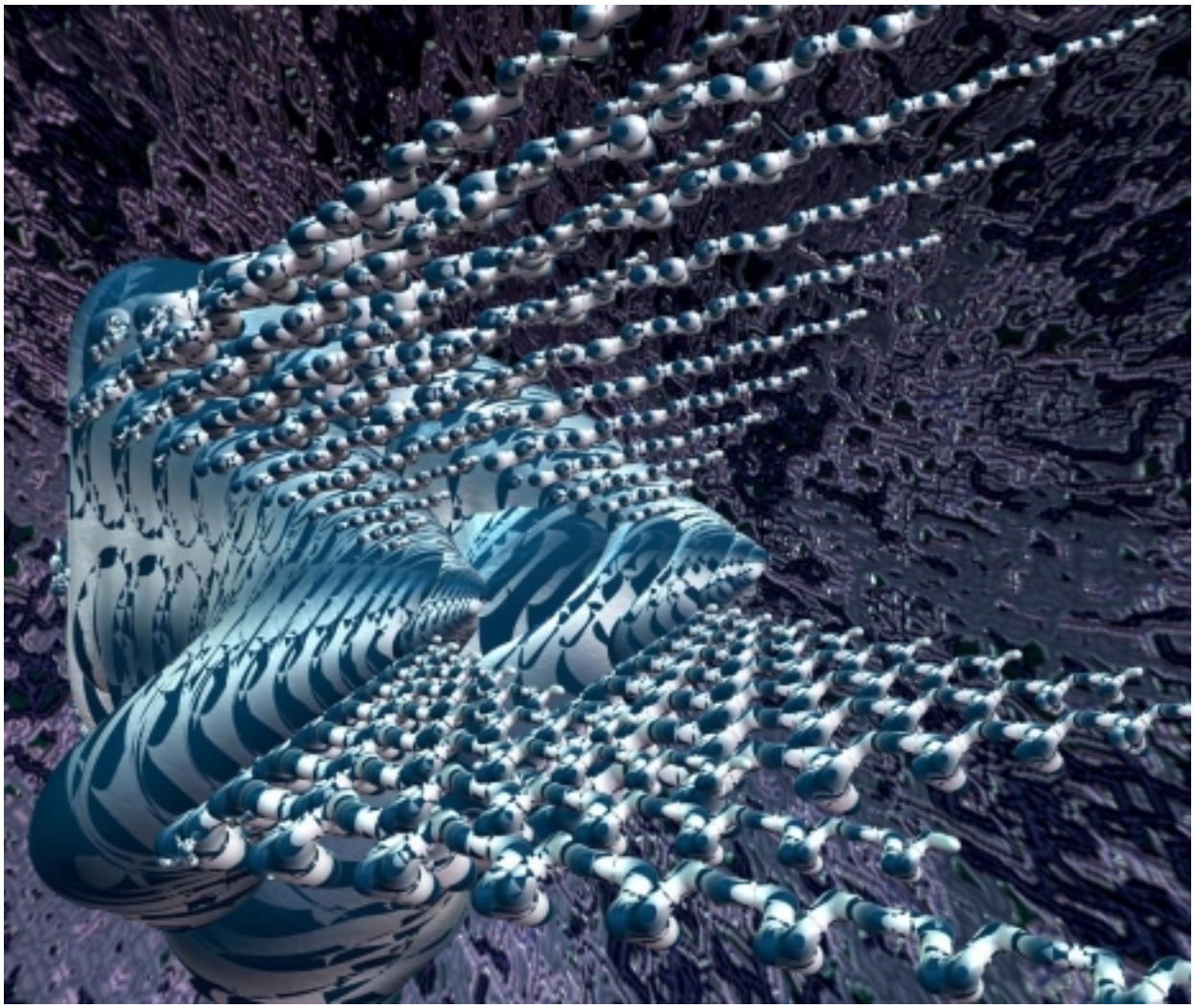

Fig.8 NEURAR 1996©Yoichiro Kawaguchi