Multi Modification Design Model：New Visual Expression by a Computer without CG Technology

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Summary
In this paper, the authors propose a "Multi Modification Design Model", as a new type of visual expression. This visual expression by a computer has been unified as so-called Computer Graphics (CG). Today, in most circumstances, visual expression by a computer indicates CG; its main role is to generate a image on the virtual space of a computer and this is an image that is difficult to be drawn or recreated physically. In recent years, expressive abilities by CG have been enhanced. In other words, complicated images and drawings that require much calculation became possible and easy due to the speeding up of computer processing. However this alone cannot broaden the variety of expressivity of visual expression by a computer we need to extend its ability. Usually the history of visual expression referred to its CG history and there has not been much progress or innovation in terms of creativity since 1980s when the so-called CG was determined. The author describes "Multi Modification Design Model ", as a new visual expression by a computer which is demonstrated through the actual produced work.

Key words:
Media Art, Computer Graphics, Design, Image Scanner, Information Design, Interactive Art

1. Introduction

Computer graphics studies were first carried out by the American navy and the Massachusetts Institute of Technology (MIT) in 1944 during the midst of WW Ⅱ. With a radical empowerment of the computer functions, the visual expressions using computers were investigated. Since the 1980s, digital expression and design by a computer, such as media art and computer art, which are highly entertaining and artistic, have been actively pursued. Today various visual expressions by a computer are utilized in many fields; e.g. Physics Simulation, Medicine, Education, Architecture, Industrials, Natural Phenomena, Life and Wars. They are not just used for computer games and image products.

Most of the visual expressions by a computer are assumed to be the so-called CG and they have a problem of difficulty to generate something that surpasses the idea of so-called CG production. As a result, these production methods and environments are studied or developed only in the framework of so-called CG production. In short, to render modeling generated by a computer program virtually on a display is basically the only way that visual expressions by a computer can be done. It seems that this current situation restricts the ability of a computer's visual expression and restricts its development and diversification. It is certain that various efforts in the framework of so – called CG have made much progress and there are many possibilities in this field. As much as the producers and developers have creativity, the field can generate all sorts of abstract expression and virtual rendering, which cannot be achieved manually. However, from a different point of view, it can be said that the producers' creativity is only executed by a computer's accuracy and reliability.

Today the performance of the computer is much improved and various CG techniques have been developed. The authors expect that so-called CG has approached its limit as a visual expression by a computer. With future improvements to the processing speed and the capacity of a computer in an exponential manner, the more real and organic are the CGs generated. They have more reality than live-action films or pictures. Although the so-called CG improvements in its complexity and reality is in accordance with a computer's performance, it is always only the result of the program that is steadily run by a high-performance computer. In recent years, autonomous rendering by a computer utilizing artificial intelligence has been discussed. However, in most of the cases, it is a programmed output result or a random (disorganized) result, and it is difficult for it to be regarded as offering a new possibility for visual expression by a computer.

Based on this situation, this paper proposes to explain the "Multi Modification Design Model", which is being developed by the authors as a new visual expression by a computer different to the so-called CG.

2. Visual Expression by a Computer

What is unique about a visual expression done by a computer? The answer is, originally only one: i.e.it can create a situation on a computer virtually and this image is difficult to be replicated or realized manually. To reproduce physical things in this way, a computer is the most appropriate tool. However, to achieve these computer

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graphics, huge amounts of calculations are required. Unlike humans, computers can execute processing a large amount of information quickly, which is difficult for humans to do. Since computers do not experience physical fatigue, they theoretically cannot make mistakes as long as they are not broken or a human does not make any operating mistakes.

Of course, computer errors could be caused by the computer's performance degradation or mechanical defects. But when there are no mechanical defects and even when there are, if humans deal with them, a computer itself does not make mistakes. It does not tell a lie, cheat on or deceive humans. Computers never run away in disgust of a heavy workload. Computers can always do a task until the indicated order (program) is finished, even if the order is a wrong order. The exception is when mechanical breakdown or errors occur. Whenever the computers execute wrong processing; it is almost always not because of the computers' mistakes but because of human error.

Uniquely computers do not make mistakes by themselves. Thus their loyalty is attractive. They never cheat on their commanders, humans. This is why computers today are able to process huge amounts of information, which humans cannot deal with. For example, computer graphics and a large-scale simulation: natural phenomena or life phenomena can be replicated by a computer accurately with calculations.

However, the accuracy of computers also has its restrictions. Because of its accuracy it rarely generates an unexpected consequence caused by mistakes or ambiguity, by chance. Unexpected consequence caused by unpredictable chance often leads to some great discoveries or better-than-expected results. This phenomenon is an attractive part of human work, in other words, it is a human possibility. It is no exaggeration to say that human creativity exists in that part which is hardly generated by accurate computer processing. Ambiguity and possibility for a result by chance, which computers cannot achieve is actually a humans' merit. In other words, it means that the computers' biggest flaw is its absence of ambiguity and possibility for a result by chance. As it is known, in the 80's, studies such as Fuzzy Logic that focused on "ambiguity" by a computer was prevalent in the new academic fields: Information Science, Artificial Intelligence, and Knowledge Processing. Also in the 90's, with improvement of computers' performance, in the new interdisciplinary approaches as represented by Complex System: a study to understand a non-linear and complex phenomenon as it is by utilizing computers' power, have been built. Tendency of those studies have been increasingly active with recent popularity of artificial intelligence. However they are only to address to replicate unpredictable situations and phenomena associated with human, society and nature, by using computers' vast amounts of calculations. It is nothing but a simulation of "non-computerlike attributes."

This is also the case in the field of so-called CG. Although it realizes abstract expressions and drawings, which are impossible in physical space, by various techniques and algorithm, it cannot be anything but a simulation of "non-computerlike attributes" in the framework of so-called CG. It does not have ambiguity nor attribute that cause a result by chance. It is rather a simulation of ambiguity or attribute that cause a result by chance.

3. Outline of Multi Modification Design Model

Regarding the visual expression by a computer, the authors have focused on ambiguity and attribute that cause a result from chance, which computers are not capable of. Usually an ambiguous expression or replication by a computer consists of programming it to cause humanlike mistakes: nothing but a simulation technology. Thus a computer is just programmed to make errors on purpose.

Of course, if the program is only to generate errors, the results will be random and useless, which humans will not understand. Therefore, today, a complex program enables the computers to make products or reactions that remains an impression of ambiguity or attribute that cause a result by chance by correcting incomprehensible errors to the extent that humans can perceive and accept them. It could mean that a computer is required to pretend to occur error.

On the other hand, the Multi Modification Design Model that is proposed in this paper does not take on that approach to create a manmade program that enables a computer to generate intentional errors or simulated ambiguity. It is the method to make a computer generate ambiguity, attribute that cause a result by chance or unexpected results by itself: It is not a simulation of "non-computerlike attributes." as a result of an accurate execution of a computer function. Multi Modification Design Model is a visual expression produced by a computer, and it is a great novelty in respect of the fact that it is not in the framework of so-called CG and nor does it use any technology or environment for so-called CG.

The expression method is totally different from the existing simulation or expression method for ambiguity to have a computer pretend to occur errors. It enables mysterious visual expression that cannot be shown by so-called CG by deceiving a computer; accuracy itself causing an erroneous-like output.

4. Mechanism of Multi Modification Design Model

In this chapter, the mechanism of "Multi Modification Design Model" will be described.

The "Multi Modification Design Model" is achieved not by a traditional CG method, which creates a complicated algorithm to get a perplexing drawing, but by a simple method of using an image scanner to scan objects. Also, it does not require particular software and theoretically it is possible to execute under all environments by using a digital camera or an image scanner with a scanning function by CCD or CMOS sensor. Usually an image scanner illuminates the object by one line (one dot), and measures reflected light intensity and color. It reproduces the object as one image by combining acquired data.(Fig.1)

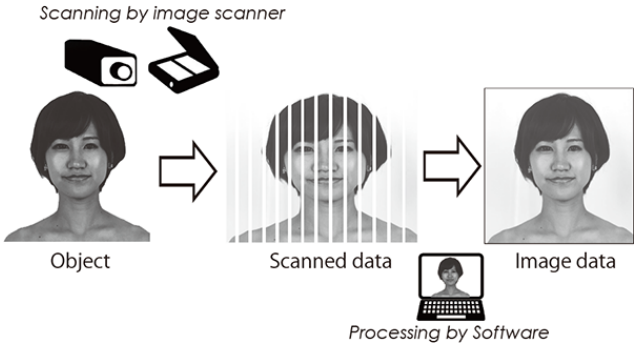

Fig.1 Imaging scan mechanism

This is a very sequential and simple processing method that all computers are capable of, without committing any enormous errors in the scanning steps, as long as there are no mechanical defects or malfunctions in the processing software.

By understanding this procedure of how the scanned image is visualized there is only one case where it could generate an unexpected output. This is when the objects are transferred in accordance with the sensor's transfer rate at the same time when the scanner's image sensor scans the object to convert into data. Normally, if the objects are transferred by the shooting with a digital camera or scanned by an image scanner, the image result is blurred or cut off by halves. However, if transferring is adjusted in accordance with sensor speed or timing, the object generates one organically connected image that has continuity without being blurred or cut off. Also, depending on the timings, the result of the object that is being scanned can be vertically reversed.

For example, if one person is set as the object and you have a successful shot of him or her by a panoramic scanner or digital camera, a big panoptic image by one person, which is organically connected (sometimes causing a reversed result), can be generated. It may look like abstract graphics created by CG technology, but the organic graphics generated by this model is different from so-called CG. Also, it can bring a brand-new sensation to the visual expression, which is difficult to create by existing CG technology. By using this method, special kinds of systems or programs are not utilized. It only utilizes the original function of an image scanner. Visual expression generated by this method is rich in diversity and has a remarkable real-time attribute. Compared to the so-called CG, a programmed technology without any real-time attributes, this method achieves a more life like and unique visual expression, by a computer. Authors have named this method as the "Multi Modification Design Model."

Fig.2 Indicates the example of how one image of the same object was transformed by this method.

The reason why this kind of phenomenon is generated is not well understood by the scanner developers or technicians. In theory, it is said to be an impossible phenomenon. So far this phenomenon has never been focused on or noticed. (Fig.2)

Because the purpose of taking photos or scanning figures and images is to record them accurately, and objects are assumed to be in a static condition. No one imagined a situation in which objects move or are transferred intentionally in accordance with an image sensor's scanning operation.

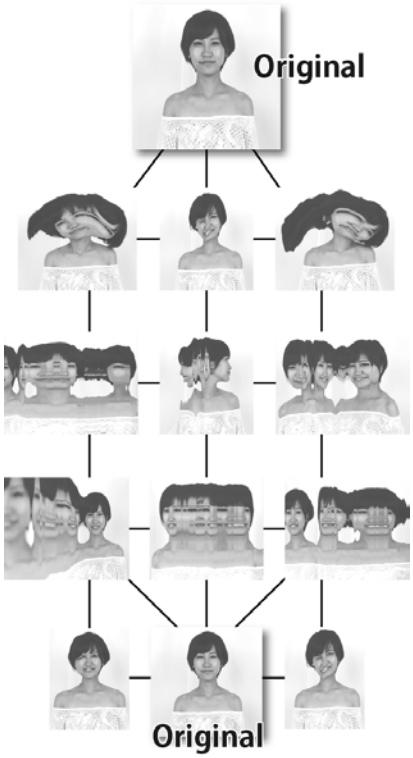

Fig.2 Expression by "Multi Modification Design Model"

5. Output Examples by Multi Modification Design Model

In this chapter, resulting examples by the proposed method, the “Multi Modification Design Model” will be shown.
Recently, large-format image scanners with a wide range of high-resolution are in the market to record and preserve scenery, folding screens, or large-scale art works. In response to 3D printer’s diffusion, 360 degrees scanning and its application are becoming rapidly useful. By using this proposed method, a richer visual expression is achieved by using an image scanner which has the largest format and highest resolution that is possible. This time we used an image scanner with rotating scanning part, “Photomap Scamera” by Newly Corporation.(Fig.3)
This system has a 10000 pixel CCD color line sensor and resolution in horizontal rotation is 10000 pixels in height as the standard. With the use of 50mm lens, H10000 x W85000 pixels. 360 degrees shooting is possible with either pattern.
Examples of the resulting expression are indicated in Fig.4-9.

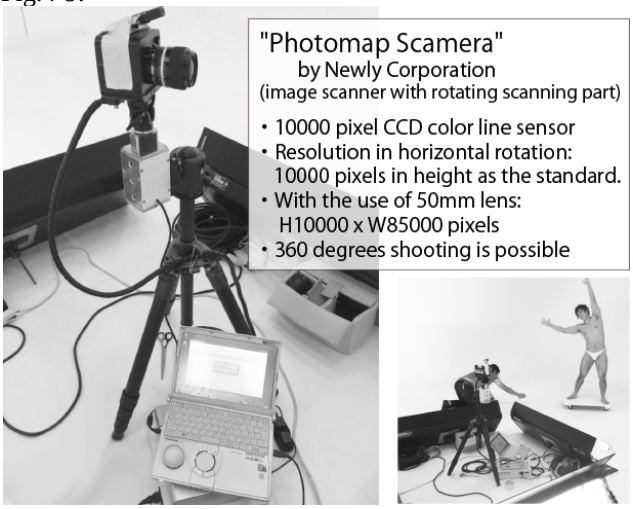

Fig.3 360 degrees scanning system“Photomap ”

Fig.4 Expression example1 (combined)

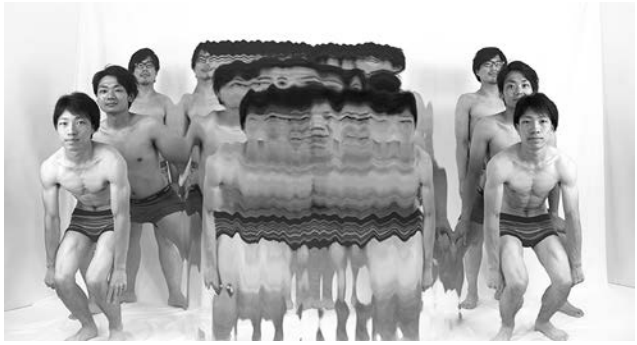

Fig.5 Expression example 2(consecutive)

Fig.6 Expression example3 (reversed)

Fig.7 Expression example4 (duplicated)

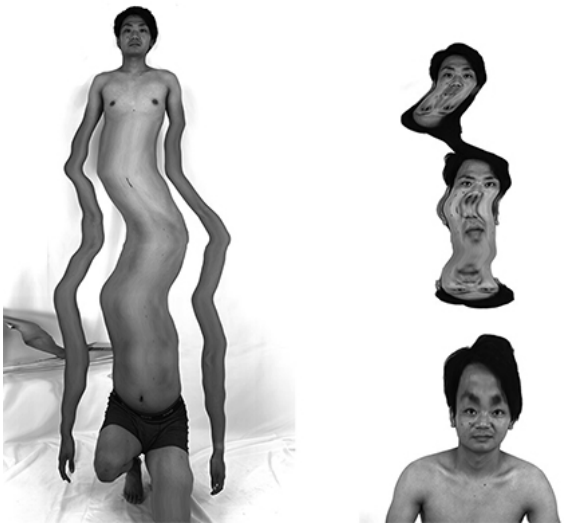

Fig.8 / Fig.9 Expression example 5(extended)

6. Scamorphose: A Work by Multi Modification Mode

We have completed “The Scamorphose : This is NOT CG”, as the first shot of serial works by the “Multi Modification Design Model.”
“Photomap Scamera” was used for this work to scan four men and women transferring to 360 degrees scanning for the production. The actual work is a plastic flag: 300W(9.84’) x 300H(9.84’)(Fig.10).

Fig.10 One piece of work (Actual size 300Wx 300H)

It was a huge work consisting of a set of ten flags connected together; [in total 3000W(98.42’) x 300H(9.84’)](Fig.11).

Fig.11 Panoramic view (Actual size 3000W[98.42’] x 300H[9.84’])

In this work, the objects were four men and women (Japanese malex1, Japanese femalex1, Black malex1 and Caucasian femalex1) and the state of the four people’s bodies compounding like one huge organic matter is expressed. The bodies of the four people are consecutive and connected. (Fig.12)

Fig.12 A part of work1(Organic combination)

Fig13. A part of work2 (Organic reverse)

Sometimes they are reversed (Fig.13). Reproduction by an existing CG technology is difficult. Of course, this kind of expression can be generated by so-called CG. Also similar visual expression can be created by using Photoshop, an Adobe's software. However, the "Multi Modification Design Model" is visual expression by a computer which cannot be acquired by technologies or ideas in the framework of so-called CG in respect of that it is not generated by the creator's programs or algorithms and also it is not a so-called CG drawn by any artist or designer.

Particularly, so-called CG technically cannot create continuing organic compounding and the object abstractions that are generated with the use of a 360 degrees scanner, in real time by a computer with accurate operation. Because using this method, no program for intentional ambiguity is installed to the computer or the system and they do not have any errors.

This work was exhibited for three days from Jan. 29th to Feb. 1st in 2015 at Kawagoe City Art Museum in Saitama prefecture. (Fig.14)

Fig14.The Scamorphose：This is NOT CG Exhibition at the Kawagoe City Art Museum.

7. Relevant Studies

There are not many studies or examples of visual expression by a computer without the use of existing CG technology. Most of them just express organic drawings that have a taste of ambiguity or attribute that cause a result by chance, in the framework of so-called CG.

However, included in the field of so-called CG, various efforts to target new possibilities of visual expressions by a computer have been made since 1980s.

For example, there is the "GROWTH Model" by Yoichiro Kawaguchi, who has created organic CGs on the concept of "artificial life" since 1980s.

Masayuki Akamatsu's "ATOMxGALAXIES", a video installation on the concept of "2.5D" is one of the attempts for a new visual expression by a computer.

"Deep Dream" developed and released, as an image-processing AI algorithm by Google is an exciting new and recent visual expression by a computer. By using an AI program, a computer can produce images autonomously based on the replacement of the studied images.

It capture's your attention with the concept, "What if AI dreams? " Also, the "DCGAN face generator" uses the AI program on the computer to draw an illustration by utilizing "Deep Convolutional Generative Adversarial Networks(DCGAN)" it is a high-quality entertaining system.

8. Further Development and Possibilities

The "Multi Modification Design Model" that is proposed in this paper can theoretically envision work as large as "The Scamorphose：This is NOT CG" due to the use of a digital camera or scanner which can panoramically shoot / scan and it is a versatile expressive technique, suitable for almost all types of tools and environments.

Therefore if someone has a simple digital camera or a smartphone with a panoramic shooting function, it can be easily implemented. These days realistic stereo modeling products and technologies by 360 degrees scanners and 3D printers, have been used in various ways.

Application of this method to the production of new-sensational design work for 3D printer is being considered.

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