Causes and tendencies of distortions in the process of making 3D models from 2D sketches

In the case of Adult's making models from Child's sketches

Naoki TANI*, Toshiaki UCHIYAMA**

* Graduate School of Comprehensive Human Sciences, University of Tsukuba, tani@kansei.tsukuba.ac.jp
** Faculty of Art and Design, University of Tsukuba, uchi@kansei.tsukuba.ac.jp

Abstract: The purpose of this research is to identify cause and tendency of distortions in the process of making model from an original sketch. This study especially covers 3D models made by adults from children's sketches. In the experiment, each participant made a model based on sketches drawn by children. The models and the sketches were showed to other people and they described freely the difference between the sketch and the model and the data of their descriptions were applied to text mining analysis. Next, the participants making the models were interviewed about what was the key point of their models. The results of these experiments show: distortions have been centered on heads of characters, people tended to focus on proportions and balance of the model. Then there were two types of subjects making models. There are three tendencies of the distortions: (1) changing its size, (2) given symmetric property and (3) fixing up deformation of sketch's outline.

Key words: Sketch, Model making, Workshop, Child, Kansei Design

1. Introduction

In designing, distortions often take place between sketches and models. Especially, in the case that a person who draws a sketch and a modeler are different persons, it is difficult to avoid distortions between an original sketch and a made-up model. This research identifies cause and tendency of distortions in the process of making a model from the original sketch. Additionally, this study especially covers 3D models made by adults from children's sketches. Spreading the education of designing today, there are various services and workshops participated by parents and children, focusing on children’s sketches. For example, there are the service to make a soft toy based on children’s original sketch submitted and the workshop to create toy robots from children’s sketches. Then distortions are often found between the sketches and the models and they should be conspicuous instances distortions arising in design process. The purpose of this research is to identify causes and tendencies of distortions and to demonstrate what attitudes by modelers bring on these causes and tendencies. This research contributes to making valuable model and suggests a process of model making.

2. Experiment

2.1 Experiment (1)

This experiment was held in order to analyze what is the distortion people cognize between sketches and models and where distortion gets centered on. First, 30 participants (about 20-year-old male/female) compared 15
photos showing a set of an original sketch and a soft toy based on the sketch. Next, participants described and wrote about what was different between the sketches and the soft toys. These photos were from “Child's Own Studio” which provides customers handmade soft toys. Customers submit their children’s sketches and the Studio creates soft toys based on the sketches. Then participants were required to describe what was different between the sketches and the toys in order to analyze what is the distortion people cognize.

929 sentences were gotten in their free descriptions and frequently appearing words were counted. As a result, it is found that participants tended to focus on the parts in the head compared with other body parts. On the other hand, they commented on size. “Big/small” and “long/short” are also found many times.

Focusing on these words, participants described “eyes” and “mouth” most. In size “big/small” is most commented.

In addition, all words were applied to text mining analysis to research the association between these words. In this analysis, “symmetric property” and “proportion” have a relation each other and these two words got a lot of number of counts, thus people tend to lay weight on a proportion of model.

![Figure 1](image1.jpg)

Figure 1 An example of response sheet

![Figure 2](image2.jpg)

Figure 2 The relation of the common answers
2.2 Experiment (2)

To dig out what intentions the modelers have, model making and interviews for modelers were conducted. In this experiment, six modelers were assigned to three sketches and made models based on them. The modelers make models using flour clay, polystyrene foam and wires as a wicking in 3 hours. Therefore 18 models were obtained in total.

![Figure.3 The original sketches and the models](image)

Next, 18 models were evaluated by 30 participants. As the result of this evaluation, people tend to describe the distortion on the head, which is the same as the result of Experiment (1).

Then from the free description of evaluations, the modelers were interviewed about the models they made and asked what they thought in the process of modeling in details. From these interviews, the modelers can be divided into two categories on the basis of their approach of modeling: one is the modeler who makes models following the original sketches, another is the modeler who arranges the model in their own interpretation in the modeling. The former group often commented, “I respected the design of the original sketches”, “I endeavored to keep characteristics of the sketches”. In the latter group, modelers often commented “Shapes in the sketches were distorted, so I improved them in the modeling”, “Children can not draw a clear line, so I made the models with intentions to build a right shape that children might want to draw.” From these modeler’s comments, the models were divided into the “faithful” model and the “arranged” model. According to the modelers’ comments, each model can be divided into either group, and in this case, the number of the “arranged” models is larger than the “faithful” models:
The “faithful” group: A-1b, A-1m, A-1p, B-3e, B-3f, B-3t
The “arranged” group: A-2b, A-2m, A-2p, A-3b, A-3m, A-3p, B-1f, B-2e, B-2f, B-2e

2.3 Experiment (3)

This experiment was held to find which group was highly acclaimed, the “Faithful” model group or the “arranged” model group. Three modelers were assigned to the same sketch. Then six sketches were prepared so that 18 models divided into six groups were made. Then, 25 participants compared each model and ranked three models in each six group according to their preference. Each model group from the same sketch has both the “faithful” models and “arranged” models. Thus this comparing clarified which models were evaluated. These hierarchical rankings were applied to pairwise comparison method and example result is below figure (4).

As a consequence, the “faithful” models mostly got the first place. In figure (4), the model B-3f was most acclaimed in B-F group and it was the “faithful” model. This tendency was also shown in other groups, the “faithful” model got the first place in 4 groups out of 6 groups. Thus, it is demonstrated that the models made faithfully receive higher evaluations than the models arranged.

![Figure 4](image4.png)

**Figure 4** A result of pair comparison about the models of B-f group

![Figure 5](image5.png)

**Figure 5** A result of pair comparison about each model group (the “faithful” models are marked in yellow)
4. Discussions

From these experiments, why adult modelers arrange to modify distortions was discussed, and there are two reasons for that.

First is a bias to children’s sketches. For instance, in Experiment (2), one of the modelers said, “though children’s lines are strained, they actually wanted to draw a clear line.” Thus, adults often arrange the design of models with the bias that children have a low technique drawing and poor expression ability. As a result of that, the size of head was changed, a symmetric appearance was produced and contours of the models were refined. Therefore the “faithful” model keeps details of the original sketch, on another front, the “arranged” model also have the same characteristics of original sketch, but its details are disappeared.

Second is the cause that adults interpret a motif of the sketches arbitrarily. Judging from their own knowledge and experience, adults regard the sketch something they knew. Therefore, adults often make models closer not to the sketches but the motif in their mind. For example, in the case of the sketch that looks like mammoth, there is significant difference between the “faithful” model and the “arranged” model. The former has three legs because the mammoth-like animal in the original sketch has three legs. It seems strange but the modeler wanted to be faith to the original. On the other hand, the latter have four legs because the modeler thought the child intended to draw a mammoth, so the modeler made the model like an ordinary four-footed animal. As a result, acclaimed models are the “faithful” models.

The difference between a “faithful” modeler and an “arranged” modeler is whether thinking about people drawing the original sketches or not. The “faithful” modeler less interprets the sketches than the “arranged” modeler. They just do transfer, and their focus is making a model look similar to the sketch as much as possible. On the other hand, the “arranged” modelers always think about drawers who drew the sketches. They concern about motifs of sketches and meanings of lines, and then they arranged models by their interpreting. Through the sketches, they infer what the drawers wanted to explain.

In fact, the “faithful” modelers lay weight the sketches, on another front, the “arranged” modeler focus on not the sketches but the drawers. The sketches drawn by children were used in this research, so it is assumed that the “faithful” model retaining childish design and shapes was acclaimed. However, it is possible that the “arranged” model become highly regarded if it is not children’s sketches.

5. Conclusions

From the experiments and the discussions, the causes and tendencies of distortion are respectively revealed.
The tendencies of distortion are three things: Changing the size, producing a symmetric appearance and refining contours.

The causes of distortion are two. One is creating models with a bias that children have low technique drawing. Two is fitting models into something that the modeler knew.

For these reasons distortions come up and lead to ruin witching and beauty of children’s sketch. Thanks to being revealed these causes and tendencies, more smooth and better modeling can be expected when adults and children work together.

5. Acknowledgements

I would like to express my gratitude to Prof. Yamanaka who gave me a lot of comments and suggestions. His careful reading and giving useful recommendation made an enormous contribution to my work. I have greatly benefited from Wendy Tsao of Child’s own Studio, inspiring this research and proving their works to be of great value for my experiments. I would also like to express my gratitude to my family for their moral support and warm encouragement.

5. References and Citations


