THE DEVELOPMENT OF A TACTILE MODELING INTERFACE

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1. Introduction

Recently, more and more researchers dedicated in the development of human computer interaction for CAD systems, such as gestural input of three dimensional coordinates (Lee, Hu, and Selker, 2005), flexible manipulation of NURBS objects (Cohen, Markosian, Zeleznik, Hughes, and Barzel, 1999; Emmerik, 1990), and the creation of force feedback (Wu, 2003). These research results indicated that the more intuitive control the device can provide in modeling process, the more creative solutions can be generated (Lee, Hu, and Selker, 2005; Schweikardt and Gross, 2000; Wu, 2003).

2. Problem and Objective

Based on what mention above, the problems of this research are that what kind of interactions with computer is necessary for designer while modeling? How to develop an intuitive modeling interface that fulfills the criteria generated by previous question?

The objective of this research is to develop a tactile modeling interface by which designer could create three dimensional models as freely as playing with clay. In order to achieve this goal, there are four main questions to be discussed:

1. What are the behaviors in the process of making physical models?
2. How to extract key behaviors that could be further implemented?
3. What kind of technology could be used to implement?
4. How to evaluate the usability of the interface and to ascertain the validity of this research?

3. Methodology and Steps

In order to discover answers for the questions mention above, there are four main steps in this research:

1. Recording the modeling behaviors through empirical experiments.
2. Analyzing the recorded behaviors through coding schemes
3. Implementing the analyzed results through electronic technology
4. Evaluating the implemented interface through interview

4. Results

First, after analyzing the data generated by the empirical experiment, we find out that the actions of "squeeze", "push" and "pare" are the most frequent actions when modelling. Second, the combinations of sensors and micro-pump balloon not only provide modeller a feel but also generate a shape as the same as the clay. Third, the virtual objects which are connected to the digital signals generated by sensors give the modeller real time feedbacks which are very crucial in the "seeing-moving-seeing" design process.

5. Future Study

In this paper, we find out some basic phenomena that can be used as base for developing the tactile modelling interface. However, because we have only a few subjects with background of sculpture design in the empirical experiment, the results of the experiment might not represent all the typical actions of modellers. Future more, we only pick three actions as our target to implement in the device so that this device might not fulfill all required actions when using hand to modelling. Third, in the Virtool application, we only use surface as our type of virtual clay, but there are many other types of clay such as cube, sphere and cylinder which might have better performance than the surface. These three obstacles will be the future study in our development of second version.

References

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