

Design Method of Digital Fabricated Pen and Evaluation of the Writability

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Writing is an essential part of our daily lives. There is various writing instrument on the market because of Taste in the writability varies from person to person, for instance, Ink mechanism, line weight, material. We use it depending on purposes and our mood. So, we focused on a method to change the writability. In conventional research, various methods for changing the writability have been proposed as follows. For example, control by using electronic vibrations and control by frictional electrification, control of visual information by digital depiction. In this paper, we propose a flexible pen design method by devising the pen structure with digital fabrication technology.

In order to realize the mechanism of elasticity, we assembled a spring structure to the handle of a pen. Moreover, it controls user feedback of elasticity influence of the overall height of the spring, the number of turns, the size of the cross-section. Also, in order to realize writing with only 3D printing, we imitate glass dip pen using a capillary action. It also realized to control the ink flow rate by computationally designing the groove shape of the pen tip.

In this paper, we evaluated the difference in the writability for the proposed method. First of all, we carried out the following two pilot studies. First, we surveyed an existence of the difference in the writability when it changes the spring parameter. As a result of verification with nine different pens, the pens that each participant felt comfortable writing were different. In the other pilot study, We surveyed an existence of the difference four types of pens different pen tip in the writability. As a result, the user was able to recognize the difference in the writability over half of all combinations.

There are many factors in the writability, for example, pressure, writing speed, etc. depending on the position of the hand of the pen and the angle of the pen. In this paper, we focused on elastic feedback and flow rate. However, in order to evaluate the whole writability, we need to increase the number of experiment participants, strictly equalize the conditions among participants, and evaluate it.

(Advisor: Yoichi Ochiai)