USABILITY EVALUATION OF COGNITION ON COMMAND ICON OF INTERNET EXPLORER WITH GESTURE INPUT

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Abstract: This research evaluates the usability of browsing the internet through semiology and cognition. It divides the internet browsing behavior into verb and function to design the gesture inputs. It is designed using the four characteristics of the sign language (shape of the hand, direction of the hand, motion of the hand and location of the hand relative to the body.) to find the connection between sign language and the characteristics of hand action. Evaluation of confusion is further used to evaluate the recognition rate of using gesture inputs for internet browsing.

Keywords: gesture input, semiology, behavior of internet, evaluation of confusion, confusion matrix

1. Introduction

In the field of input devices, except the traditional mouse and keyboards, there are other devices such as the tablet, and voice cognition input, gesture inputs that has not matured in terms of its technology. Kemp (2001) used video cameras to capture the movement of a hand to complete the input of commands used to build 3D-models. Regenbrecht (2000) used the aid of VR to use the action of hands as direct commands in a design environment. This research uses semiology (Horton, 1994) and recognition (Hoffman, 1996) on sign languages that is limited on internet browsing behavior. It is focused on commands that is used most frequently and escapes from the singular use of our senses, which is the sense of sight. This research focuses on the semiology of the internet command icons combined with sign language, so that the hand actions are based on semiology. There are four basic components to make up a gesture: (1) handshape (2) orientation (3)motion of hand (4) direction of your hand .(Stokoe, 1991). I try to formulate a reference rule that can be used when designing gesture inputs used on browsing the internet. This is done for the gesture input technology that has not ripened yet.

2. Method

2.1 Formulation of the gesture inputs

STEP1 – Listing the verbs used while browsing the internet and combining similar verbs. Lastly, opposite verbs are categorized and 14 verbs are obtained, such as figure 1. Listing the function used most while browsing the internet and 10 functions are obtained, such as figure 2.

STEP2 – Listing the numbers and operation symbols used while browsing the internet. There are two types of numeral key pad(horizontal and vertical), such as figure 3.

STEP3 – Divide the 14 verbs and 10 functions according to the four characteristics of the hand, namely: shape, direction, motion and location to find each verb and gesture input's potential. Questionnaires are then used and based on the points given to find the verb and function most suited for the gesture inputs.

Figure 1 Gesture inputs of the verbs
Figure 2 Gesture inputs of the functions
Figure 3 Gesture inputs of numeral key pad
**STEP 4** – By brainstorming, each gesture classified four characteristics (shape, direction, motion and location). And each type of a gesture will follow 3 rules: (1) handedness, most people’s active hand is right hand. (2) least effort. (3) combination. Finally, a gesture had four different ways to show the same verbs (function). Then score each type of a gesture by 20 questionnaires. Choose the highest score type of a gesture and it means the type suit the gesture most. ( good to memorize or learning ).

2.2 Gesture inputs and evaluation of confusion

**STEP 5** - Using an evaluation of confusion on the 14 verbs with the highest points. The recognition rate and hand actions are then evaluated through the principal component analysis (PCA) to find their connectivity.

**STEP 6** - Using an evaluation of confusion on the 10 functions with the highest points. The recognition rate and hand actions are then evaluated through the principal component analysis (PCA) to find their connectivity.

3. Results

From the questionnaire, the ratio of the gesture inputs from the 14 verbs and 10 functions can be formulated in table 1.

<table>
<thead>
<tr>
<th></th>
<th>shape</th>
<th>direction</th>
<th>motion</th>
<th>location</th>
</tr>
</thead>
<tbody>
<tr>
<td>verb</td>
<td>35.70%</td>
<td>28.60%</td>
<td>35.70%</td>
<td>0%</td>
</tr>
<tr>
<td>function</td>
<td>40%</td>
<td>0%</td>
<td>10%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 1 ratio of the gesture inputs from the 14 verbs and 10 functions

The 14 gesture inputs of the verbs and the 10 gesture inputs of the functions are tested through 10 participant under the evaluation of confusion. The recognition rate of all the gesture inputs are as follows in table 2 and table 3.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>90%</td>
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</tbody>
</table>

Table 2 confusion matrix-verb

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>80%</td>
<td>50%</td>
<td>40%</td>
<td>70%</td>
<td>100%</td>
<td>50%</td>
<td>60%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 3 confusion matrix-function

4. Discussion

From Tab.1, one can see that the participant thinks that shape and motion is best suited as the verb of gesture inputs, followed by direction. In terms of the function gesture inputs, location scored the most points, followed by shape. The user uses the location of the hand relative to the body to learn the gesture inputs, this is an important reference. The shape of the hand forms a big ratio in both the verb and function categories, so it can be concluded that shape is an important reference for people when learning or memorizing gesture input. And most people choose the horizontal type of numeral key pad for gesture input, because the horizontal type’s layout is just like cell phone and remote controller. This notifies the designer that it’s not only important to consider semiology when designing verb and function gestures, but also to consider the hand actions characters into the design.

5. Reference