Target Reverse Crossing – A Selection Method on Camera-based Mouse-replacement System

Wenxin Feng, Ming Chen, Margrit Betke

Abstract

We propose a new selection method – target reverse crossing – for use with camera-based mouse-replacement systems, an assistive system for people with motion impairments. We assessed the method by comparing it to the dwell-time clicking, which is widely used by this kind of systems. Our results show that reverse crossing is more efficient than dwell-time clicking, while the one-time success accuracy is lower. Target directions have effects on the accuracy of reverse crossing. In addition, we show that increasing the target size significantly improves the performance of reverse crossing, which provides future interface design implications for this selection method.

Reverse Crossing / Dwell-time

<table>
<thead>
<tr>
<th>Name</th>
<th>Selection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse crossing</td>
<td></td>
<td>When the cursor cross the edge of the blue target, a red arc will appear to indicate the valid reverse crossing area. If the cursor moved out of the target through the red arc, a selection was made.</td>
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<tr>
<td>Dwell-time</td>
<td></td>
<td>If the cursor stayed on the blue target for more than a certain dwell-time, a selection was made.</td>
</tr>
</tbody>
</table>

Experiment

Subjects
- 4 females and 6 males with average age of 25
- Some with previous experience using the Camera Mouse

Procedure
- Two sections: 5 reverse crossing blocks and 5 dwell-time blocks
- Start from the red button to the blue target that randomly arrange in 3 Sizes × 8 Directions

Results 1

- We found significant difference of CMT and therefore TMT
- The difference of BMT is not significant
- Reverse crossing could save about 0.6s in corrective phase.

Results 2

- Different target sizes significantly affected both accuracy and movement time in reverse crossing
- The effects of size on accuracy is likely reduced when the target radius is sufficiently large for reverse crossing
- Target size also affect the accuracy of dwell-time selection significantly

Results 3

- Target direction likely affect the accuracy of reverse crossing
- Straight up, down, right and left directions had lower accuracy

Conclusions

- Both statistical analysis and subjective feedbacks showed that reverse crossing was more efficient than regular dwell-time clicking
- The one-time success accuracy of reverse crossing is lower than dwell-time selection
- Target reverse crossing had satisfactory performance when used with camera-based mouse-replacement system
- Dwell-time is a natural and commonly used selection method. However, some subjects felt that maintaining the cursor in the target region caused fatigue in long-term use
- Target size and target direction should be taken into consideration for graphic interface design

Acknowledgments

We would like to thank all experiment participants and NSF HCC Grant IIS-0910908.