iClick: The Development of a Vision-Based Virtual Mouse

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The optical mouse has replaced the mechanical mouse as the major pointing device for desktop and laptop computers due to its ability to work on a wider variety of surfaces. Although vision-based mice that can work on any surface were proposed twenty years ago, a complete implementation is still not available. In this study, a practical virtual mouse named iClick was developed. iClick uses a web camera facing down on the keyboard, and tracks the movement of multiple fingers of the user who can make gestures for many actions such as cursor moving, clicking, dragging, scrolling, etc. The tracking resolution is ~0.4mm with a latency of ~33ms. The clutching problem (concerning when the finger movement should be interpreted as cursor moving event) was solved by using the relative positioning of the pointer finger to the middle finger. Simple and efficient finger tracking strategies and algorithms were developed for optimal performance. Tests on different computers (desktop, laptop) with different brand cameras and under different lighting situations such as offices, strong light on the left or right of the keyboard, etc. showed that the robustness of iClick is satisfying for everyday use. iClick combines the advantages of the optical mouse, which does not require the user to hold his/her hand in the air, and those of the newly developed pointing devices such as touchscreens and Leap Motion, which eliminate the extra space needed for a physical mouse.

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