

Concept of haptic device for user interface navigation and guidance (Extended Abstract)

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Since its introduction in Xerox Alto [Cooper, 2007], the desktop metaphor, has not changed significantly, still using mainly visual feedback to deliver information. Nevertheless, utilization of only one channel (out of 5 possible for humans) poses restrictions, augmenting the feedback with one or more channels should thus be a straightforward solution. But since mapping of auditory, olfactory and vestibular channels brings various difficulties, haptics seems to be ideal for enriching the visual feedback.

Analogy between two dimensional visual feedback and two dimensional haptic feedback is unambiguous and if the 2D haptic feedback is coupled with 2D input device, it should lead to an improvement in user's performance. Similar approach was described in [Choi and Kim, 2009] where a customized trackball was augmented with 2D haptic feedback with tactile cues used for directional navigation. In our approach, on the other hand, we use computer mouse augmented with 2D haptic feedback providing users with kinesthetic cues used for directional navigation in an environment of desktop application. According to [Holbert and Huber, 2008], we have decided to use the mouse instead of the trackball because the hand position on the mouse allows to use the mouse's work surface to steady movements.

Our first prototype was created from an ordinary computer mouse adapted with two motors. We control the motors with a Phidgets Advanced Servo Controller in order to deliver passive kinesthetic cues to the user. The passive kinesthetics is perceived by receptors in muscles, determining the direction of movement and the position of user's hand [Bowman et al., 2004].

We experiment with the combination of visual and haptic feedback in a sandbox application created in JAVA using NASA World Wind and Phidgets SDKs. We believe that there are two fundamentally different ways of navigating users in graphical user interfaces:

- driving user's hand to the target by applying

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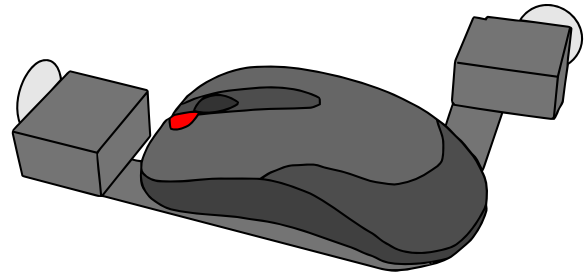


Figure 1: First prototype of haptic mouse

pushing force with the motors

- constraining user's movement in wrong direction by applying resistance

in order for the user to create more accurate mental model of the interface.

We plan a second prototype, adding two more motors in order to achieve precise movements and user test it with proper use cases and target users, and finally measuring the performance using Fitt's law.

References

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