Accelerating object-command transitions with pie menus, J. Cance, M. Collomb and M. Hascoët, proceeding of 3rd international conference on Enactive Interfaces, Enactive'06, p109-110.

Accelerating object-command transitions with pie menus

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In most direct manipulation human computer interfaces, users spend a lot of time in transitions. Transitions are of various kinds. Moving the pointer from one window application to the taskbar or to another window application can be considered as a transition. Because of the very nature of many GUI components (such as toolbars, pull-down menus or else) many of such transitions cannot be avoided without reconsidering the interaction styles.

In the work reported in this paper we are interested with very generic transitions that we call object-command transition. A object-command transition happens when a user first selects an object then applies a command on the object then returns to the object to resume the ongoing task. Concrete examples of such transitions are numerous. For example, such transitions occur when a user selects a piece of text in a text editor then change the font by acting on an icon in a toolbar and further returns to the piece of text to resume editing.

Our purpose in this work is to provide ways of accelerating such transitions.

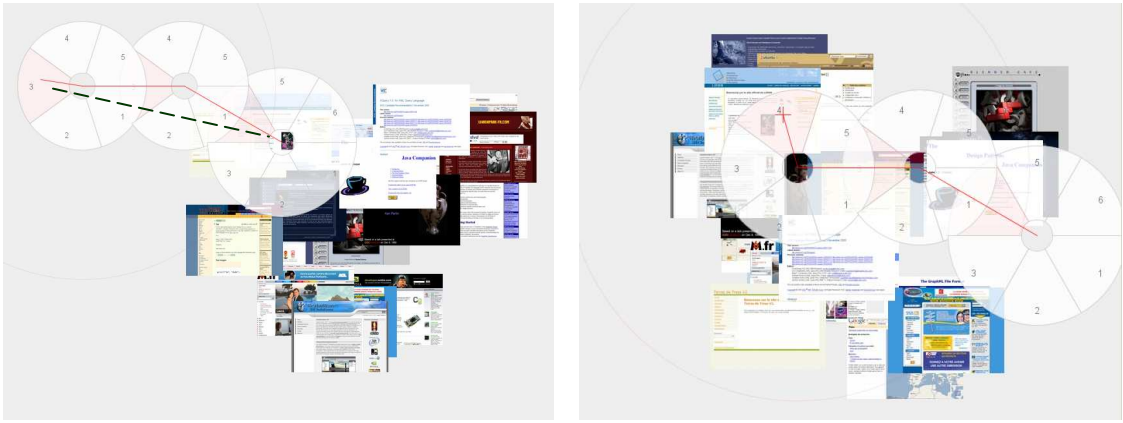

Figure 1: Pie menus: regular interaction style (left) , reversed style (right). The red line is the way from the activation of the menu towards the command. The dotted line identifies the distance to go through to get back to the original item. In the case of reversed style, this distance is 0.

Context: visualisation application and pie menus

The visualisation application we are using for the study is an application that displays a large amount of visual items representing various types of information on a wide surface. Users can perform actions on the items displayed either directly (by dragging the items around for example) or indirectly by using pie menus.

Pie menus [2][3] have long been considered as a very good alternative to regular pull down menus. A pie menu is a circular popup menu. Commands are displayed on circles and submenus can be added as depicted in Figure 1. Command selection depends on direction. So that experienced user can make quick gesture to get very rapidly to commands. However, when it comes to the object-command transition, they still have limitations, especially when they contain submenus (like in Figure 1). Indeed, when a user invokes the menu and has to browse through the submenus, he can be relatively far from his original location when he reaches the command and the transition back can be relatively costly.

Enhanced pie-menus

In order to reduce the time spent in object-command transitions with pie-menu, we came up with two new interaction styles for pie menus. In both cases, mouse moves and

pointer moves become unrelated when the pie menu is invoked. Indeed, as soon as pie menu is active, mouse moves result in pie menu moves while the pointer remains fixed. The impression for the user is that the pie menu slips under the mouse pointer when he moves the mouse. Consequently, in both styles, when the user reaches the desired command in the pie menu, the pointer is still at the location where it was when he invoked the pie menu. Both interaction styles present the advantage of reducing object-command transitions to the minimum: i.e. the traversal of the pie menu to the command.

The two interaction styles differ in the way the pie menu slips under the pointer. In the first interaction style, called fixed style, the menu is controlled by the mouse in the same way as a toolglass [1] would be. In other words, if the mouse goes right, the pie menu moves right, etc. In the second interaction style, called reversed style, the mouse moves and pie menu moves are reversed. Consequently, when the user moves to his left, the pie menu moves right. The motivation for this design is that user moves are oriented toward the command to reach.

Experiment

We conducted an experiment with 12 subjects, 9 males and 3 females. 8 subject aged between 20 and 30, 2 between 30 and 40 and 2 between 40 and 50. All had good practice of computer environments but none of pie menus. The task studied consisted in a right click on a specific item displayed on the surface to popup the pie menu then a traversal through the pie menu to select a given command and finally a return to the original item.In order to limit the noise coming from different command labels, all command labels where numbers.

The experiment design is a within subject design. Each subject performed one block of 10 trials repeating the task for each modality of the main independant variable (regular style - fixed style - reversed style). A different command was given for each trial and the target item was also moved at each trial to avoid learning effects. The order in which modalities were treated was controlled by a Latin square pattern. After the experiment, each user was asked few questions about his preferences and impressions. The experiment is available as a Java application and can be downloaded on the web [4] .

Results and discussion

The 6 first trials of each block were considered as the training trials and the 4 last of each block were considered as the trained trials. Results suggest that for the training trials users perform the fastest with the normal interaction style, then comes the reversed and finally the fixed (average times to complete the task are respectively 306ms, 372 ms and 459 ms)

On the contrary, for the trained trials, users performs the fastest with reversed style. Regular comes after followed by fixed (averages respectively 271 ms, 280 ms and 339 ms).

User preferences indicated that 10 out of 12 preferred the regular style, 1 the fixed and 1 the reversed. However, five of them declared they might prefer the reversed if they had been a little trained.

Conclusion

This preliminary study aimed at providing cues. It suggests that with very little experience users might perform better on the reversed pie menu than with normal ones. This would indicate that our interaction style for pie menu can indeed reduce the time spent in transitions. A more complete study with more experimented users will be conducted to further determine whether this tendency is confirmed.

[1] Bier, E. A. & Stone,M. C. & Pier, K & Fishkin, K. & Baudel, T. & Conway, M. & Buxton, W & DeRose,T, (1994) *Toolglass and magic lenses: the see-through interface*, Conference companion on Human factors in computing systems, p.445-446, April 24-28, Boston, Massachusetts, United States

[2] Callahan J.& Hopkins, D.& Weiser M. & Shneiderman, B. An empirical comparison of pie vs. linear menus. In *Proceedings of the SIGCHI conference on Human factors in computing systems* , 1988, pp. 95-100.

[3] http://www.piemenus.com/

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[4] http://www.lirmm.fr/Edel/