1 Introduction

Navigation of the view space is an essential task during visual exploration of graphs. A fairly standard approach not only in graph visualization is to let users grab a view and drag it as necessary. Though being a very natural and intuitive interaction, it implies higher physical costs in terms of mouse mileage [Harrower and Benjamin 2005]. To alleviate these costs, we propose two alternative navigation methods: pan-wheel navigation with radar view for the view space and edge-based travelling as a dedicated data space navigation method.

2 Pan-Wheel Navigation with Radar View

In contrast to common pan or scroll operations, for which users know the specific position to where they want to go, the pan-wheel interaction allows users to travel the view space freely when no particular graph region needs to be reached. This opens up the possibility of spotting “interesting” areas for further inspection via zooming into more specific regions. Pan-wheel navigation is activated by simply clicking and holding the left mouse button on the pan-wheel and dragging the mouse to specify direction and speed of the navigation.

A weak spot of this approach is that users are unaware of what they might discover during the course of the navigation. To address this concern, pan-wheel navigation is augmented by a novel look ahead guide of what is coming next in the current travel direction. Look ahead guidance has recently been suggested for mobile devices [Gustafson et al. 2008], but has not yet been proposed for graph visualization.

3 Edge-Based Traveling

Data space navigation is required to explore different data subsets. Most systems map the task of data space navigation to one of view space navigation. But graphs offer a well-defined structure that should be utilized for data space navigation. We propose a navigation method for node-link-representations called edge-based travelling. It allows users to explore a graph’s structure by performing a series of simple mouse clicks. To activate edge-based travelling, the user has to lock on a node. After that it is possible to click any edge adjacent to the node. From then on there are two options to follow: travel or preview. The user can left click an edge (u, v) to travel to the node v. This causes the view to be centered on v, and the selected navigation direction of the pan-wheel is aligned with the selected navigation direction of the pan-wheel.

Figure 1 illustrates pan-wheel interaction with and without the radar view.

Figure 1: Pan-wheel navigation – (a) without radar view and (b) with radar view.

What we call the radar view shows a semi-transparent circular sector that emanates from the center of the view to infinity and that is aligned with the selected navigation direction of the pan-wheel. The sector’s central angle can be parameterized by users or can be dynamically changed depending on traveling speed. During pan-wheel navigation, all the nodes that fall into the circular sector are currently not visible in the current navigation direction. The different sizes and colors of the projected nodes provide a look ahead mechanism of what will be found in the current navigation direction. Users can use this as a guide to adjust their travel direction with the pan-wheel. The radar view then adjusts itself accordingly. Figure 1 illustrates pan-wheel interaction with and without the radar view.

References


