Fisheye Lenses for Location Bookmarking

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Abstract

Navigating and interacting with very large or dense data sets is a challenge for users. Fine scale operations often require a user to have a detailed view of the data, whereas large scale navigation tasks and general awareness can benefit from the user having a contextual view of the data. Detail-in-context fisheye lens views have been proposed as a means of facilitating navigation of, and interaction with, large or dense data sets. We introduce an interaction technique that employs fisheye lenses for the purpose of bookmarking regions of interest in a data set. This bookmarking technique makes it possible for users to maintain an awareness of regions of interest, even when those regions are off-screen. The technique also addresses the problem of what to do with fisheye lenses during panning operations.

Key words: fisheye lens, detail in context, interaction techniques.

1 Introduction

When interacting with large and dense data sets, such as maps, CAD drawings and photographs, it is often necessary for users to view the data in detail, as well as see a general overview. The detailed view allows users to perform precise manipulation tasks, while the overview allows users to keep their bearings, and maintain awareness of the global state. Traditionally, users have achieved understanding of data at multiple detail levels by performing sequential zoom+pan operations. While effective, these operations have as a downside the requirement of significant time consuming user input in order to navigate. Without the aid of other visualizations, it is also impossible for zoom+pan operations to allow a user to view data at multiple scales simultaneously.

An alternative to traditional zoom+pan navigation is the interactive detail-in-context fisheye lens (see Figure 1). Fisheye lens presentations show data at multiple scales, with detail shown in context of the surroundings. A user is able to position and reconfigure one or multiple lenses in real-time, providing a focus on regions or objects of interest in the scene.

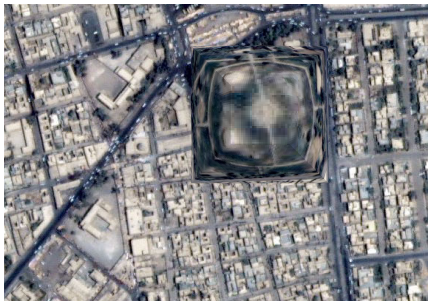


Figure 1: A fisheye lens applied to a satellite photograph.

Fisheye lenses are indeed an alternative to other data interaction and navigation techniques, but it is important to realize that there are many variables in exactly how fisheye lenses are used. At its core, a fisheye lens is simply a method of displaying data. Any number of possible interactions can be wrapped around the lens presentation.

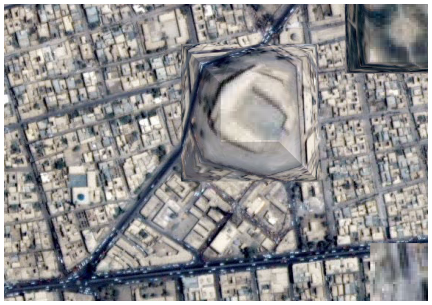
One way in which fisheyes can be leveraged is in the use of multiple fisheyes for bookmarking multiple regions of interest in applications that also contain panning functionality. When bookmarked regions move off-screen due to panning operations, lens folding [2] can be employed in such a way that the lens focal region always stays visible to the user. In this way, the region of interest slides along the edge of the visible window, always remaining visible to the user.

2 Related Work

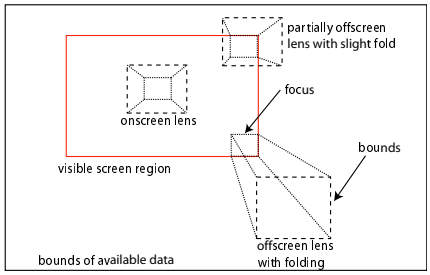
A survey of early fisheye research is provided by Leung and Apperley [5] . Development of Elastic Presentation Space (EPS), a constrained fisheye presentation technique based on 3D perspective geometry was performed by Carpendale et al [3]. More recent work looking at the potential benefits of fisheye lenses was done by Gutwin and Skopik [4].

3 Fisheye Lens Bookmarks

Most research dealing with fisheye lenses has considered them in isolation from other interaction techniques. For



(a) The three lenses as seen by the user.



(b) A diagram showing global lens positions and folding.

Figure 2: Three bookmark lenses. One each: contained within the view space, partially contained, and outside the view space.

example, it has not been considered how fisheyes would function if integrated into an application also containing zoom+pan functionality. When integrated into such an application, new challenges become apparent, and new interactions are possible.

In an application with both pan and fisheye lens functionality, it is necessary to define the behaviour of a placed lens when the user performs a pan operation. Two techniques for dealing with this situation are easily evident: either keep the lens stationary with respect to the data, or stationary with respect to the screen. In the first case, the lens contents will remain constant, however, the lens can be panned off the screen until it is no longer visible. In the second case, the lens will always remain on the screen, but the lens contents will change. Both solutions are problematic.

A third technique is what we call the fisheye lens location bookmark technique. This technique, similar to a bookmark in a web browser or an old-fashioned book, allows a user to maintain a direct link to content that would not otherwise be immediately available or visible. Visually, a fisheye bookmark is a lens which stays stationary with respect to the data, but has its focal region folded so that it is always contained within the visible region (see Figure 2). As the lens moves off the screen during a pan operation, it transitions from being a detail-in-context visualization, to being an off-screen awareness widget.

This technique bears some similarity to the Baudisch Halo visualization [1]. Like Halo, it provides awareness of regions not on the screen. Additionally, however, it provides the user with a direct visual reference to the data. This is especially useful if the data is dynamic. In addition to promoting awareness, the fisheye bookmarks can allow the user to interact with the data within the lens focal region.

4 Conclusions and Future Work

Fisheye lens presentations can be used in many different ways in order to provide the user with novel interaction possibilities. A new interaction technique is fisheye lens location bookmarks. With this technique, regions of interest specified by the user are magnified, and their presence on the screen is preserved regardless of panning operations. This allows users to monitor these regions, and can provide a simple means of navigating between them.

We plan on extending this work to look at a variety of fisheye lens based interaction techniques. We are also actively collaborating with other researchers, investigating potential performance benefits of fisheye lenses.

References

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