Integrated Image Zoom and Montage

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1 Introduction

Standard features of medical image viewers often include zoom & pan, image montage, and blended overlays. Zooming and panning are typically implemented with a convenient real-time mouse interface. For example, dragging while pressing the left mouse button pans, and dragging while pressing the right mouse button zooms. A montage refers to constructing a tiling, or 2-D array of images, from a set of images acquired at various slice locations or time-points. An overlay refers to blending one image with another as a form of image fusion. A parameter, alpha, specifies the opacity of a foreground image that is overlaid on a background image.

A method is proposed that combines the three features of zoom/pan, montage, and overlay with an interactive interface.

2 Method

In existing implementations of zoom/pan, when a user zooms out (expands the field of view), the image appears to shrink away into a blank surrounding. In contrast, the proposed method surrounds the shrunken image with a montage of neighboring slices, where *neighboring* can refer to images at nearby slice locations in a 3-D volume, or stack of slices. Alternatively, *neighboring* could be defined to refer to nearby time-points in a dynamic image acquisition, or to slices near the same location but from different imaging protocols or modalities, or to images from different patients but related according to some metric such as correlation.

Once an image has been zoomed out as a montage, panning the montage can result in moving a different image tile to the center of the montage. The center tile is indicated by a graphical border. Subsequent zooming enlarges the tiles around this new center tile. Zooming in to the extent that the center tile fills the field of view (the montage vanishes) allows the user to examine a different image tile than the one being viewed prior to zooming out.

Furthermore, not just one data set, or set of slices, can be visualized in this way, but two or more data sets can be fused using a blended overlay.

A user's workflow proceeds as follows:

1. The user can zoom and pan, but when the user zooms out far, a montage becomes visible.

2. The user pans so that a different tile is positioned in the center of the montage.

3. The user zooms in to examine the new tile up close.

3 Results

Results are presented in Figures 1-3. The foreground image is a

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segmentation (tan skin, white brain, blue ventricles, and green tumor) overlaid with an opacity of 0.3 on the grayscale MRI scan.
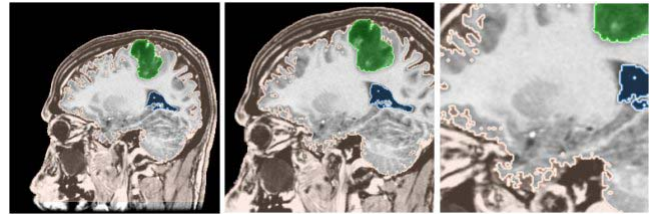

Figure 1: With the original image on the left, this figure shows the effect of zooming in (magnifying), which is the same for both the existing and proposed methods.
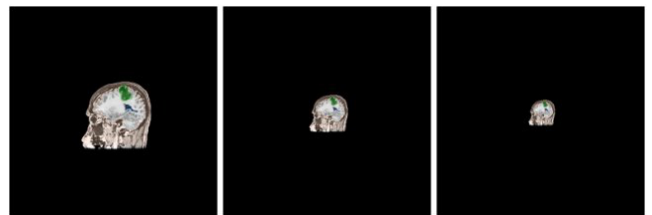

Figure 2: The effect of zooming out from the original slice shown in Figure 1, using existing methods with blank surroundings.
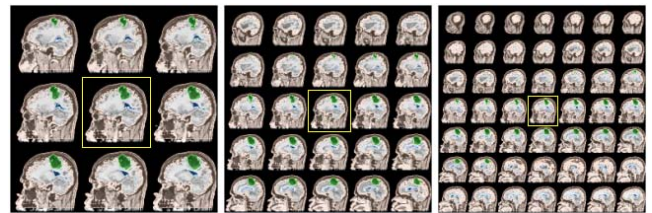

Figure 3: The effect of zooming out from the original slice shown in Figure 1, using the proposed method such that a montage becomes visible while zooming out. The center tile is indicated with a yellow border.

The shrunken images (during zoom-out) are reformatted from a scale-space version of the image rather than the original. Scale space is computed through a process of pyramiding that consists of smoothing the image with a Gaussian kernel followed by downsampling, in order to avoid spurious artifacts [Witken 1983].

4 Conclusion

A method was presented that allows the user to rapidly transition between "bird's eye" views and "close-up" views, which could aid the user's understanding of the dataset. The user zooms out into a montage of proximal slices instead of a blank surrounding. From here, the user may pan in order to zoom in on a new slice.

References

WITKIN, A. P. 1983. Scale-Space Filtering. In *Proc. International Joint Conference on Artificial Intelligence*, Karlsruhe, Germany, 1019-1023.