

# Interactive Poster: Variable Density Scroll Areas for Rapid Image Retrieval

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## 1. Abstract

This poster describes an interaction technique called *variable density scroll area* (VDSA) to assist in the browsing of large datasets. This technique actively supports the user in the task of browsing by allowing the user to scroll through a dataset with the ability to change the resolution of the scrolling action. It employs two major principles. First, we provide a two-dimensional scroll area in which scrolling occurs. The complete dataset is represented as a column displayed on the left edge of this area. By providing this context, the user is always able to determine the location of the current results within the entire dataset. The remainder of the scrolling area is used to refine the resolution of the scrolling action. The second principle involves the use of *rapid serial visual presentation* (RSVP) for displaying the chosen data in a fixed location. In the interface, the user can focus on this fixed location to see the data rapidly presented as they scroll through the large set of possibilities.

## 2. Introduction

In many applications, datasets grow to be very large and difficult to access using the standard interface elements, such as a scroll bar. Searching provides one way to restrict the size of a dataset, but is only applicable when the user has some notion of what they are looking for and the data has been properly meta-tagged. QBIC, Query-By-Image-Content, is another technique to restrict the size of a visual dataset by constructing visual queries into the image data itself. But this technique is not suitable for all applications. New techniques are needed to enable users to browse large collections of information. While interacting with these large datasets, users can easily lose the context of the source of the information. They “get lost” in the data. Especially when the data is visual, one would like the ability to “scroll” through that data, and quickly view the elements. Current techniques are not well suited for large datasets. The new technique described here addresses this problem, allowing the user to browse over a large set of information while maintaining the user’s context within the collection.

There are a number of interaction techniques that helped to motivate the design of this prototype. These techniques include: 1) presenting all the data, all the time, 2) animating between states to maintain context and ease the transitions, and 3) displaying sequential data using rapid serial visual presentation (RSVP).

Presenting all of the data, all of the time, is easy if the dataset is small. Once the dataset grows in size, issues of layout become critical. Additional visual techniques such as modification of size, transparency, or representation need to be used to ensure legibility. In combination with user interaction, the data that is of interest can then be revealed.

Animation is a way to allow users to maintain focus while experiencing state changes within the interface. It has been used effectively in many applications and has even made its way into today’s operating systems. These techniques were successfully demonstrated in two applications, *Elastic Catalog* and *ActiveNews*. RSVP has been shown to be an effective technique to rapidly view data in a serial fashion. RSVP was successfully demonstrated in *Temporal Typography* to present information and tell stories on interactive displays.

## 3. Variable Density Scroll Area

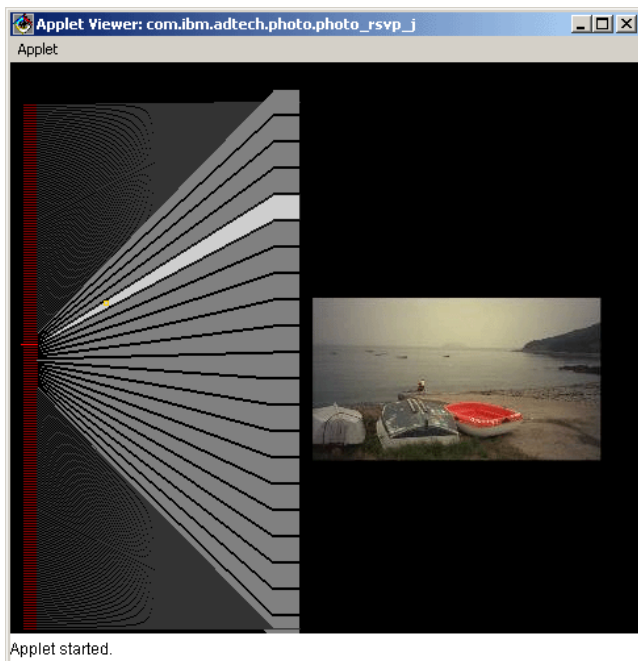
Variable density scrolling uses the three techniques described above to allow users to quickly browse through large collections of visual data. It displays a representation of the complete set of data as a graduated column on the left edge of the scrolling area. The middle area is used to refine the scrolling action and the resulting data from the scrolling action is presented on the right side in a fixed location.

As the user moves up and down the left column, the corresponding image is displayed to the right utilizing the RSVP technique. This approach raises a problem when the density of the data exceeds the resolution of the display. If the size of the dataset is more than the resolution of the left column, the column can not provide access to the whole collection. Variable density scrolling uses the real estate between the left column and the displayed data to further refine the user’s selection. There are two variations of this technique, a continuous and a discrete method, each which use the additional scrolling area differently.

## Continuous Variable Density Scrolling

In the first technique, the scroll area is a continuous area. It shows how the user can change the scroll resolution on a continuous scale. In this example, Figure 1, the graduated column on the left represents the complete dataset. The user can move through this representation of the data but may miss data if the density of the data exceeds that of the display. As the mouse moves to the right, the user fine-tunes the scrolling action. Moving left scrolls at a lower resolution (moving through more of the data) while moving right scrolls at a higher resolution (moving through less data). In addition, the amount of data that scrolls is proportional to its vertical movement. On the right edge of this scroll area, a discrete subset of possibilities is displayed. The item selected is highlighted and displayed to the right of the scroll area. The user can quickly jump to different areas of the data (on the left edge) and focus in on the images by moving to the right to better refine the scrolling increment.

The algorithm for determining scroll area behavior may vary but here is a simple example. When the cursor is dragged within the light gray highlighted cone area, no scrolling occurs allowing the user to select one of the items presented in the cone. When the cursor is dragged in the dark gray area, outside the cone, the focus on the left edge moves towards the cursor at a speed proportional to the Y distance away from the current focus (farther away the faster the movement).



**Figure 1.** Continuous variable density scroll area. The graduated column on the left represents the complete dataset. The chosen image is displayed on the right in a fixed location.

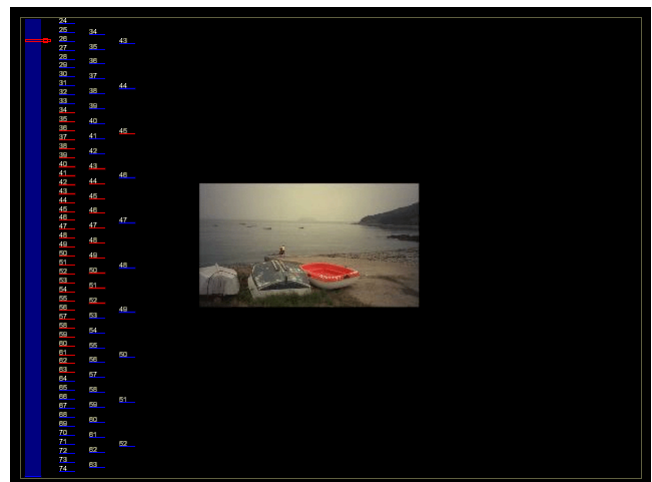
In addition, the movement is inversely proportional to the x distance from the left edge (faster to the left and slower to the right). These two dimensions allow fine tuning of the scrolling rate based on the density of the information. A click in the dark gray area animates the focus on the left edge to that absolute position vertically.

## Discrete Variable Density Scrolling

The second technique uses a discrete set of vertical scrolling columns. These scrolling columns work in concert to fine-tune the access to the data through interaction. A discrete variable density scroll area is similar to the continuous implementation but breaks up the scroll area into a discrete set of scroll columns. The data can be separated into any number of discrete scroll columns. The example illustrated in Figure 2 uses a set of four vertical scroll columns to provide access to the data. Similar to the continuous implementation, the left scroll column represents the complete set of data, thus, providing a fixed context for the complete dataset. The scroll columns to the right provide finer grain of resolution as the user moves from left to right. The red highlighted elements in any scrolling column show the portion of the data that is represented in the column to its immediate right. As before, the image is displayed to the right of the variable density scroll area in a fixed location.

## 4. Acknowledgments

We would like to thank Phillip Tiongson who helped in the design and implementation of this interaction technique and for the Internet Technology Group that has fostered an environment in which to explore new ideas.



**Figure 2.** Discrete variable density scroll area. Multiple columns provide finer grain of scrolling control.