MoneyTree: Ambient Information Visualization Of Financial Data

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Abstract

Ambient information visualization is a display of information outside the focus of attention of the viewer. Ambient displays normally do not reside on the screen of a desktop computer, but exist in the general environment, in the periphery of the user's attention. The aim is not only to provide useful information, but also to blend in with the surroundings and to be appealing to the eye.

In this paper we use ambient visualization to represent financial data.

Financial visualization is the practice of making large financial datasets into images. In comparison to the bland financial data, the visualization is easier for people to understand, especially as the image changes.

In this paper we describe a research project that uses different images of trees to represent the real-time changes in stock prices and volume.

Keywords: Ambient information visualization, financial data, tree

1 Introduction

With continual development in display technologies, scientists, artists, and graphic designers have begun to break free from the limitation of traditional desktop computer screens. When walls and tables become screens [Li et al. 2000], methods for presenting suitable information on such surfaces raise new problems. Human focus of visual attention is quite narrow in comparison to current large screens, and it is clear that some of the large screen space must be in the periphery of the user's attention. *Ambient* displays, as "decoration of the architectural space" rather than the central focus of a user's attention, have been investigated as background media [Wisneski et al. 1998].

In our project, we use different tree images to represent dynamic stock price and volume data, and allow people to get price change information visually. Our aim is twofold:

- Provide a pleasant visual decoration which shows stock price and volume data.
- Inform the user of changes in this data.

1.1 Ambient Information Visualization

Information visualization is commonly defined as "the use of computer-supported, interactive, visual representations of abstract data to amplify cognition" [Card et al. 1997]. *Ambient information visualization* is "the use of aesthetically pleasing displays of information which sit on the periphery of a user's attention" [Jennifer et al. 2003]. This can not be achieved by using a traditional computer desktop display.

These days, ambient visualization involves real-time, real-world information from distributed sensor networks (sensors, RIFID readers, cameras, automation controllers, etc) to deliver better quality information about assets, inventory, location, status and other critical data. On the other side, people need better ways to interpret and understand this ever-increasing amount data. This information can be delivered to people when and where they can benefit from it, using new kinds of display devices.

A variety of ambient information displays have recently been investigated. A common approach seems to take traditional wall-hung art to inform the design and use of these displays. *Digital family portraits* use a picture frame to put the updated information about the health of an elderly family member in the border of the photo [Mynatt et al. 2001]. *InfoCanvas* consists of specialized computer displays that provide awareness of some source of information using images, creating a form of "virtual paintings" [Miller and Stasko 2002] (see figure 1). *BusTraffic*, inspired by Mondrian, creates an informative art installation to represent the real-time local bus traffic conditions [Tobias et al. 2003] (see figure 2).

Figure 1. InfoCanvas as a painting hung on the wall

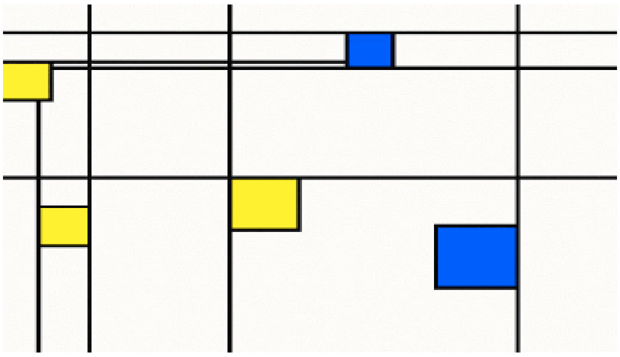

Figure 2. Ambient visualization in *BusTraffic*

1.2 Financial Data Visualization

The purpose of visualization is to transform data into information that forms a critical component within the decision-making process.

There are some important terms in stock trading such as "*bid price*", "*ask price*" and "*volume*". "*Bid price*" is the price that somebody will pay for a stock at a given moment, while "*ask price*" is the price at which someone is willing to sell a stock. Bid/ask prices are always posted together with the number of shares offered, often called "*volume*". Normally, people will use 2D charts to see the trend and make a decision (see figure 3).

In this paper, we use 3D tree image to represent the real-time stock information.

Figure 3. 2D chart

2 MoneyTree

In this section, we describe the *MoneyTree* system, which uses tree images to represent real-time stock data information.

The trunk of the tree represents trade volume and tree leaves represent the trade price. In Figure 4, the trees from left to right represent trades for AMP, NCPDP, and VCR at 10:50 on August 28, 2003. AMP has a larger tree than NCPDP; this means that it so far on August 28, AMP has traded more volume than NCPDP. Further, the AMP tree has more leaves (it looks healthier); this means that its price has been firmer so far on August 28.

The state of these three stocks at 11:50 and 12:20 on the same day is represented in Figures 5 and 6.

We assume that the price change rate is within negative 10% to positive 10%. If the stock price change rate is outside this range, we will regard it as 10%.

The trees change just once every minute. Because the stock price normally does not change much in one minute, a finer granularity is not needed.

Although the stock data is from a real-time feed, there is a one or two minutes delay before changes appear in the trees. This is to allow for some computation.

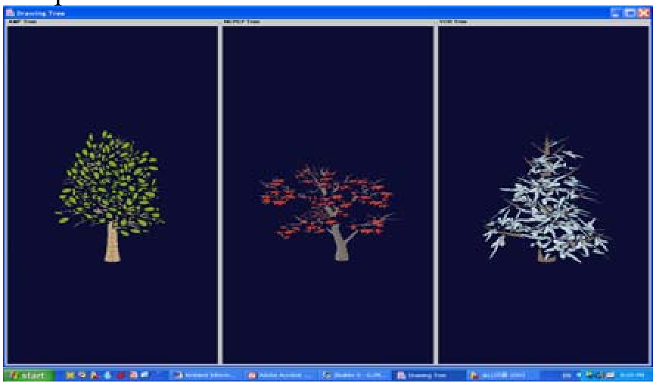

Figure 4.10:50 on 28/8/2003 the state of stock price

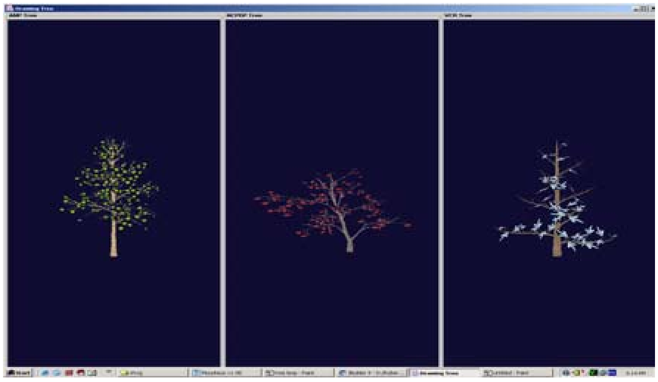

Figure 5.11:50 on 28/8/2003 the state of stock price

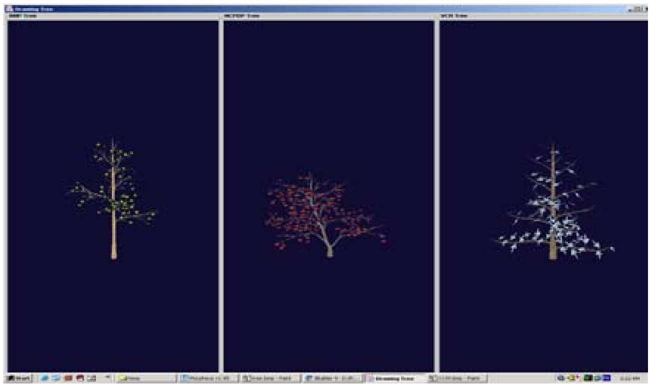

Figure 6.12:20 on 28/8/2003 the state of stock price

2.1 The data

Figure 7 shows some sample source data. The first step is to extract necessary data from the source, including date, time, stock name, stock volume, and stock price.

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TRADE: 10:43:40 28/08/2003 b0: AMP x254 at $6.23;    [Bid:12345] [Ask:9876]  id=0815  Si
TRADE: 10:43:40 28/08/2003 b0: AMQHA x850 at $89.80;    [Bid:12345] [Ask:9876]  id=0815  Bi
TRADE: 10:43:40 28/08/2003 b0: AMP x1249 at $6.23;    [Bid:12345] [Ask:9876]  id=0815  Si
TRADE: 10:43:40 28/08/2003 b0: AMP x1751 at $6.23;    [Bid:12345] [Ask:9876]  id=0815  Si
TRADE: 10:43:40 28/08/2003 b0: AMP x1000 at $6.23;    [Bid:12345] [Ask:9876]  id=0815  Si
TRADE: 10:43:41 28/08/2003 b0: VCR x900 at $2.96;    [Bid:12345] [Ask:9876]  id=0815  Bi
TRADE: 10:43:41 28/08/2003 b0: CBA x8859 at $28.40;    [Bid:12345] [Ask:9876]  id=0815  Bi
TRADE: 10:43:41 28/08/2003 b0: MUL x185736 at $0.08;    [Bid:12345] [Ask:9876]  id=0815  Bi Xi
TRADE: 10:43:41 28/08/2003 b0: MRL x1737 at $1.80;    [Bid:12345] [Ask:9876]  id=0815  Bi
TRADE: 10:43:41 28/08/2003 b0: MRL x763 at $1.80;    [Bid:12345] [Ask:9876]  id=0815  Bi
TRADE: 10:43:42 28/08/2003 b0: NABHA x190 at $98.90;    [Bid:12345] [Ask:9876]  id=0815  Bi TK
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Figure 7. ASX stock data information

The second step is to calculate the average stock price and compare with the beginning stock price to calculate this price change rate. Further, we must sum the stock volume within one minute and add to the total stock volume for the day.

The final step is to map this data into a tree model.

2.2 The tree models

To create models of trees with a variety of size and leaf characteristics we use *XFrog*, a rule based tree model generation system with techniques such as free form deformation and global and local constraints.

A database of tree models was created with *XFrog*, and *Java3D* is then used to load trees with appropriate parameters each minute.

A smooth graphical transition from one tree to the next is achieved by image morphing, illustrated in figure 8. The transition takes 1 second. During this time, the old image fades out and the new one fades in.

3 Conclusion and Future Work

This work is still in progress. In particular, an evaluation in a stock market workplace is planned.

In ambient information visualization, aesthetics is considered a primary property, both in the design and during use [Tobias, et al. 2003]. For instance, our project is not entirely consistent in its coding, since trees have many different style and different shape but in our project it is only 3 types. The most important thing for our model is that it should fit the art requirement and local environment.

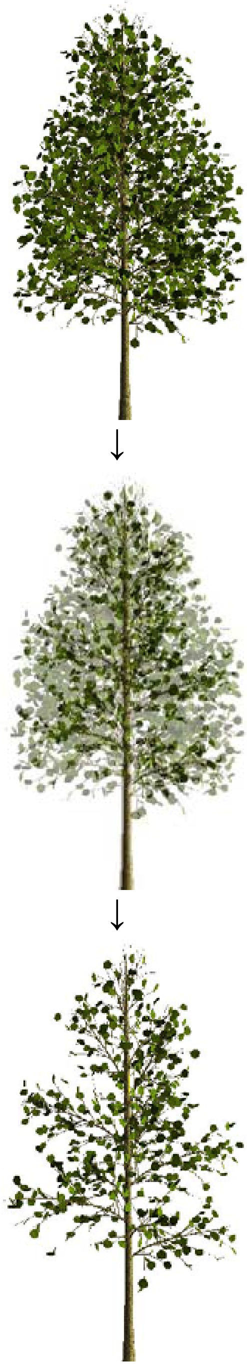

Figure 8: Image Morphing

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