Financial Reminiscences:
An Example of Art Based on Information Visualization in Finance

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Abstract

Useful techniques for information visualization allow engineers or analysts to produce works of art. A work entitled “Financial Reminiscences” is an example of such works. This work has been produced using a visualization technique for financial analysis. This technique is not only a tool for generating images. It is closely related to the information visualized in the work. Thus, the audience needs to understand the visualization technique and then to analyze the information.

1. Introduction

Although an information visualization technique is evaluated on the basis of usefulness of the technique, users of the technique are interested in not only usefulness but also artistic expressions generated by the technique. For example, some media artists use visualization techniques in order to generate fantastic images. For these artists, the generated images are more important than the information from which the images are generated. On the contrary, the visualization technique used in my works is closely related to the information. In other words, the technique is useful in helping us to analyze the information.

I have produced a series of works of art based on a visualization technique for financial analysis. These works require the audience to understand the technique used in the works and to analyze the information visualized in the works. I argue that it is possible for engineers or analysts as well as artists to produce works of this style of art.

In my work presented in this short note, I attempt to visualize dry financial data gracefully. In order to predict stock prices, investors draw various kinds of charts day by day. However, these charts are not graceful. I think that investors should use more graceful charts so that they can cover economic losses by aesthetic profits.

The remainder of this note is organized as follows. In Section 2, the visualization technique used in my work is described. In Section 3, I show that this technique is useful by applying this technique to a system for checking stock prices using a cellular phone. In Section 4, my work based on this technique is explained.

2. A visualization technique

I have developed a technique for financial analysis [1]. In this technique, outlines and features of information are visualized using portfolio textures. A portfolio texture represents a frequency distribution as a texture composed of numerous colored dots.

A frequency distribution is defined as a mapping \( f: C \rightarrow F \), where \( C \) is a set of categories and \( F \) is a set of frequencies. A frequency distribution can be represented as a pie chart. Each sector of the pie chart is colored. A color mapping is defined as \( h:C \rightarrow H \), where \( C \) is a set of categories and \( H \) is a set of hues. Let \( h(c) \) be the hue of a sector corresponding to \( c \), where \( c \) is a member of \( C \).

Given a frequency distribution and a color mapping, a portfolio texture is generated as follows:

1. A pie chart representing the frequency distribution is drawn using the color mapping.
2. The pie chart is decomposed into numerous dots.
3. These dots are mixed so that they are arranged on a plane randomly and densely.

A portfolio texture is defined as a rectangle area clipped from the plane on which the colored dots are arranged.

When we visualize a stock portfolio using a portfolio texture, it is necessary to prepare the following frequency distribution. Let \( p(s) \) be the price of a stock \( s \) included in the portfolio, where \( t \) indicates a trading day. Let \( r(s) \) be the price change rate of \( s \). That is, \( r(s) \) is computed as \( r(s)=p(s)-p_{t-1}(s)/p_{t-1}(s) \). We define \( C=\{0, 0.001, 0.002, \ldots, 0.065\} \). Each member of \( C \) is a price change rate. The maximum rate is 0.065. If the price change rate of a stock is greater than 0.065, it is regarded as 0.065. Let \( f(c) \) be the frequency of \( c \) in \( C \). That is, \( f(c)=n \) if \(|\{s \in P| r(s)=c\}|=n \).

For each \( c \) in \( C \), \( h(c)=0.4000c \). Thus, we obtain \( H=\{0, 4, 8, \ldots, 260\} \). Each member of \( H \) is a level on a color scale. Key colors on the scale are arranged as red < orange < yellow < green < blue < indigo < violet.

We can use a portfolio texture instead of a pie chart. A pie chart represents a frequency distribution as a set of sectors. On the other hand, a portfolio texture represents a frequency distribution as a single texture. Because of this difference, a set of portfolio textures is more helpful than a set of pie charts, when we observe a large number of or a long sequence of frequency distributions.
3. An application of portfolio textures

Investors can get stock price data in real time using cellular phones. In order to reduce risk, however, they need to hold a large number of stocks. As a result, it is difficult to check the stock prices one by one. Since screen sizes of cellular phones are small, this problem is crucial. From this point of view, I propose a system for checking stock prices using a cellular phone [2]. In this system, a portfolio texture displayed on a small screen of a cellular phone visualizes a stock portfolio. Checking the portfolio texture, we can decide whether or not to check detailed information on each stock included in the portfolio.

The portfolio texture indicates whether the portfolio is stable or not. If the texture contains more red, orange and yellow dots than green and blue dots, the portfolio is stable. This is because the stable portfolio includes many stocks of which price change rates are small. Thus, it is not necessary to check detailed information on each stock included in the stable portfolio. On the contrary, if the texture contains more green and blue dots, the portfolio is unstable. This is because the unstable portfolio includes many stocks of which price change rates are large. Thus, it is necessary to check detailed information on each stock included in the unstable portfolio.

4. A work of art based on portfolio textures

I present a work entitled “Financial Reminiscences” as an example of art based on portfolio textures. As shown in Figure 1, this work consists of many portfolio textures, each of which is generated from stock price data of 23 Japanese automobile companies. The textures arranged in the upper part are generated from the data in 1989 and the textures arranged in the lower part are generated from the data in 1990. Dates of trading days are printed under the textures. If the sum of all stock prices of day $t$ is greater than or equal to that of day $t-1$, the date is printed in green. If the sum of all stock prices of day $t$ is less than that of day $t-1$, the date is printed in red.

In 1989, most of textures contain more red, orange and yellow dots than green and blue dots. As a result, these warm textures make us feel comfortable. In 1990, however, we can find a number of cool textures containing more green and blue dots. The difference between 1989 and 1990 implies a turn of the tide in the Japanese stock market. That is, this work reminds us that the Japanese stock market bubble burst at the beginning of 1990.

5. Conclusion

Engineers or analysts can produce works of art using information visualization techniques. One of such works has been presented. The visualization technique used in the presented work is not only a tool for generating images. It is closely related to the information visualized in the work. Thus, the work requires the audience to understand the visualization technique and to analyze the information.

References
