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Animation Information Applications in the Capital Markets

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***Abstract*: Recently 3D computer graphics can be extremely expressive and used in lay outing of to display an entire securities market, like the S&P 500, on a single screen. A complex roster of 3,000 positions can also easily fit on a single screen. With the correct approach to the visual design of the layout, these massive amounts of information can be quickly and easily comprehended. By using motion and animated interaction, it is possible to use 3D as a reliable, accurate and precise decision-support tool. Information animation applications are particularly suited to the securities industry because that is where we find huge amounts of data, the value of which declines rapidly with time, and where critical decisions are being made on this data in very short periods of time. Information animation technology is an important new tool for the securities industry, where people need to be in the decision-making loop without suffering from information surplus. Several examples are discussed including equity trading analytics, fixed income trading analytics and fixed-income risk viewing. Risk viewing is widespread to include instruments and markets beyond fixed-income, namely equities, derivatives, and foreign exchange.**

This paper establishes and understanding the common risk factors, the common elements are positions, models of asset value, parameterized models of risk sensitivity, and scenario projections. The 3D visual risk models more easily allowing control and guidance of risk exposure over a wide variety of scenarios and stress tests.

Key wards: 3D; Graphics; Visualization; Creativity; Animation.

1. INTRODUCTION

3-dimensional computer graphics can be extremely expressive and use of such correct approach to the visual design of the layout, massive amounts of information can be quickly and easily comprehended by a human observer.

Data visualization, depends on the person seeking personal investment is imaginary from person to person. Data visualization has reached a new level of capability which can be described as Information Animation. Graphics display technology and applications have moved beyond the static or interactive 2D bar charts, line charts and pie charts, and beyond the interactive 3D scatter plots and contour plots of statistical and scientific visualization. It is now likely, on an inexpensive workstation, to build, display and have updated in real time, visual scenes comprised of intellectual 3D geometrical forms. The viewer's point of view can move through these 3D scenes, which have been constructed of simple and/or complex objects, and the objects themselves can move within the scenes. Desktop workstations can now move hundreds of thousands of independent 3D polygons per second on a display console.

In industrial and business simulations make use of this computer graphics power in applications that portray realistic visual scenes. However, same hardware technology can be used in management and knowledge worker tasks. "Information animation" is the application of this level of computer graphics power to data intensive, time critical, decision making tasks where the 3D landscape comprises numerical / textual data and analytical models.

To support decision making tasks, information animation uses 4D (3D plus motion) graphics. By itself, 3D is not sufficient. The 3D display of data is not a new concept and has often been used as a communication medium when more emphasis on impact rather than insight is desired. 3D does not lend itself to rigorous comparative analysis because of the distortions arising from a perspective view and occlusion. However, by using motion and animated interaction, it is possible to use 3D as a reliable, accurate and precise decision-support tool. According to James Clark, the founder of Silicon Graphics Inc., , to make 3D work, you need to make it move. This new 3D and motion capability, which we call information animation, allows a higher level of expression, a significant increase in the amount of data displayed, and a broader scope of application.

This paper delivers a number of examples of information animation applications in the securities industry. These examples are drawn from equity trading analytics and fixed-income risk management. Many other applications are suggested as well, including OTC trading, equity trading execution and equities risk viewing. Today the discussion of various applications, of stock exchange and commodity market, there is a brief review of how data visualization. How data visualization has been used in the past, and depends on the worksheet and WUSIWUG tools. In desktop applications such as Excel, it works and the importance of graphic design. Data visualization and 3D design helps to motivate the users and take proper decision.

2. DATA VISUALIZATION

The origins of data visualization are in the statistical and scientific disciplines. If we put forth this to commercial applications like stock exchange and financial situation can do wonders. The majority of early work involved 2D

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analysis of multidimensional and multivariate data sets via static images and graphs. These static 2D images are useful in analysis but have more merit in the presentation of final results. Protuberant statistician John Tukey was a pioneer of exploratory data analysis.

Recently dynamic graphics have been used in, for instance, spinning 3D data plots. A Dynamic, in this context also means direct manipulation by the user, where the user interacts directly with the graphics by use of the mouse. Dynamic graphics much more readily supports the process of finding and understanding patterns and anomalies in the data, as shown by Cleveland.

In the sciences, 3D visualization is typically used in analysis and presentation. It is more observed in Financial and Stock Exchange or commercial applications as well. Faced with understanding the large amounts of data generated in simulations and computational experiments, scientists often turn to visualization as the only practical way to digest the stacks of output created by overnight runs on supercomputers. Converting the stacks of output into a static 3D image is a useful way to sift through the information overload and pick out the patterns and anomalies of interest. Data Visualization broadened the scope of scientific and commercial exploration by expanding the horizon of what could be understood.

In data visualization, one of the most well-known animation studies was of the pollution formation in the India. The techniques makes use of traditional frame-by-frame animation methods. Each frame is rendered and then transferred to video tape, where motion can be viewed at the standard video rate of 30 frames per second. While motion is achieved, it is not interactive. The viewer is limited to a predetermined set of presentations and the communication of pre-conceived messages. These visualizations do not support data analysis because the relationships and features have already been identified, and the information has been extracted and prioritized for communication purposes.

In both, scientific and commercial, visualization, the 3D image is always based on an underlying physical structure. Whether in physics, molecular, chemical or biological studies, statistical, the images use the physical structure of the elements themselves. Coherent data sets with an underlying xyz arrangement of positions provides a natural and easily understandable framework for a 3D image.

Information visualization using 3D animation is numerous prototypes have been constructed. These examples allow users to better understand the structure of large datasets by allowing viewing from different angles, by flying through the data, and by interactively examining and rearranging information objects. In these examples, the structure of the visual presentation is provided by the hierarchical or linear structure of the data itself. This provides a natural data-oriented framework and is a step forward in providing an application that is aligned to the decision making task.

In financial data visualization, there is no physical geography to provide an organizing structure. Dimensions corresponding to variables in mathematical functions can provide an organizing structure. On exploring the value of a portfolio of options by interactively manipulating the option market value function of six variables in a 3D space. Higher dimensionality is achieved by embedding one 3D space into another. This provided a mathematically correct coherent framework but perceptually still proved to be not as natural and easy to understand as a geographical structure.

A visual layout that corresponds to the rationale underlying a decision blends human perceptual strengths with the exercise of human judgment. Information visualization expands to include decision visualization.

3. VISUAL PERCEPTUAL/ COGNITIVE ABILITIES

Visual Perceptual skills involve the ability to organize and interpret the information that is seen and give it meaning. All the organism of our body plays different roles, our eyes send large amounts of information to our brains to process every single second, the brain can then process it, thus allowing us to form thoughts, make decisions, and create action. Our both test for and treat the seven core visual perceptual skills.

Visualization works because key aspects of the perception process occur rapidly without conscious thought. Mentioned human visualization power can be harnessed to allow the presentation of massive amounts of data and to highlight patterns hidden in that data. Used effectively, visualization can accelerate perception of data. By designing visualizations with human strengths and weaknesses in mind, it is possible to exploit people's natural. Ability to recognize structure and patterns, and circumvent human limitations in memory and attention.

The human brain excels at processing images and recognizing patterns. In contrast this with how the brain handles rows and columns of numbers and letters. In a stressful, time-critical environment, such as a trading desk, it would be easy to miss a crucial number displayed among dozens in rows and columns. It takes a good deal of precious time to digest a set of interrelated numbers. Using information animation, the size, color, shape, and motion of the data can all be used to indicate the information you want and its significance.

Scientific study of perception and cognition have established some explanations for why visualization is so powerful, but much still remains to be understood

Certain aspects of visual processing seem to be accomplished simultaneously for the entire visual field at once. Some aspects of visual processing are also automatic in that it does not require attention to be focused on any one part of the visual field. Other aspects of visual processing seem to depend on focused attention and are done serially, or one at a time, as if a mental spotlight were being moved from one location to another. Visualization tasks involve a combination of preattentive and attentive human behaviors. Psychological research, see Rogowitz, et al, has shown that certain visual stimuli attract attention, can be searched in parallel, and are perceived effortlessly by observers. These extremely efficient preattentive visual competencies are engaged before conscious or attentive thought is required. In fact, Zeki discusses how four

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parallel systems within the visual cortex have been identified, each concerned with a different attribute of vision: one for motion, one for color, and two for form.

Powerful visualizations are designed to enlist both preattentive and attentive processes. A preattentive encoded attribute may be used to identify a region in the visualization which demands further attentive scrutiny.

There is virtually unlimited freedom in how we represent data. The difficult question is how best to represent it.

The study of graphical perception needs to be expanded to examine the effectiveness of new representational techniques such as new forms of 3D geometry, animation, transparency, depth cues and connections. In the absence of scientifically derived rules, it is necessary to depend on the graphics design profession.

4.GRAPHICS DESIGN

While science cannot always explain the functions and provide explicit rationales, the graphics design profession has developed highly effective guidelines and heuristics. There is a rigor and discipline in the graphics design process whose intent is to reveal and not obscure. Graphics design methods have largely evolved from dealing with 2D graphics used in the print medium. However, their spirit and mandates are directly applicable to a 4D medium.

Graphical displays should induce the viewer to think about the substance, present many numbers in a small space, make large data sets coherent, encourage the eye to compare different pieces of data, reveal the data at several levels of detail, from a broad overview to the fine structure. Graphics disclose data, and can be more precise and revealing than conventional numerical computations and displays.

5.ANIMATION INFORMATION SECURITIES INDUSTRY

Animation Information applications are particularly suited to the securities industry. Information animation technology is an important new tool for the securities industry, where people need to be in the decision-making loop without suffering from information overload.

6. EQUITY TRADING ANALYTICS:

The baseline is the price of the last trade. The offers are above, and the bids are below the baseline. The height is proportional to the price of the bid or offer. The length of a bid/offer's bar is proportional to the size of the bid/offer. This display immediately shows where bids and offers are unbalanced and where there is liquidity.

An actual user would order the landscape to correspond to particular interests and models of value. Several different forms of mouse and keyboard driven navigation are supported, including zooming to a point of interest, walking, running and moving to preset fixed points of view.

Of course, liquidity is just one attribute of an equity's performance. Volume on the day, volume at a price, trades at the bid, trades at the offer, etc. For each attribute, it is possible to develop a graphical icon or glyph which will visually and precisely communicate the value of the attribute.This is an important requirement for information animation applications. Visual perception can be used to quickly see anomalies and patterns. However, at some point, detailed data is needed. The user must be able to point at signs and retrieve the numerical and textual data behind the signs which is called brushing.

7. FIXED-INCOME TRADING ANALYTICS

The spreads are taken between the start date (green curve) and the current date (yellow curve). Positive spreads are gray, and negative spreads are purple. As we animate the scene, all the spreads move up and down with time.

Information animation applications can provide significant value in many areas of the securities industry. The risk viewing application can be expanded to instruments and markets beyond fixed income, including equities, derivatives, and foreign exchange. In each case, the common elements in the application are positions, models of asset value, parameterized models of risk sensitivity, and scenario projections.

Risk viewing starts with being able to quickly see thousands of positions on a single screen. Effective risk visualization requires direct manipulation of such risk parameters as interest rate risk, volatility risk, currency risk, and credit risk. These visual risk models more easily allow control and guidance of risk exposure over a wide variety of scenarios and stress tests. Simple combinations of changes to risk parameters will quickly reveal exposed positions and help suggest more effective risk management strategies.

An information animation landscape can easily show on one screen all the market makers for a watch list consisting of 10 equities. Each market maker's current activity, their activity since market open, and several other analytics can all be seen simultaneously.

Equity trade execution is another task that could benefit from information animation. In any given asset management firm, hundreds of buy, sell, sell short orders may need to be executed in one day.

An information animation landscape allows order aggregation from many portfolios, and then allows those orders to be routed to appropriate trading systems. The status of each order and the quality of execution can be displayed for hundreds of orders simultaneously on one screen.

In fact, information animation can be used in general to unify and simplify diverse sources of trading data.

10. CONCLUSIONS:

Rows and columns of numbers are a representation appropriate for machine processing but do not draw upon human perceptual and cognitive strengths. With 3D and 4D graphical representations, people can see more information, more quickly, with more comprehension. These 4D graphical applications are a significant technological advance and can be thought of as a new type of decision support medium. Information animation applications

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combine large amounts of rapidly changing data with interactive decision-making models.

Two other technology challenges are worth mentioning. A high level of animation performance is required. A large amount of 3D geometry in the landscape needs to be updated with new data and redrawn in sub seconds to achieve animation frame rates of at least four frames per second. Even higher performance levels are required as larger volumes of data are input into landscapes, as 3D landscapes become larger in scope, and as signs make more use of motion as a representation medium.

Finally, ease of use and user interface design are crucial to application success. Information animation is a new way of working with information and requires innovative user interface techniques. Several new techniques have been developed in the prototypes, and more are being tested. The expressive power of information animation provides an opportunity to dramatically simplify user interfaces.

Animation Information has an important role within organizations. With significant investments made in computing infrastructure over the last decade, organizations have vast amounts of business data available to support decision making. So much data, in fact, that some current conditions might be described as information overload. Used effectively, information animation can accelerate perception, provide insight and control, and allow this flood of valuable data to be harnessed for competitive advantage in business decision making.

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