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Information Animation Application in the Capital Markets

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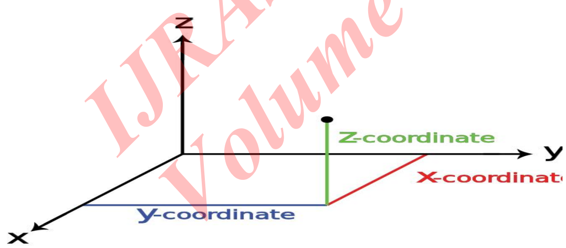
Abstract: 3D computer graphics are graphics that use a three-dimensional representation of geometric data often known as Cartesian that is stored in the computer. These are used for the purposes of performing calculations and rendering 2D images. These images may be stored for viewing later or displayed in real-time.3d computer graphics can be very expressive if efficiently used. It allows us to display the entire securities market like S&P 500 on a single screen. With the use of correct approach to the visual design of the layout, these massive amounts of information can be quickly and easily comprehended by a human observer. 3D computer graphics rely on many of the algorithms as used in 2D computer vector graphics in the wire-frame model 3D is occasionally blurred; 2D applications may use 3D techniques to achieve effects such as lightning and 3D may use 2D rendering techniques. With the use of animated interaction and motion ,3d becomes reliable, accurate and precise decision support tool. Information animation technology is an important new tool for the securities industry, where people need to be in the decision-making area without suffering from information overload. These are particularly suitable for the securities industries Examples including fixed income trading analytics, fixed income risk viewing and equity trading analytics Risk viewing is generalized to include instruments and markets beyond fixed-income, namely equities, derivatives and foreign exchange. In every case the common elements are the models of asset value, positions, parameterized models of risk sensitivity, and scenario projection

These visual risk models more easily allows the control and guidance of risk exposure over a wide variety of scenarios and stress tests.

I. INTRODUCTION

Three-dimensional space is a geometric 3-parameters model of the physical universe (without considering time) in which all known matter exists. These three dimensions can be labeled by a combination of three chosen from the terms: length, width, height, depth, and breadth. Any three directions can be chosen, provided that they do not all lie in the same plane.



3-d computer graphics can be extremely expressive. With their correct approach to the visual design of the layout, a lot of massive amounts of information can be easily grasped by a simple human being.

Data visualization has reached a new level of capability which can be termed as Information Animation. Graphics display technology and applications have moved beyond the interactive or static 2D bar charts, line charts and pie charts and beyond the interactive 3D scatter plots and contour plots of statistical and scientific visualization. And today it is possible to build, display and have updated in real time, visual scenes comprised of abstract 3D geometrical forms on an inexpensive workstation.

These have been constructed of simple and/or complex objects, and the objects themselves can move within the scenes. So for the viewer's point of view can move through these 3d scenes. Many areas use this scheme such as military and industrial simulations, these help to portray realistic visual scenes which show tank combat in urban centers or merchant marine vessels docking in the busy harbors. While this 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.

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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. The new 3D and motion capability, termed as 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 provides a large number of examples of information animation applications in the securities industry. The given examples have been 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. Before the discussion of these various applications, there is a brief review of how data visualization has been used in the past, why it works so well, and the importance of graphic design.

II. DATA VISUALIZATION

Data visualization or data visualization is a modern branch of descriptive statistics. It involves the creation and study of the visual representation of data, meaning "information that has been abstracted in some schematic form, including attributes or variables for the units of information". The origins of data visualization are in the statistical and scientific disciplines. The majority of early work that was involved in the 2D analysis of multi dimensional and multivariate data sets via static images and graphs. The static 2D images can be of great use for the analysis, but these are more useful for the presentation of the final results.The recently used technique is the dynamic graphics, for instance, spinning 3D data plots. “Dynamic” in this context also means direct manipulation by the user, where the user can directly interact with the graphics with the help of mouse. Dynamic graphics much mainly supports the process of finding and understanding patterns and anomalies in the data. Visualization today has ever-expanding applications in science, education, engineering (e.g., product visualization), interactive multimedia,HYPERLINK "http://en.wikipedia.org/wiki/Medical_visualization" medicine, etc. Typical of a visualization application is the field of computer graphics.

The invention of computer graphics may be the most important development in visualization since the invention of central perspective in the Renaissance period. The development of animation also helped advance visualization.

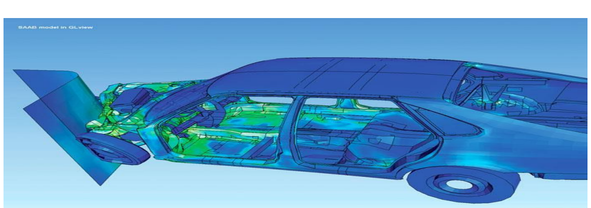

Fig 2 shows the Visualization of how a car deforms in an asymmetrical crash using finite element analysis.

In the sciences, 3D visualization is typically used in analysis and presentation. The large amounts of data generated in simulations and computational experiments, scientists often use visualization as the only practical way to digest the stacks of output created by overnight runs on supercomputers. For Converting the stacks of output into a static 3D image, It is a useful way to sift through the information overload and pick out the patterns and anomalies of interest. Visualization broadened the scope of scientific exploration by expanding the horizon of what could be understood.

In scientific visualization, the 3D image is always based on an underlying physical structure. For example, the smog study presents the data overlaid on a 3D map of the Los Angles basin. Whether in physics, molecular, chemical or biological studies, the images use the physical structure of the elements themselves. The coherent data sets with an underlying xyz arrangement of positions provides a natural and easily understandable framework for a 3D image.

Some of the Applications of visualization are listed below:

Scientific Visualization:

Scientific visualization is the transformation, selection, or representation of data from simulations or experiments, with an implicit or explicit geometric structure, to allow the exploration, analysis, and understanding of the data. Scientific visualization focuses and emphasizes the representation of higher order data using primarily graphics and animation techniques. It is a very important part of visualization and maybe the first one, as the visualization of experiments and phenomena is as old as science itself. Traditional areas of scientific visualization are flow visualization, medical visualization, astrophysical visualization, and chemical visualization. There are several different techniques to visualize scientific data, with isosurface reconstruction and direct volume rendering being the more common.

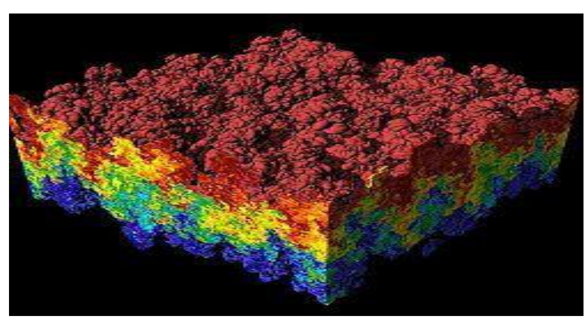

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Fig.3 shows a scientific visualization of a simulation of a Raleigh-Taylor instability caused by two mixing fluids.

Educational Visualization:

Educational visualization is using a simulation not usually normally created on a computer to create an image of something so it can be taught about. This is very useful when teaching about a topic that is difficult to otherwise see, for example, atomic structure, because atoms are far too small to be studied easily without expensive and difficult to use scientific equipment.

Information Visualization:

Information Visualization concentrates on the use of computer-supported tools to explore large amount of abstract data. The term "information visualization" was originally coined by the User Interface Research Group at Xerox PARC and included Dr. Jock Mackinlay. [citation needed] Practical application of information visualization in computer programs involves selecting, transforming, and representing abstract data in a form that facilitates human interaction for exploration and understanding. Important aspects of information visualization are dynamics of visual representation and the interactivity. Strong techniques enable the user to modify the visualization in real-time, thus affording unparalleled perception of patterns and structural relations in the abstract data in question.

Knowledge visualization :

The use of visual representations to transfer knowledge between at least two persons aims to improve the transfer of knowledge by using computer and non-computer-based visualization methods complementarily. [9] Examples of such visual formats are sketches, diagrams, images, objects, interactive visualizations, information visualization applications, and imaginary visualizations as in stories. While information visualization concentrates on the use of computer-supported tools to derive new insights, knowledge visualization focuses on transferring insights and creating new knowledge in groups. Beyond the mere transfer of facts, knowledge visualization aims to further transfer insights, experiences, attitudes, values, expectations, perspectives, opinions, and predictions by using various complementary visualizations. See also: picture dictionary, visual dictionary

Product visualization :

Product visualization involves visualization software technology for the viewing and manipulation of 3D models, technical drawing and other related documentation of manufactured components and large assemblies of products. It is a key part of product lifecycle management. Product visualization software typically provides high levels of photorealism so that a product can be viewed before it is actually manufactured. This supports functions ranging from design and styling to sales and marketing. Technical visualization is an important aspect of product development. Originally technical drawings were made by hand, but with the rise of advanced computer graphics the drawing boardhas been replaced by computer-aided design (CAD). CAD-drawings and models have several advantages over hand-made drawings such as the possibility of 3-D modeling, rapid prototyping, and simulation.

Systems Visualization :

Systems visualization is a new field of visualization which integrates and subsumes existing visualization methodologies and adds to it narrative storytelling, visual metaphors(from the field of advertising) and visual design. It also recognizes the importance of complex systems theory, the interconnections of systems of systems and the need of knowledge representation through ontology's. Systems visualization provides a viewer of systems visualization the ability to quickly understand the complexity of a system. Unlike other visualization approaches - such as data visualization, information visualization, flow visualization, scientific visualization and network visualization, which focus mainly on data representation - systems visualization seeks to provide new way to visualize complex systems of systems through an integrative approach.

For abstract information visualization, we believe that the process and decision models provide a more natural framework. the 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 the term decision visualization.

III. GRAPHIC DESIGN

Graphic design is the art of communication, stylizing, and problem-solving through the use of type, space and image. The field is considered a subset of visual communication and communication design, but sometimes the term "graphic design" is used interchangeably with these due to overlapping

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skills involved. Graphic designers use various methods to create and combine words, symbols, and images to create a visual representation of ideas and messages. A graphic designer may use a combination of typography, visual arts and page layout techniques to produce a final result. Graphic design often refers to both the process (designing) by which the communication is created and the products (designs) which are generated.

Common uses of graphic design include identity (logos and branding), publications (magazines, newspapers and books), print advertisements, posters, billboards, website graphics and elements, signs and product packaging. For example, a product package might include a logo or other artwork, organized text and pure design elements such as images, shapes and color which unify the piece. Composition is one of the most important features of graphic design, especially when using pre-existing materials or diverse elements.

While science can not always explain the functions and provide explicit rationales, the graphics design profession has developed highly effective discipline in the graphics design process whose main aim 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 is directly applicable to a 4D medium. In 4D information animation applications, the success of the graphics visual design (i.e. the shapes, layout, colors) is critical to the success of the application. Graphical elements should be carefully selected and arranged to reveal data and relationships. Poor graphics design will obscure the data and its meanings. The visual design simply needs to be perfect. Users must see the message and not the 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 reveal data, and can be more precise and revealing than conventional numerical computations and displays.

Information Animation Examples in the Securities Industry:

Information animation applications are particularly suited to the securities industry as this is where we can find a huge amount of data, the value of which declines rapidly with time, and where the critical decisions are 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 overload. 3D seems to hold some promise as a general decision support tool. These are key questions, and to help answer them, several prototypes, or “dynamic illustrations,” Which were built to provoke business thinking regarding the benefits, and to help further develop the basics oftechnology.

IV. HUMAN VISUAL PERCEPTUAL AND COGNITIVE ABILITIES

Visualization works because the visual cortex dominates perception, and because the key aspects of the perception process occur very rapidly without conscious thought. This 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 It is possible to exploit people’s natural ability to recognize the structure and patterns, and circumvent human limitations in memory and attention.

The human brain excels the processing images and recognizes the patterns. Contrast to this is with how the brain handles number of rows and columns and letters. In a stressful, time-critical environment, such as the 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

There is virtually unlimited freedom in how we can 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.

V. FIXED-INCOME RISK MANAGEMENT

Color Plate 6 shows on a single screen a bond inventory with over 3,000 positions in it. Long positions are in green; short positions are in pink. The left axis shows portfolios and trading groups. The front axis shows time to maturity. Height

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is used to show the value of the positions. Along the front of the landscape is a total line that totals across trading groups. At the rear is a yield curve based on the bid yield of a set of benchmarks. Color Plate 6 displays a profit/loss for each position for a yield curve shift scenario. Other models of asset value can also be displayed (e.g. weighted price value of a basis point or benchmark Animation is used in this landscape to help assess market risk (i.e. risk due to change in interest rates). The yield curve can be moved, in even or uneven shifts, and as it moves, the impact on the inventory's projected profit and loss can be assessed.

Projected P+L values change by increasing or decreasing in size. Users can quickly see where the inventory is hedged (i.e. insensitive to changes in rates) or where it is exposed and by what degree. Projected P+L is calculated using pre-computed fixed income analytical parameters such as the dollar value of an 01 (i.e. unit value for a change of l/100 of a percent in interest rates) and convexity (i.e. second order approximation for sensitivity due to change in interest rates). The scenario P+L calculations are done rapidly so that the P+L value changes interactively with a change in the yield curve. This risk viewing landscape provides many conclusions. An on-line system can display perhaps 20 to 40 positions per screen. A 3D landscape can display 3,000 or more positions per screen. Using query and filtering, it is possible to highlight patterns that may be hidden in a numerical display.

The number of Rows and columns are appropriate for representation of machine processing but do not draw upon the 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 combines large number of frequently changing data with interactive decision-making models. The most effective landscapes encapsulate and simplify complex decision making process models. Information animation technology will evolve into a powerful new decision-making medium, which will unify disparate sources of data and disconnected task processes. At this point, we can summarize that a number of key components are used in any information animation application.

Signs- A sign is a graphical geometrical object that can represent a set of related data elements, and is transformed as the data changes. For example, the current bid and ask of an equity can be represented by one sign. Each sign needs to be optimally designed to portray the significance of the data.

"Sign" is preferred over the word "glyph" because it Stresses the need for effective illustration.

Controller signs-. This is a sign which maps a set of related input/output process control parameters to a geometrical object. For example, an interactive yield curve used to assess market risk on an inventory is a controller sign. Landscapes. Each information application is based on one or more landscapes. A landscape consists of an arrangement in xyz space of signs and interactive controller signs. Effective landscapes reinforce - or make apparent - information attributes, decision models and the taskprocess. Navigation. Information animation applications require new user interface methods to allow users to move through the landscapes. These include zooming in and out, walking and running along an xyz vector, returning to predetermined fixed points of view, and a local heads-up capability to allow quick controlled viewing in thse immediate neighborhood of a landscape.

REFRENCES

[1] Cleveland, W.S., and M.E. McGill, eds.Dynamic Graphics for Statistics, Belmont, CA, Wadsworth Inc.,1988.

[2] Feiner, S., and C. Beshers, "Worlds within Worlds - Metaphors for Exploring n- Dimensional Virtual Worlds", ACM Symposium on User Interface Software, 1990.

[3] Mackinlay, J.D., G.G. Robertson and S.K. Card, "The perspective wall: Detail and context smoothly integrated", Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems, ACM, April, 1991.

[4] NCSA - National Center for Supercomputing Applications, Video, "Smog - Visualizing the Components",

[5] University of Illinois at Urbana- Champaign, Visualization Services and Development Group, 1990

[6] Robertson, G.G., S.K. Card, and J.D. Ma&inlay, Information visualization using 3D interactive graphics, Communications of the ACM, 36(4), 1993.

[7] Rogowitz, B.E., D.T. Ling, and W.A. Kellogg, "Task Dependence, Verdicality, and Pre- Attentive Vision: Taking Advantage of Perceptually-Rich Computer Environments", Human Vision, Visual Processing and Digital Display III, SPIE Vol. 1666, 1992.

[8] Treisman, A., "Features and Objects in Visual Processing", Scientific American, Nov., 1986.

[9] Tufte, E.R., The Visual Display of Quantitative Information, Chesire, CT, Graphics Press, 1983
[10] Tukey, J.W., "Exploratory Data Analysis", Reading, MA, Addison-Wesley, 1977
[11] Zeki, S., "The Visual Image in Mind and Brain", Scientific American, September, 1992.