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Data Visualization

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Abstract—Data visualization can be said as quite new and challenging field in the computer science. It uses the computer graphics tool and various software to reveal patterns, trends and relationship between the various datasets. In this paper we first get familiar with the data visualization and its related terms. After having a deep study on data visualization, we will look through the algorithm which could be used for implementing the data visualization. With the combination of some known algorithm we will also see how to visualize 4 dimensional data. We will also look into and find some way the tools which could be used to visualize the semi structured data like XML data and JSON data.

Keywords—*data visualization, data visualization techniques, data visualization algorithm XML.*

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I. INTRODUCTION

Human has a long story of visualizing the various type of data and datasets graphically even before the computer were invented. Data visualization is still a hot topic even today also as well as in coming future also because It is easy to interpretation an helps in decision making in various situation and also show the data and relationship between these data graphically.

In today's technological advancement it is not much difficult to store and retrieve any kind of data but problem arises when one thinks about to represent these data in a meaningful way to the human easily and which could be used in the software application.

Data visualization is all about understanding ratios and relationships among numbers. Not about understanding individual numbers, but about understanding the patterns, trends, and relationships that exist in groups of numbers [4].

From the user's point of view , it may involve detection, measurement, and comparison via interactive techniques and providing the information from multiple views and with multiple techniques.

II. DATA VISUALIZATION TECHNIQUES

A. Keeping the requirement in mind, we have some commonly used representation ways of data visualization, they are :

1) bar or pie Graphs: good for structure
2) relationships Plots : 1- to n-dimensional
3) Maps :one of most effective
4) Images :use colour/intensity instead of distance (surfaces).

B. We also have some common steps in data visualization [4], they include:

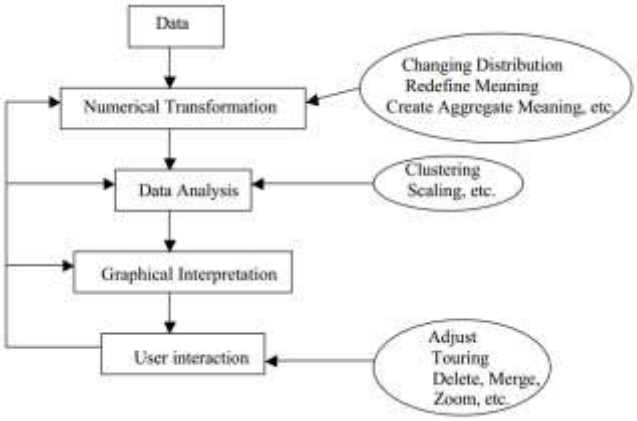

Figure 1 common steps in data visualization

1) Numerical Transformation:

Perception is a sort of change numerical information to graphical information and demonstrating the relationship between these data. Numbers are dynamic ideas, and to envision them as focuses and draw lines requires a change. Changes includes:

1) changing the dissemination: alter the circulation of numbers so they are more reasonable for analysis. Some as often as possible utilized ways technique: Linear ttransformation, Logarithmic change, Normalizing change, Arcsin change, Square root change, Inverse change

2) Redefining the Meaning: change numbers so that they are ended up significant, or more illustrative of the idea that the information investigator is keen on.

3) Creating important information from change which is helpful to get it.

2) Data Analysis:

Information Analysis is a procedure of spreading the information on least complex way so it can help with elucidation. A percentage of the unmistakable information investigation strategies are: factual bolster, bunch examination, multidimensional scaling, and element examination. Information investigation can be utilized to change information or to outline the information itself or its factual report.

3) Graphical Interpretation:

Graphical elucidation comprise of a couple key exercises, for example, judgment of greatness (and relative size), judgment of extent (and relative extent), judgment of pattern and slant, and judgment of collection. It might likewise utilize some courses, for example, Use scaling and balance variable to fit in reach, Use inferred values (residuals, logs) to uphold changes Use projections, other conceivable blends to pack data get measurements Use arbitrary jiggling to isolated covers .Use various perspectives to handle concealed relations, high measurements Use successful networks, keys and marks to help understanding and get a fitting data.

4) User Interaction:

At the point when given the perception yield, clients may discover it not fitting their psyches and prerequisite appropriately. Clients might need to do the followings, which might be required to rehash some before activities. Powerfully change mapping to our information by various perspectives marking to get unique information.

III. 4-D Data Visualization Algorithm: Dynamic Color Plane

1 Methodology

As indicated 4-dimensional information perception calculation (called "dynamic shading plane" multidimensional information representation calculation) exploits human eyes “complex capacities toward hues. We make utilization of a shading based perception calculation. What's more, we additionally exploit liveliness in our calculation.

We utilize a dynamic-shading plane to move into the 3D information point's space, and powerfully change the shades of the focuses and force that cooperate with the plane. We additionally can change the moving power and pixels of this plane, permitting the client to concentrate any relations among the focuses and the hues and force of pixels. Thusly, the client may proficiently assess the dispersion of the hues, and the propensity of the information and power, which might be extremely useful to the client. This calculation is better than the current shading based calculations, for the reasons: my calculation goes about as the general representation calculations that take utilization of hues and power focuses. So my system would be at any rate on a par with these representation programs. In some different conditions when the thick information focuses counteract perception impacts in for the most part calculations, my calculation will be better since we take utilization of: 1) bunching innovation. 2) our predefined dynamic shading plane calculation moving. Coincidentally, any normal calculations that help representation can likewise be incorporated into my calculation.

2 Related Work

A few models of information perception have been found. A large portion of them are extremely specialized and portray either the procedure of the representation of the information. An intriguing late paper utilizes two criteria to separate amongst data and logical data: discrete and persistent information, and whether the spatial design of the representation is given or picked.

Sack thinks about Information Visualization to theoretical workmanship, and contends for the selection of a style of organization: instead of taking a gander at the surface, assess the kind of administration a specific perception empowers. Sack's article will be specified again underneath.

Goodman's hypotheses on craftsmanship and dialect give an intriguing thought to a characterization of representation and the perception of information. His thoughts regarding visual dialects create well with data perception, despite the fact that most representations don't satisfy his prerequisites for a dialect. To study them is still helpful to take in more about perception and its relations to different fields. Cox [5] recommends a general perspective on perception highlight than it is normally seen, accordingly connecting the slippery (and regularly misjudged) idea of the illustration to solid specialized executions of representation frameworks.

3 Artistic and Pragmatic Visualization:

Kelly states aesthetics as “critical effect on art, culture, and nature”. Critical thinking is the basis of all science, and also connects the technical aspect to pragmatic visualization with philosophy and artistic visualization. A particular type of critical thinking is an important part of the process in design and the arts: criticism. Aesthetic approaches are also being applied to computer science called aesthetic computing.

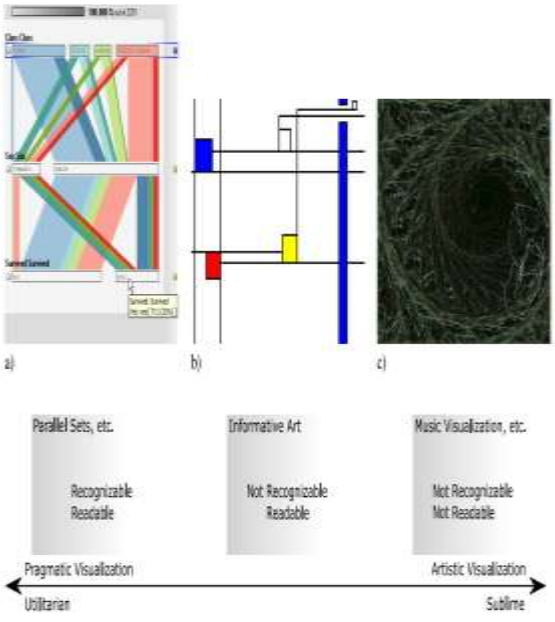

Figure 2 The gamut of data-based visualization

a) Parallel Sets show data about the people on the Titanic, and are readable and recognizable as a visualization; b) Ambient visualization visualizing a bus schedule are readable but require more effort and are not readily recognizable as a visualization; c) Music visualization like Milk Drop is also based on data, but not readable.

3.1 The Sublime

One aesthetic visualization of particular interest is the sublime. The sublime can be understood as that which inspires fear, impressive, and evokes a deep emotional and/or intellectual response. Works of art generally possess a sublime quality, making them difficult to understand and attractive at the same time. Sack equates its opposite, the anti-sublime, with user convenience, which is a central concept in computer science. In fact, visualization is generally understood to be a part of human-centred computing , and techniques that are published at the main conferences and in journals usually need to be solved in user studies . They are thus designed to remove any sublimity, and instead support immediate understanding. While the sublime is just a type of criteria in aesthetics, it is an quite useful one for this discussion. The data based visualization examples discussed so far: while the classical technical information visualization is entirely anti-sublime, artistic visualizations are primarily sublime.

3.2 Pragmatic Visualization

Pragmatic visualization is what we say the technical application of visualization techniques to analyze data. The goal of pragmatic visualization is to explore, analyze, or render information in a way that allows the user to thoroughly understand and interpret the data. Card et al. describe this process as knowledge crystallization, and the recent initiatives in visual analytics have used the slogan detecting the Expected, Discovering the Unexpected. Visual efficiency is of course a key criteria for work in visualization. The goal is to produce images that convey the data as quickly and effortlessly as possible. User studies are done to measure the speed and accuracy of users, and to compare different methods and tasks.

While data is often hard to come by for pure academic research, the field is driven by the need to analyze and understand vast amounts of data, and the particular characteristics of different data sets are often the motivation to develop new methods.

3.3 Artistic Visualization

The objective of masterful perception is to convey a worry and data, instead of to show information. The information is utilized as the premise, the crude material. Information give an establishment to speaking to and translating important data from it. This is the reason individuals call it representation: the basic issue may not be unmistakable, but rather is made obvious through the piece. Visual proficiency does not assume a part in imaginative representation, a remarkable opposite. The objective of representation is not to peruse the information itself but rather to comprehend the information. From numerous points of view, this stride is the inverse of down to business perception: as opposed to making the information effortlessly lucid, it is changed into something that is unmistakable and intriguing, yet that must at present be promptly caught on. As it were, aesthetic perception has amazing quality that down to business representation is not having. Information gathering is regularly a necessary part of a representation. The way that the information exists at all can be utilized to make mindfulness, and information streaming in continuously can make the piece "live". A case for this is the Carnivore venture, which was named after the FBI project of the same name. The first Carnivore was an observation device that made it conceivable to output a large number of messages every day, just removing the "meat" of all that activity: suspicious messages that would then be checked by hand. The creative venture of the same name "sniffs" the movement experiencing a system, and gives that information to various representation modules. These more often than not demonstrate little and in part disguise pieces of the activity, which the client perceives as parts of site pages, messages, and so on., subsequently acknowledging the amount of the system movement s/he creates can be perused effortlessly. Different illustrations incorporate online journal perceptions, for example, The Dumpster and We Feel Fines. Both show data gathered from the web, and dissected for certain words. The general perceptions don't give a great deal of data; however the client can tap on any of the energized.

3.4 Navigating the Space in Between

The true fact that artistic and pragmatic visualizations are on opposite ends of the sublimity scale, and thus theoretically impossible to make, should not constrain us from trying though. Interaction in particular is a way to enable the user to choose which side of a visualization she/he fits their requirement. We Feel Fine has a mode that allows the user to arrange the individual postings in way that allow him or her to read the relative sizes of male vs. female authors, for instance Another example is Artifacts of the Presence Era , which uses a metaphor of sediment deposits to organize images taken as a memento from the former building of a museum. The presentation of the images is undoubtedly sublime, but the user can contact with the installation and look for patterns and specific images.

IV. USING XML FOR DATA VISUALIZATION

It is very difficult to represent Complex information to user when we have large data set and find relevant information user may feel lost. in such case so it is possible to represent it as a tree. however ,most visualizations are cluttered because of amount of information to display .

eXtensible Mark-up Language [XML] promises to be the standard for structured data transfer so XML solves problem for Distributed applications where problems caused by the lack of a uniform standard to transfer structured data. It offers a structured and consistent way to describe and transfer data and it also maintains a separation of the user interface from actual data.[5]

XML document character data which is (content) and markup provides structures for that content markup tags and data are organized in groups called elements and those elements are hanging together in logical tree structure . Document Type Declaration is information about the document’s content.

The techniques and tools used for data visualization provide the user with an overview of the hierarchy and enable him to visualize a specific node within the whole context

Following are representation models which can be with XML for data visualization[5]:

1. *Treemaps :*
   represent hierarchical information via a 2D rectangular map visual representations of complex data spaces through both area and colour

2. *CGI's File System Navigator* :
   Such visualizations are very intuitive, but they are rapidly cluttered and not fitted to large hierarchies.
3. *Fisheye Visualizations :*
   they show the centre of interest in a large scale and with great detail, while areas further from the centre Become smaller and less detailed.
4. *Hyperbolic visualizations :*
   hyperbolic geometry is able to display trees that spreading whereas Euclidian spaces are rapidly cluttered. This representation is less esthetic than information landscapes, but many nodes can be displayed.

Figure 3 Hyperbolic visualizations

5. *Cone trees*:
   There are 3D interactive visualizations of hierarchically structured information. Each sub-tree is associated with a cone; the vertex at the root of the sub-tree is placed at the apex angle of the cone and its children nodes are arranged around the base of the cone.

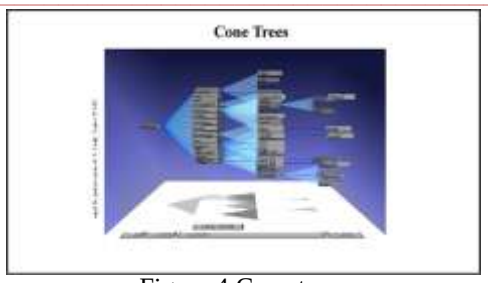

Figure 4 Cone trees

V. CONCLUSION

Data visualizations are not only used for information retrieval, but also for understanding the global structure of the hierarchy. we have tried to discuss various techniques which can be used for data visualization and we approached latest solution available to visualize dynamic data exist on the web with help of xml

most critical problems with complex data visualization is to find efficient abstraction or metaphor enabling the user to get an general review or summary of data space and to find rapidly relevant information and make decisions based on that visual experience.

for future enhancement User can manipulate data using interface, and organize it according to his will this is the concept of dynamic visualization . this can be solve by provide the tool with the capability to add or remove connections between nodes using the graphical representation and enhance user interactivity level

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