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Image Processing of Data by using Visualization Technique

Pravin V. Thakare
Department of Computer Science and Engineering
MGICOET
Shegaon, India
pravint275@gmail.com

Kshitij R. Mawale
Department of Computer Science and Engineering
MGICOET
Shegaon, India
krm.mawale@gmail.com

Ravikiran G. Deshmukh
Department of Computer Science and Engineering
MGICOET
Shegaon,India
ravideshmukh611@gmail.com

Sheetal N. Pore
Department of Electronics and Telecommunication
MGICOET
Shegaon,India
sheetalpore777@gmail.com

Priyanka S. Barapatre
Departmentt of Electronics and Telecommunication
MGICOET
Shegaon,India
priyanka212patre@gmail.com

Abstract- Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image .Most of image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Images are also processed as three-dimensional signals where the third-dimension being time or the z-axis. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. In this paper we discuss about Data visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context. Patterns, trends and correlations that might go undetected in text-based data can be exposed and recognized easier with data visualization software. This paper covers some of the challenges in visualization of Big Data.

Keywords *- Visualisation, Patterns, Correlations, Big data*

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I. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps.

a. Importing the image with optical scanner or by digital photography.

b. Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

c. Output is the last stage in which result can be altered image or report that is based on image analysis.

II. Purpose of Image processing

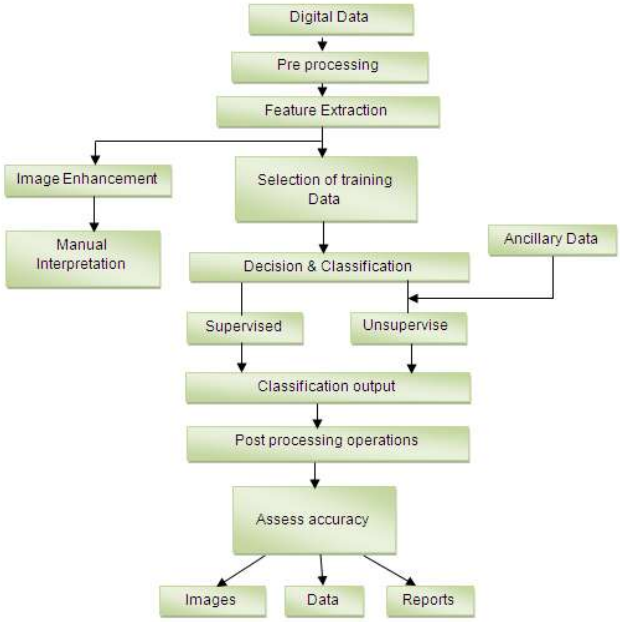
The purpose of image processing is divided into 5 group They are:

1. Visualization - Observe the objects that are not visible.
2. Image sharpening and restoration - To create a bette image.
3. Image retrieval - Seek for the image of interest.
4. Measurement of pattern – Measures various objects in a image.
5. Image Recognition – Distinguish the objects in an image

The two types of methods used for Imag Processing are Analog and Digital Image Processing.

a. Analog or Visual Techniques of Image Processing It can be used for the hard copies like printouts an photographs. Image analysts use various fundamentals c interpretation while using these visual techniques. The imag processing is not just confined to area that has to be studie but on knowledge of analyst. Association is another importar tool in image processing through visual techniques. S analysts apply a combination of personal knowledge an collateral data to image processing.

b. Digital Image Processing Technique: It help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre-processing, enhancement and display, information extraction.



Figure(1): Image Processing of data

II. VISUALIZATION

Visualization transforms digital data into images representing information about the data. The data stems usually from analysis results of images or from simulations. Since imaging and simulation gain increasing interest in biotechnology and biomedicine, visualization receives increasing interest. Image processing transforms images with the goal of supporting human vision or automatic visual analysis. The research group does basic research in the area and is currently investigating co operations with BBZ partners. The group works in the whole area with a strong interest in applications. They work on the following topics:

1. Automatic volume rendering of biomolecules
2. Analysis and visualization of MRI data
3. Visualization of protein folding simulations
4. Visualization of dynamic networks (e.g. barrier trees of fitness landscapes)
5. Visualization of tumor growth simulations
6. Image processing of cell cultures

IMAGE PROCESSING CONTAIN DIFFERENT TYPES OF VISUALISATION AS

A. Data visualization

B. Scientific Visualization

C. Information Visualization

D. Infographic Visualization

E. Visual Analytic

We discuss the most useful data visualisation technique

A. Data visualization

a. History of data visualization: beginning in the 2nd century C.E. with data arrangement into columns and rows and evolving to the initial quantitative representations in the 17th century .According to the Interaction Design Foundation, French philosopher and mathematician René Descartes laid the ground work for Scotsman William Playfair. Descartes developed a two-dimensional coordinate system for displaying values, which in the late 18th century Playfair saw potential for graphical communication of quantitative data .In the second half of the 20th century, Jacques Bertin used quantitative graphs to represent information "intuitively, clearly, accurately, and efficiently. John Tukey and more notably Edward

Tufte pushed the bounds of data visualization. Tukey with his new statistical approach: exploratory data analysis and Tufte with his book "The Visual Display of Quantitative Information", the path was paved for refining data visualization techniques for more than statisticians. With the progression of technology came the progression of data visualization; starting with hand drawn visualizations and evolving into more technical applications – including interactive designs leading to software visualization .Programs like SAS, SOFA, R, Minitb, and more allow for data visualization in the field of statistics. Other data visualization applications, more focused and unique to individuals, programming languages such as D3, Python and JavaScript help to make the visualization of quantitative data a possibility.

b. Defination:

an umbrella term, usually covering both information and scientific visualization. Data Visualization plays an important role in the world of Business Intelligence (BI). By efficiently identifying trends and patterns, Data Visualization helps the user quickly understand and relate to the data, without having to painstakingly sift through it. This is a general way of talking about anything that converts data sources into a visual representation (like charts, graphs, maps, sometimes even just tables).

Data visualization refers to the techniques used to communicate data or information by encoding it as visual objects (e.g., points, lines or bars) contained in graphics. The goal is to communicate information clearly and efficiently to users. It is one of the steps in data analysis or data science. According to Friedman (2008) the "main goal of data visualization is to communicate information clearly and effectively through graphical means. It doesn't mean that data visualization needs to look boring to be functional or extremely sophisticated to look beautiful. To convey ideas effectively, both aesthetic form and functionality need to go hand in hand, providing insights into a rather sparse and complex data set by communicating its key-aspects in a more intuitive way. Yet designers often fail to achieve a balance between form and function, creating gorgeous data visualizations which fail to serve their main purpose — to communicate information". interactive data visualizations allow users to explore a data set for themselves — often by providing details on mouse over, giving different coordinated views, or panning and zooming. Quite interesting Interactive

Data Visualization is a presentation of data in pictorial or graphical format. It can be developed taking the advantage of modern web browsers. It enables decision makers to see analytics presented visually, so they can grasp difficult concepts or identify new patterns.

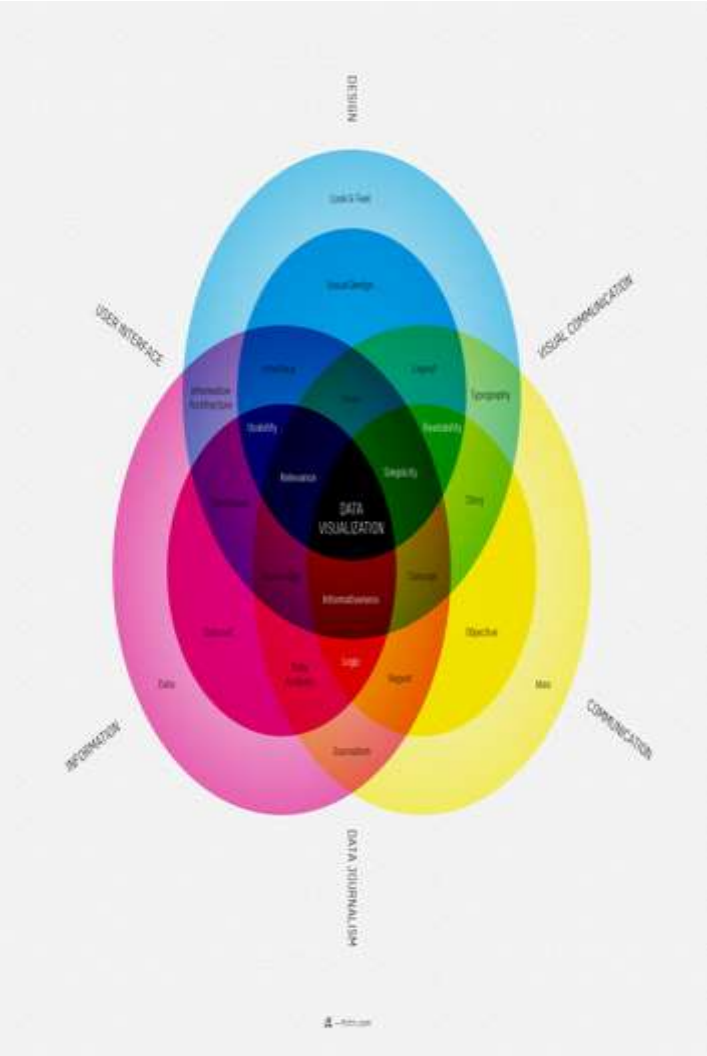


Figure (2) :Data Visualization Technique

c*. Impotance of Visualization:*

Data Visualizations help users to see things that were not obvious to them before With Data Visualizations even when data volumes are very large, patterns can be spotted quickly and easily. Visualizations convey information in a universal manner and make it simple to share ideas with others.

d. .Visualizing Big Data:

Big data brings new challenges to visualization because of the speed, size and diversity of data that must be taken into account. The cardinality of the columns you are trying to visualize should also be considered.The definition of big data is data that is of such volume, variety and velocity that an

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organization must move beyond its comfort zone technologically to derive intelligence for effective decisions.

• Volume refers to the size of the data.
• Variety describes whether the data is structured.
Velocity is the speed at which data pours in and how frequently it changes.

Building upon basic graphing and visualization techniques, SAS Visual Analytics has taken an innovative approach to addressing the challenges associated with visualizing big data. Using innovative, in-memory capabilities combined with SAS Analytics and data discovery, SAS provides new techniques based on core fundamentals of data analysis and the presentation of results.

1. **Visualizing Semi structured and Unstructured Data With Word Clouds and Network Diagrams:**

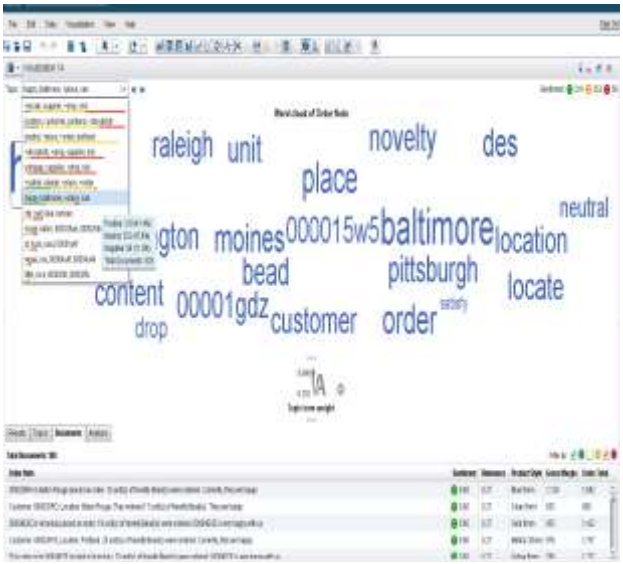
Semi-structured data is data that has not been organized into a specialized repository, such as a database, but that nevertheless has associated information, such as metadata, that makes it more amenable to processing than raw data. Unstructured data has not been organized into a format that makes it easier to access and process.

The variety of big data brings challenges because semi structured and unstructured data require new visualization techniques. A word cloud visual (where the size of the word represents its frequency within a body of text) can be used on unstructured data as a way to display high- or low-frequency words. SAS Visual Analytics takes the concept of word clouds a step further by taking advantage of taxonomies and ontologies to make associations . Words are then organized into topics based on how the words are used. SAS Visual Analytics word clouds can display the hot topics of the day gleaned from such text analysis. Users can drill down by clicking on an individual topic to see exactly what words or phrases comprise that topic.

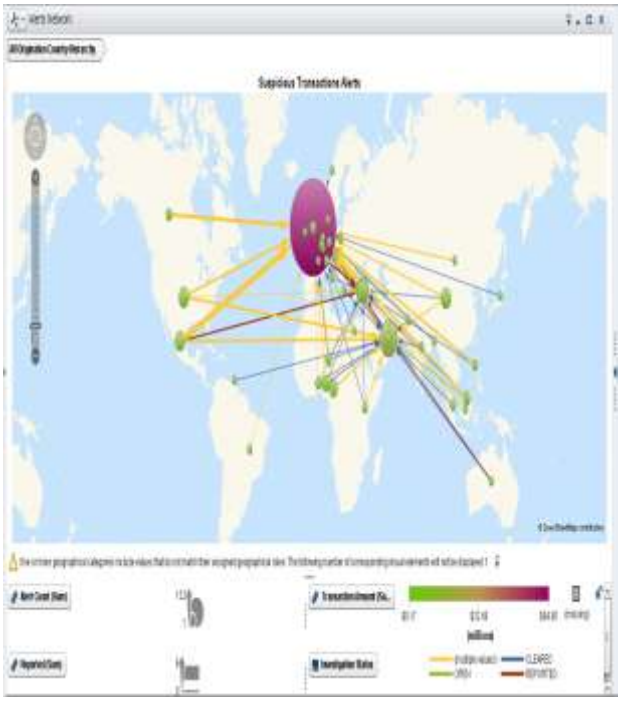
For example, you could use the topic cloud to categorize customer comments on Twitter about your products or services and then click on a topic to drill down to see the actual comments.

While visualizing structured data is fairly simple, semi structured or unstructured data requires new visualization techniques, such as word clouds or network diagrams.

Another visualization technique that can be used for semi structured or unstructured data is the network diagram. Network diagrams view relationships in terms of nodes (representing individual actors within the network) and ties (which represent relationships between the individuals, such as friendship, kinship, organizations, business relationships, etc.). These networks are often depicted in a diagram where nodes are represented as points and ties are represented as lines. Network diagrams can be used in many applications and disciplines. For example, businesses analyze social networks to understand their interactions with customers, while counterintelligence and law enforcement might map a clandestine or covert organization such as an espionage ring, an organized crime family or a street gang. You can also superimpose the network diagram on a map, for example, to show the relationship or product sales across geographic areas.



Figure(3) : A word cloud shows the words or phrases associated with a topic,Units



Figure(4): Network diagrams explore relationships within a data set, including connections across geographic areas

2. Filtering Big Data:

When working with large amounts of data, being able to quickly and easily filter your data is important. What if you only want to view data for a certain region, product line or some other variable? SAS Visual Analytics has filtering capabilities that make it easy to refine the information you see. Simply add a measure to the filter pane or select one that's already there, and then select or deselect the items on which to filter.

But what if the filter isn't meaningful or it skews the data in undesirable ways? One way to better understand the composition of your data is through the use of histograms. Histograms provide a visual distribution of the data along with cues for how the data will change if you filter on a particular measure. Histograms save time by giving an idea of the effect the filter will have on the data before apply it. Rather than relying on trial and error or instinct, you can use the histogram to help you decide what to focus on.

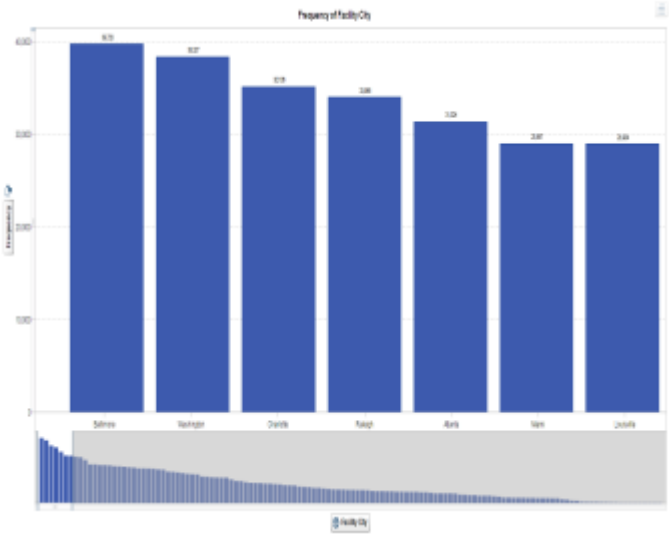


Figure (5): An overview axis bar chart shows the high cardinality in big data more clearly. You can scroll through the entire chart.

B. Scientific visualization:

generally, the visualization of scientific data that have close ties to real-world objects with spatial properties. An example might be visualizations of air flow over the wing of an airplane, or 3D volumes generated from MRI scans. The goal is often to generate an image of something for which we have spatial information and combine that with data that is perhaps less directly accessible, like temperate or pressure data. The different scientific fields often have very specific conventions for doing their own types of visualizations.

C. Information visualization:

It also a broad term, covering most statistical charts and graphs but also other visual/spatial metaphors that can be used to represent data sets that don't have inherent spatial components

C. Info graphic Visualization:

a specific sort of genre of visualizations. Info graphics have become popular on the web as a way of combining various statistics and visualizations with a narrative and, sometimes, a polemic.

E. Visual Analytic:

The practice of using visualizations to analyze data. In some research, visualizations can support more formal statistical tests by allowing researchers to interact with the data points directly without aggregating or summarizing them. Even simple scatter plots, when the variables are chosen carefully, can show outliers, dense regions, bimodalities, etc. In fields where the data themselves are visual (e.g., medical fields), visual analytics may actually be the primary means of analyzing data. The process of analyzing data through visualization is itself studied by researchers in the visual analytics field.

IV. CONCLUSION

Visualizing data can be both fun and challenging. It is much easier to understand information in a visual compared to a large table with lots of rows and columns. However, with the many visually exciting choices available, it is possible that the visual creator may end up presenting the information using the wrong visualization. In some cases, there are specific visuals you should use for certain data. In other instances,.

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