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Intelligent Data Envision: Realtime 3d Visualization Using Power Business Intelligence and Virtual Reality Plots

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Abstract: This paper highlights the proposed advancements in Virtual Reality data interpretation using generic Data Analytic tools, incorporating Microsoft Azure Power BI, Unity and Unreal Engine and mount it using Valve Steam platforms, that enables the data scientist to initialize models based on live datasets, and the user obtains an immersive representation of the scenario in discussion, being able to relay the requisites to the specified model by directly interacting with it. The interaction takes place at its intricate level using the Leap Motion Sensor and Oculus Rift/Microsoft HoloLens headgear. The base data has been entered through biometrics or manual entry, along with the content of pre-fed form data that has been used over the base model creation using Power BI. Interactive manipulation of a single characteristic parameter determines the exact data parameter to be pinpointed and focused on every individual plot.

Keywords: Augmented Reality,Power BI-Business Intelligence, Virtual.

I. INTRODUCTION

Virtual Reality has the newest venture into data visualization and interpretation. It provides us an immersive natural interaction and facilitates analysis of multi-dimensional data in an ingrained way. Functions and classes in MATLAB and R can be used to interact with Virtual Reality frames. Using Simulink 3D Animation VR-object and VR-node is created as an access to the virtual world. Alterations in the degrees of freedom is possible by parameter specificity and interoperability facilitated by the above tools mentioned along with Unity and R. Object methods play a pivotal role in regulating the FPS of the live project, that enable active user interaction. VR scenes contain sensors, which are connectors that generate time dependent output values of events, navigation, actions and change of distance in the scene. Sensor field values are read into simulation models by Simulink 3D Animation functions and feed-forward interaction of the user with the virtual scene. S function in MATLAB plays a role in the configurational mapping as well. This paper discusses and verifies the capabilities of Augmented Reality and Virtual Reality and their application in the field of Big Data Visualization. Explorations are vivid and even involve the possible implementation of mixed reality and to address the challenges of these platform integrations.

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II. REVIEW OF LITERATURE

Data analysis in the typical 2D format, comprises of numbers listed in a spreadsheet or grouped in a pie chart, there's a limit to how much information we can actually take away and use for planning, making decisions, targeting customers, etc. Intelligent solutions provide a varied insight, details buried in numbers is the target to uncover. [**1]**Visualizing data non-conventionally empowers human cognitive processes enabling us to see more than traditional representations. As per the standard industry scenario we have a very few fully 3D models and visual representations, and the society has limited approach towards dimensions of user interaction in all possibilities of gestures for users with varied motivations and experience. This paper creates a completely new viewpoint of graphical interpretation with better analysis of regressions than ever before and the instructiveness of valley, plateau and depressions with most refined standards.

III. REASONS FOR USING VIRTUAL REALITY FOR DATA VISUALIZATION PROCESSES

A. Distraction reduction

Focus of entire field of vision, concentration on the objective. Scale of data is no more a mere numerical value, it's a relative comparison parameter, in VR plots.

B. Playground of analytics

360-degree sphere of spatial representation is to aid virtual reality display terminal for display of accurate nodal values of each terminal.

C. N-ary multidimensional analytics

Primary sight supported by hearing supplements induced virtual feeling adds to the dimensionality of data-audio, data-video, audio-video relationship models added to the static data representation. Loudness, pitch, directionality related gradient of observation also plays a vital role. Using multiple senses, technically within bounds of possibility to 'feel' data.

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This is achievable right now with haptic feedback gloves or touch controllers, controllers of the oculus rift or touchless control of the leap motion sensor.

D. Bandwidth vs processing parameters

Human optic nerve is capable of transferring information at about 1 MB/s. Simple reading utilizes only 0.1% of this capacity. This has improved with visualization techniques over the years, but still it is from a 2D screen. Engaging the brain and full optic bandwidth is done by the immersive experience of 3D data simulation carried out using Virtual Reality.

E. More natural interaction

Real world object interaction is using human hands. This enables a deeper understanding of objects in its natural environment. Gone are the days of limiting input to keyboard and mice with introduction of touchless controllers. Virtual reality, is the most natural way of interaction with physical push buttons, moving windows around and manipulating data streams related to physical interaction and related analysis enabling us to walk around and through data worlds. These can facilitate employee efficiency improvement programs, deeper analysis of data and faster decisions.

IV.CHALLENGES ON FIELD AS TEMPORARY BARRIERS

Some hindrances to Virtual Reality data interpretations still exists although improvements to overcome them are very drastic. The resolution of headsets needs improvement in text stability for better legibility and comfortability of the client, whereas eye strain and nausea still have an issue for a population segment.

The Oculus Rift, HTC Vive, Google Daydream are the most advanced commercially available headsets suited for the purpose.

We are building VR data visualization not just for the sake of it but tend to use Virtualistics to take advantage of VR's strengths. Thereby we plan to offer the most improved way of interacting, analysing and manipulating data, ever explored before. Hardware development and exploration of new parameters everyday makes it a matter of time for realization of data visualization and interpretation in virtual reality.**[2]**

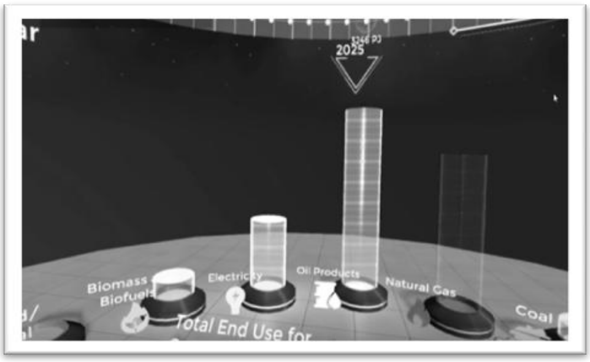
V.MAPPING 2D FUNCTIONS TO 3D FUNCTIONS FOR VISUALIZATIONS OF PLOTS

3D to 2D conversion uses a box product of vectors. The Scalar triple product of three vectors namely the x, y and z axes would geometrically represent a 3D voluminous region. 3D Kernel functions are widely used in classification of items by a hyperplane in the case of SVM. They perform the conversion.

Mesh-grid acts as the unit into which the input from the 2D plot regarding the x and y coordinates is fed which creates a rectangular solid grid like structure using two arrays containing x and y values respectively.

Function visualizations are achieved in the form of multimedia responses such as an image using a rectangular contour. The array values for x and y coordinates of mesh grids are derived by sampling of the characteristic function. It allows for data point extrapolation and deletion of the data points through interpolation. Mapping functionality from 2D to 3D modelling is then made possible.

VI. VISUALIZATION TECHNIQUES



Graph 1.1 (a & b): Samples of the 3D interaction model depicting leave records

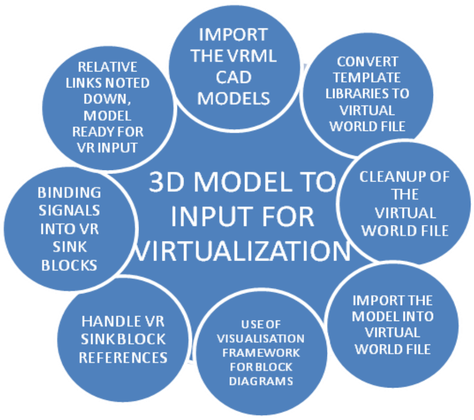


Fig. 1: Network Diagram to enable 3D Model to Virtualization input

A. Raw data set to visualization

After collecting the necessary data set for analysis, we ask appropriate questions about the data set essential to analyze the data to provide some idea and avoid going into false positives. Later, we experiment with subsets of the dataset and variables that make the most sense to the questions developed earlier. Now, we explore the various trends that are followed by the data set in specific intervals using charts in Excel or using libraries such as matplotlib in python. The right chart for visualizations is essential to avoid misinterpretation of the data.

B. Data to be visualized can be of different types

- **Categorical (nominal) data:**

Data that can be placed in categories according to specified characteristics and are not related numerically.

- **Ordinal data:**

Data that is ranked or ordered according to some relationship with one another and have a natural ordering despite being categorical.

- **Interval data:**

Ordinal data but with constant differences between observations having no true zero is said to be interval data.

- **Ratio data:**

Continuous values that have true zero point and the ratios are meaningful. Different charts that can be plotted to analyze the trends in data even in VR: Column Chart, Line Chart, Pie Chart, Area Chart, Scatter Plot, Box plot, Doughnut Chart. **[4]**

VII. CONVERTING 3D DATA MODEL INTO THE VIRTUALIZATION INPUT:

Importing the non-VRML CAD models is the primary task. STL are initially converted to the virtual world file. The converted, VRML file has the same identifier as the STL. Secondly a clean-up is carried out in the virtual world 3D file which contain the exported models. Thereafter the 3D file is imported into virtual world file. Finally, the visualization framework may be used to construct the block diagrams. The relative links between Simulink and the virtual world 3D file is noted. The 3D model after undergoing all the previously mentioned procedures is supplanted into the VR environment as the input for the visualizer and this enables an incongruous 3D model being used as the input for the visualizer in the VR mode of analytics.**[5]**

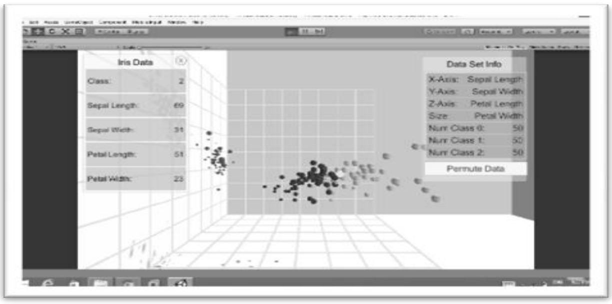
VIII. DATA MODEL DETAILS OF THE SAMPLE CONSIDERED IN RESEARCH:

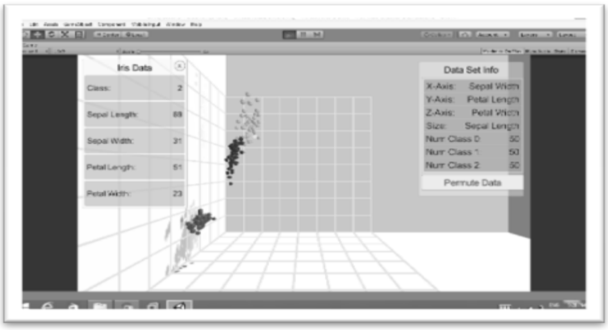
The data model considered for representation of the tabulations, follows, diagrams and connection refer to a sample data obtained from a local freeware with appropriate validations, that showcases a company A with a very large employee field of X pool with the parameters exceeding 2.5 lakh tuples, with the density distribution collected over a large geographic area and a relatively larger timeframe. The consideration of the frame taken for analysis consists of the employee leave records of the same institution for a year, 2017. For Privacy norms and security protocol safeguards, the company names, employee names or contact and address have all been masked appropriately and all those used in place of those data columns are fictionalized and proper care has been taken of the data integrity which has been verified for completeness manifolds.

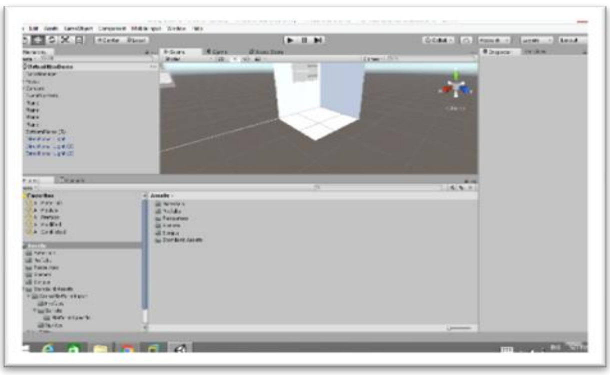
A. Using Power BI andUnity for VR:

Tabulations generated in Microsoft Power BI.

Mail the correspondence author for a temporary login to view details of the charts, tables and analysis carried out.







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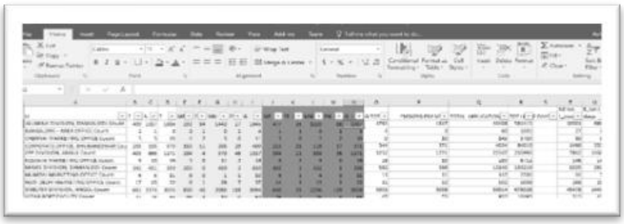
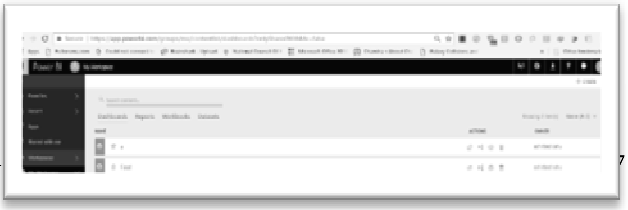
Graph 1.2 (a, b & c): Data model, depicting similarity to leave records analysis and plotting a 2D to 3D and casting it into VR, here represented by the test IRIS Dataset.**[6]**

Table 1.1 (a & b): VR Plots from Unity Playground Environment for Employee Dataset

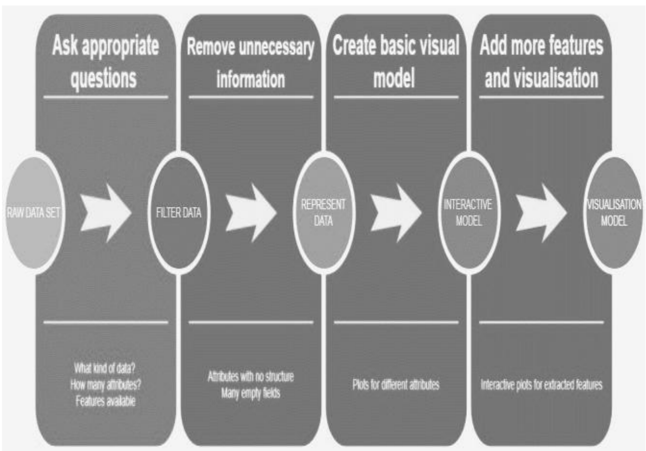




Graph 1.3: Data model design Unity/Unreal based Microsoft PowerBI.**[3]**

IX.INTEGRATION WITH REALITY:

Human brain has limited perception of vision , visualization process takes a toll on cost, time, and health. Interpretation is essential with proper wearables. AR/VR is the optical see-through head-mounted display that can reveal simple three-dimensional models in real time. Oculus Rift has brought its use into education, military, medicine and data analytics. This embeds virtual content into the physical world. Visualization, Navigation, scaling in 360 is more impactful. Focus on dynamic projection and interactive filtering in combination with motion recognition tools is solving 3D-visualization contrary to flat projections in order to produce a visual model. The final model will be one in which we can have exploration from inside as well as an overview from top. Use of Leap motion and MYO Armbands prove to supplement exploratory tools. If deformities pertaining to accurate vision is ignored, then the visual cortex in the brain has retinal size less than 1 % which captures two degrees of the vision field, which stays the most considerable for text and object recognition, being supported with Peripheral vision which is responsible for events outside the centre of gaze. Variety of perception in big data slightly depends on age, visual cortex, gender and geography as well. It is significant to discuss current visualization challenges to support future research where there is a trade-off between screen clarity and balancing utilization of CPU-GPU power.



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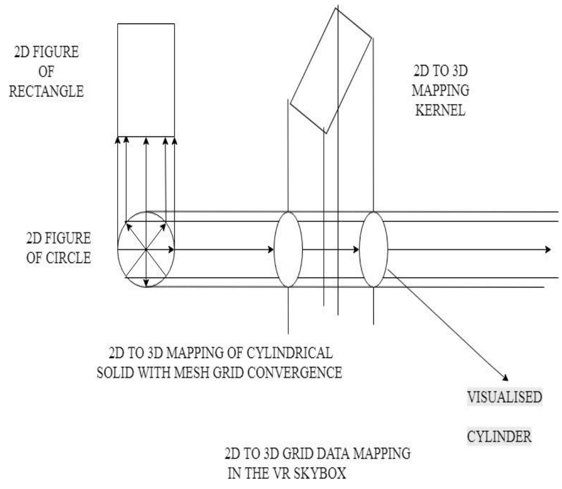

Fig. 2 (a & b): Basic principles to arrive at visualization model from raw data sets after filtering for interactive representation

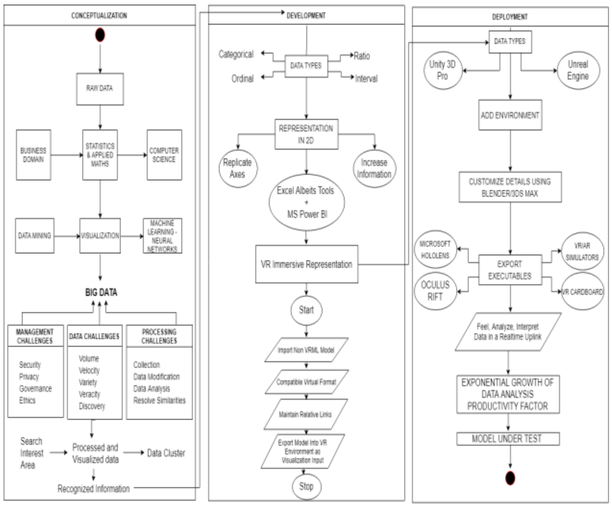

Fig. 3: Full System Architecture Diagram

X. FUTURE RESEARCH AGENDA AND DATA VISUALIZATION CHALLENGES:

Visualization redefines the understanding of preselected information to a naïve user. Exploration of images in 3D has an advantage of dimension over 2D. Here we overview important challenges and possible solutions related to future agenda for Big Data visualization with AR and VR. App development is necessary to create interactive system with scaling; navigating in visualized 3D space; selecting sub-spaces, objects, groups of visual elements, manipulating and placing; planning routes of view; generating, extracting and collecting data. Effective gestural and voice interaction implementation is not simple and needs machine learning systems. They help to define basic intuitive gestures for general or medical purposes. In HMD's disadvantage of hand-tracking input is that there is no tactile feedback, the interface should be redesigned or reinvented in order to simplify user interaction of instruments and objects to prevent mismatch of the real view scene and computer-generated objects. Perception and cognition impact human brain performance where the user's ability to recognize and understand the data is a central issue. Simplicity in information visualization has to be achieved in order to avoid misperceptions and cognitive overload improving performance by motion prediction. The human eye is capable of recognizing many levels of brightness, saturation and contrast. High resolution and minimum granularity would bring in more comfort to head mounted displays. Standard processes of visualization also need to be implemented. Benefit of MR approach is human experience improvement where visualization allows convenient access to huge amounts of data and provides a view from different angles with smooth navigation. Tangibility and verbal interaction minimizes perceptional inaccuracy in data analysis, making visualization powerful at conveying knowledge to the client end. This improves decision making.

XI. CONCLUSION

Big Data consumes memory and processing, visualization of such data takes time, still we have elicited methods of classification and have suggested the modern tendency towards visualization-based tools for business support and other significant fields using VR and AR with advantages, disadvantages and possible optimization strategies. Visualization associates human perception and limited cognition but field of design can provide more efficient and useful ways to utilize Big Data by use of multitude of sensors, a zero-touch interface, wireless networks and blade servers all in its implementation stage to bring in that expected end user satisfaction and extreme product benefit in fields of data analytics exploring a new era of possibilities. Envisioning of data through the means of VR enables us to add new dimensions and possible ways to find extreme values and measure the variance in data. VR can help us spot the correlation between the data and further implement the data model by envisioning the data in different dimensions.

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