Plug-in based System for Data Visualization

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Abstract – *Data Visualization is the combination of art and science. It is seen as a branch of descriptive statistics. Data visualization is a very new and promising field in software engineering. It is a graphical representation of the data that best conveys the complicated ideas clearly, precisely, and efficiently. Effective visualization helps users to analyze and reason about the data and evidence. It makes tedious data more accessible, understandable and usable.*

One of the main goals of data visualization is to give support in making quicker decision through appropriately designed graphically represented information. Sophistically-designed data visualization systems can greatly assist users with proper reasoning and decision making. Usually, visually presented data is easier to understand. This project's main objective is to provide a plug-in software for data visualization, which is developed using plug-in based architecture and will be adaptable for future changes and updates. These plugins will Allow user to process on different types of files (excel, html, txt, csv etc.)

Key words: Data Visualization, Plug-in architecture, Spring boot.

1. INTRODUCTION

In today's world it is very important and hard to interpret the huge chunks of data in the industry. Reading Data in the raw form is very tedious. So there has to be a better way to read this data. This Data visualization tool will help to read such data in better way understanding.

Visualization can be considered as an excellent medium to analyze and share information.[1] The objective of this project is to create an easy and reliable system for Data Visualization, provide a plug-in architecture software which will be adaptable for future changes and updates, allow user to process on different types of files (excel, html, csv etc.), provide rich, interactive visuals, show the story of user's data and make it easy to share insights, to give single-output file to download.

Data visualization also helps in detecting problems perceiving trends and outliers and also point out absorbing in a large dataset [6].

2. LITERATURE REVIEW

Datawrapper : It is a web-based visualization tool which is used to create simple charts and maps for web articles. It allows user to insert xml, csv , xls files and provides multiple charts for visualization.[8]

Tableau Software: - Tableau is a commercial tool used for data exploration; it uses interactive visual dashboards to represent data and facilitate the exploratory data analysis process.[7] The user can gain knowledge with their data, by creating charts, graphs, maps and many other graphics.

RAW :It is a web-based tool that allows user to simply paste the data and visualize it in graphs. The Raw is based on the D3.js library, which makes the user to easily accessible, so that the non-programmers can also visualize it .[9]

3. SYSTEM ARCHITECTURE AND IMPLEMENTATION

To build plug in based application it is required to have loose coupling between classes. Loose coupling can be achieved using interface. [5] The goal of the plugin is to read the data from different file formats. To achieve this, Reader Interface is created which has an abstract method call as Read(). Purpose of read method is to read data from file.

Each plugin has to implement this Read() to read data from file and create the json string out of it, now whoever wants to build the plugin (jar) to read different file format will have to implement this reader interface and implement its read method. This method will now hold the logic to read the data from the corresponding file format Plugin will also have a metadata file (txt) file. Which will indicate which type of data it is able to read and which class is implementing the reader interface. Once plugin is ready it can be added into the application.

Multiple plugins are available in the application so in order to maintain loose coupling between clients and all these different plugins Factory design pattern is used. When client/user uploads a file on to the application this Factory pattern identifies the file type and calls corresponding plugin.

The output of this architecture is a JSON file which will be hosted as webservice. Different visualization patterns are presented to user on User Interface. By selecting those, user can visualize corresponding data and also can generate report.

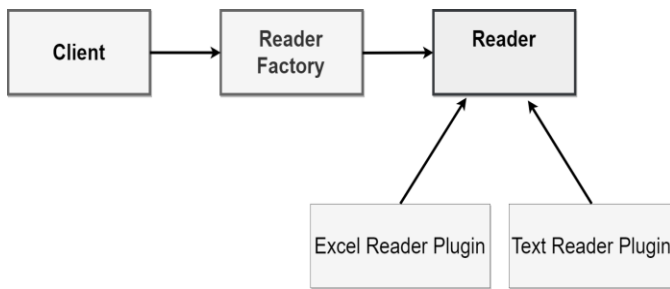Framework : Spring boot

IDE : Java Eclipse

Fig -1: Block Diagram of Plugin Architecture

How to create new plugin for the system

Plugin is nothing but a jar file. In this system each plugin represents input files of different formats and responsible for extraction of same. This plugin (Jar file) should contain a class which has to implement Read method from Reader Interface. This class will hold the logic for extraction of data. For example, Excel plugin
will have a class called Excel Reader which implements Reader Interface and hold the logic for extraction of excel data.

Plugin should also has a metadata (text file) file which indicates type of data it is able to read and which class is implementing the reader interface. For example, Excel-plugin will contain following information:

file Type=xls, xlsx
class=com.formatter.service.reader.Excel Reader
 To add new plugin to the system simply add executable jar file in the resources.

System Workflow

- Insertion of file.(fig 2)
- Through the controller file directed to Reader Factory.
- Reader Factory identifies file type and calls corresponding plugin by checking its type with type mentioned in metadata file of respective plugin.
- Plugin extracts the data from respective file and architecture converts it to JSON.
- Now webservice hosts the JSON file which has a data extracted from users input file. Visualization patterns gets the data by hitting webservice and visualize it.
- System allows user to add description for visualization.(fig 3)
- Also provides various visualization patterns, (fig 4) which are editable and allows to download in various formats (jpeg, png, pdf, etc.)
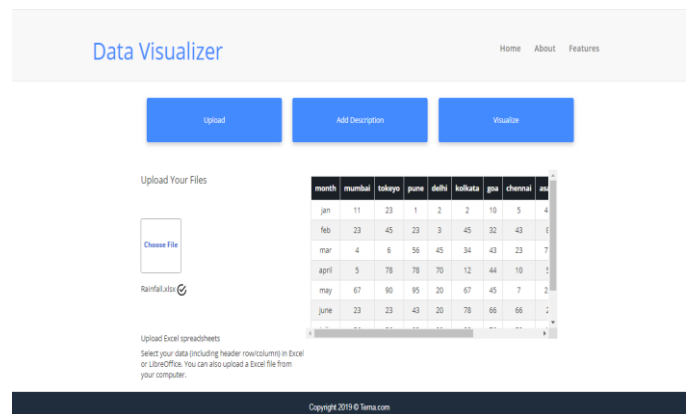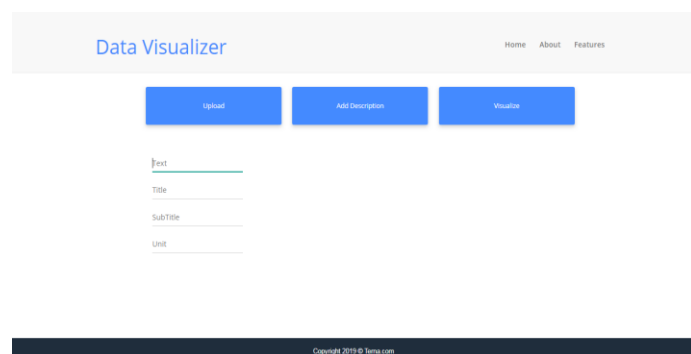

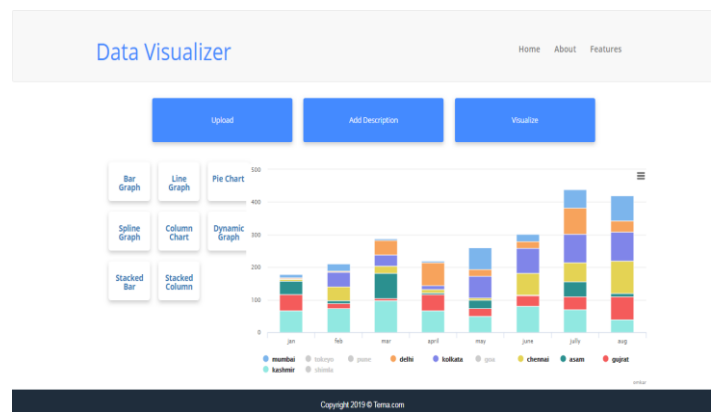**Fig -2**: upload file

Fig -3: Add Description

Fig -4: Visualization patterns.

4. SCOPE

As the world turns out to be progressively interconnected and associated, chances to create an incentive through data visualization will only increase. The Internet of Things will profoundly affect the job that data visualization can play in associations and society, improving our capacity to see how people and machines collaborate with one another and nature. Application of evolving cognitive frameworks, like Network and Complexity Theories, will help us better reflect dynamic and intricate structural dependencies. Also,

advances in multidimensional visualization will allow us to more viably blend and explore spatiotemporal conditions. The definition of data visualization explains the importance of the data by placing the data in terms of visual context [4]. It enables decision makers to see analytics presented visually, so they can learn difficult concepts or identify new patterns. With intelligent visualization, you can also drill down into charts and graphs for more detail, interactively changing what data you see and how it's processed.

While we'll always wax poetically about data visualization there are practical, real-life applications that are undeniable. And, since visualization is so prolific, it's also one of the most useful professional skills to develop. The better you can convey your points visually, whether in a dashboard or a slide deck, the better you can leverage that information.

5. CONCLUSION

A plug-in based application for Data Visualization is a system which extracts the information from the files provided by user and allows user to visualize it in various attractive patterns. The system is flexible enough to accept different input file formats as per the plug-ins added onto the system.

The great thing about system is that it doesn't require any technical or any kind of programming skills to operate. By using this system user can easily visualize and create reports to share with teams. Effective visualization helps users to analyze complex data efficiently.

A plug-in based application for Data Visualization is a data visualization solution that enables users to import data and generate powerful visuals that are easy to understand and derive insights from.

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