Real Time Data Visualization

Introduction

The ability to observe natural phenomena and collect data on them allows informed decisions to be made. Advancements in computing technology have enabled data to be collected at higher rates, stored more efficiently, and shared with others more easily. However, large amounts of quantitative data may not be helpful unless it is thoughtfully organized and presented in a way that allows humans to make inferences on the data set. Data visualization software makes is possible to quickly translate large datasets into a graphical representation that can be more easily interpreted and understood [1]. This technical review summarizes some commercially available data visualization tools, explains some of the best practices in the underlying technology, and discusses the implementation of data visualization technology.

Commercial Applications of Real-Time Data Visualization

Data visualization tools are relevant in any industry that can be analyzed quantitatively. This paper will focus on data is useful when reported and visualized in real time. Real time visualization can be used in financial markets, medical data monitoring, and monitoring music audio characteristics. Tableau is a tool that can be adapted for use in many industries depending on their specific needs and an individual subscription to their services currently costs $70 per month [2,3]. Tradingview.com provides tools that are used to visualize the trends in trading pairs of different assets including stocks, commodities, and cryptocurrency. They offer tiered subscription services with their most popular package including intraday charts, intelligent analysis tools, and optimized data flow for $19.95 per month [4]. Ableton Live is a software used for music recording and performance. The latest version of Live allows users to monitor audio, apply effects, and analyze the changes in order to make changes regarding a performance. This product comes in several editions with the most basic version beginning at $99.00 [5,6].

Technology Used in Real-Time Data Visualization

Data visualization software can be written in many different programming languages depending on the application. The nature of data visualization requires using a programming language that can render a graphical user interface. Many data visualization tools are designed for use on multiple platforms and utilize Python, PHP, Java, Javascript, .NET, C++ depending on the application [7]. This allows tools to be used on mobile devices, desktop computers, and various web platforms. Cloud computing allows data to be stored on servers that the end user does not have direct access to. In this case, the visualization tool must be able to interface with relational databases and services like Amazon Web Services. Web APIs are used to integrate the various services used to locate and return the data a user is requesting.

Building Blocks for Implementation

Both hardware and software are required to utilize data visualization tools. The programs written must be able to receive data from a query or direct input and send them to a display according to a user's preference. For applications that are time-critical (music, medical), the hardware must run at a sufficient clock speed to render the data on a display.

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