“MATHEMATICAL VISUALIZATION TOOL”

LBYEC2B - EB4

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I. INTRODUCTION

Mathematical analysis and statistical identities have been utilized throughout the evolution of modern technology, which helps people identify, compute, and apply types of numerical understanding. This study dives into the Mathematical Visualization Tool's multiple features, emphasizing its distinctive capacity to visually explain trigonometric functions and their associated ratios. Users can dynamically plot sine and cosine, using its user-friendly interface, providing a real visual depiction of these essential trigonometric connections. Furthermore, the tool allows users to appreciate the complex interplay of angles and statistical proportions. Given the various devices that separately calculate a specific complex equation, plots, and statistics, students, researchers, and practitioners often have to switch between devices to examine trigonometric relationships and execute statistical calculations. This disconnected approach not only hinders productivity in the workflow but also restricts knowledge depth by preventing an effortless transition between displaying trigonometric concepts and evaluating statistical data (Carstens, 2021). The Mathematical Visualization tool combines all of those cases into a single device to analyze trigonometric ratios and statistical characteristics with exclusive clarity and accuracy.

Given its features, there are limitations/ constraints with regards to its functions, not all equations and visualization can be satisfied to its full extent. In comparison to more specialized programs in other mathematical areas, it might not offer the same depth of capability. In light of that, The mathematical visualization tool focuses mainly on common mathematical topics of statistics, trigonometric functions, and basic numerical solving. This study aims to reveal the many features

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of the Mathematical Visualization Tool through extensive analysis and exploration, providing a full knowledge of its function in strengthening mathematical comprehension, visualization, and statistical analysis (MITTAG). Furthermore, the development and validation of a comprehensive platform that not only shows trigonometric concepts with simplicity and accuracy but also effortlessly shifts to statistical analysis of datasets. Users would no longer have to switch between numerous apps if these various functionalities were combined into one coherent tool, speeding their computations and encouraging a more cohesive approach to the study of mathematics.

II. OBJECTIVES

1. To generate an efficient mathematical tool by solving different types of mathematical functions such as trigonometric functions and algebra expressions

2. To determine the location of a certain point on a trigonometric ratios

3. To determine statistical graphs and quantities of a certain function of its mean, median, and mode.

III RELATED WORK

Desmos is a graphical and scientific calculator that provides users assistance to calculate a mathematical problem. Desmos was launched in 2011, the website application aims to graph and solve problems that involve mathematics. Until now, Desmos is still running online.

With that, our team has decided to make a similar software like Desmos. The program application is called "Mathematical Visualization Tool." Where it involves solving graphical, statistical, and mathematical problems. This application has a different interface with Desmos. However, the objectives and goals of both program applications are not the same.

IV. METHODOLOGY

Team Demeter implemented a 5-Phase plan in order to complete the code. Given the complexity of creating the Mathematical Visualization Tool, the team set the parameters of the program in order to not set an unattainable objective and then they began with the flowchart crafting. The 5-Phase plan is as follows:

Phase 1 - Flowchart

Create a flowchart to streamline the code creation process, the flowchart will define the parameters and objectives of the program, in this case, it will show what mathematical functions it will visualize and show what the required output is.

Phase 2 - Initial code framework

Create the “skeleton” code for the program, adding basic functionalities and adding a safety net for cases like user input errors and math errors.

Phase 3 - Supplementary coding and testing

Create the code for separate cases that the user may want to input or not, namely, graphing functions of y up to the 4th degree, identifying statistical means, median, mode, standard deviation, and variance. This will also be the start of the testing phase, identifying whether or not the specific cases function correctly; a sample input will be placed and the team will check to see if the sample output is displayed in the program.

Phase 4 - Debugging

Once the code is around 80% complete, the team will look for any bugs by using more sample input and comparing the results of the program to the projected output. If there is an error, the team will identify the problem by running through the flowchart again and seeing if there are any errors along the way. This phase may be integrated alongside Phase 3.

Phase 5 - Finalizing Code

Once the program provides the correct projected output from each sample input, the team will assess if the program is completely free of any major bugs. Once this is attained, the team will work on general UI and some finishing touches assuming there are some additional cases for certain functionalities. The code will be run a few more times before being deemed complete. Additionally, a user manual will be created during this phase

V. RESULTS AND DISCUSSION

From what can be observed in the demonstration phase, the program has met the objectives of the project. With the user-friendly interface, the functionality of the Mathematical Visualization Tool has achieved its role to serve as an assistant to users.

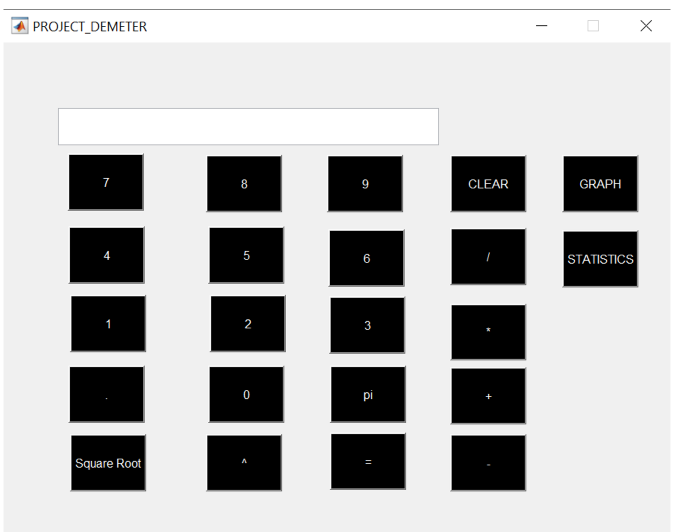

Figure 1.1

Figure 1.1 above shows that the Mathematical Visualization Tool has a calculator program that calculates simple mathematical problems. Its functionality achieves the objective of providing an answer to users who are seeking to solve a simple mathematical problem.

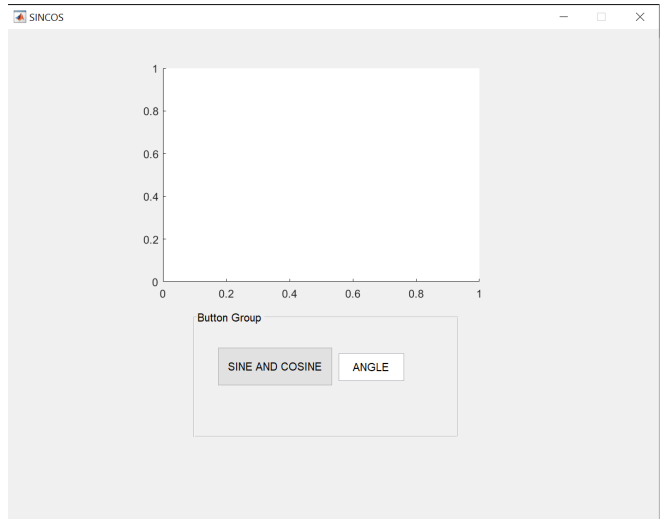

Figure 1.2

While for Figure 1.2 it provides graphical visualization to users. The Sin and Cosine function provides graphs to users who want to have a visual representation of their graphical problem. This means that the program has provided the users with a graphical answer.

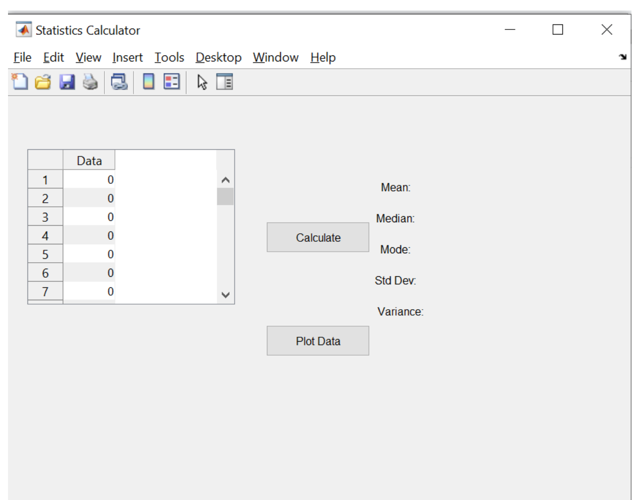

Figure 1.3

In Figure 1.3, the visualization tool can provide statistical answers. The program can calculate the user's statistical problem. This function in the program will help the user to have an answer statistically.

Overall, the Mathematical Visualization Tool has achieved the objectives of the project. It provides the user's assistance in solving mathematical problems. The features and functionality of the program application will allow the user to solve problems without difficulty.

VI. *CONSLUSION AND FUTURE WORK*

The Mathematical Visualization Tool was able to accomplish all the objectives it was set out to do. However, some improvements could be made to the application. For future work, the GUI could be improved to have better and more strategically placed elements, especially in the statistics calculator. Additionally, the application could utilize an update on its code to be able to graph basic linear functions (i.e. y = mx + b) and show functions of sin and cosine.

Another suggestion for future work is to expound on the functions of the applications, such as being able to read external data for statistics, a way to graph 3-dimensional functions, and customization of the graphical elements when plotting a graph.

VII. CONTRIBUTIONS

Miguel Alejandro Aquino

- Planning
- Project Proposal (EVALUATION & CONCLUSION)
- Coding (INTERFACE, PRIMARY CALCULATOR, & LEAD PROGRAMER)
- Project Documentation (RELATED WORKS & RESULTS AND DISCUSSION)

Chielee Willnes G. Arceno

- Planning
- Project Proposal (INTRODUCTION)
- Coding (INTERFACE, TRIGONOMETRIC RATIO VISUALIZER & LEAD DEBUGGER)
- Project Documentation (INTRODUCTION AND OBJECTIVES)

Jose Enrique Mempin

- Planning
- Project Proposal (METHODOLOGY AND DELIVERABLES)
- Coding (STATISTICS CALCULATOR, DEBUGGING)
- Project Documentation (METHODOLOGY, CONCLUSIONS AND FUTURE WORK)

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