

Data Visualization with Gnuplot

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<https://github.com/TKVuBER/pic-wise23-DataVisualization-project>

Problem Statement

- Develop a data visualization that generates charts, plots, and graphs from input data.
- Use of open-source software Gnuplot within a C application (Codeblocks)

A screenshot of the Gnuplot application window. The window has a dark title bar with the text 'gnuplot'. Below the title bar is a menu bar with the following items: File, Plot, Expressions, Functions, General, Axes, Chart, Styles, 3D, and Help. Below the menu bar is a toolbar with icons for opening files, saving, printing, and navigating. The main area of the window displays the following text:

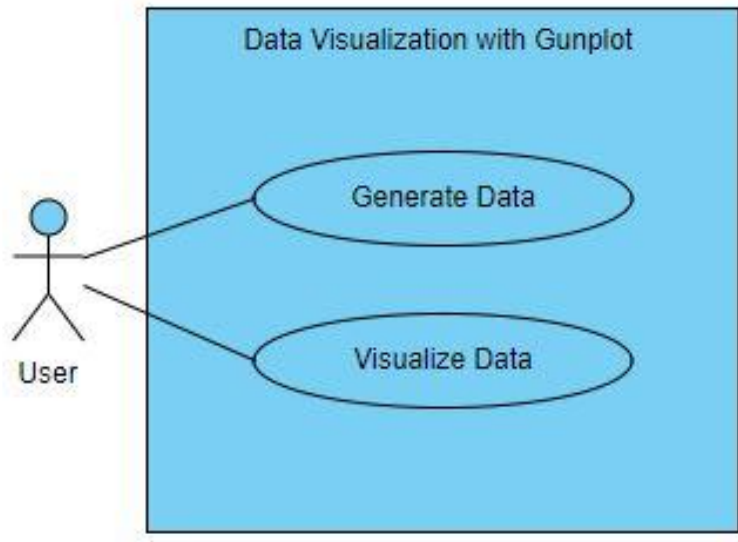
```
GNUPLOT
Version 5.4 patchlevel 8    last modified 2023-06-01

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Thomas Williams, Colin Kelley and many others

gnuplot home:      http://www.gnuplot.info
faq, bugs, etc:    type "help FAQ"
immediate help:    type "help" (plot window: hit 'h')

Terminal type is now 'qt'
gnuplot> _
```

Use Case-Diagram



1. Generate Data:

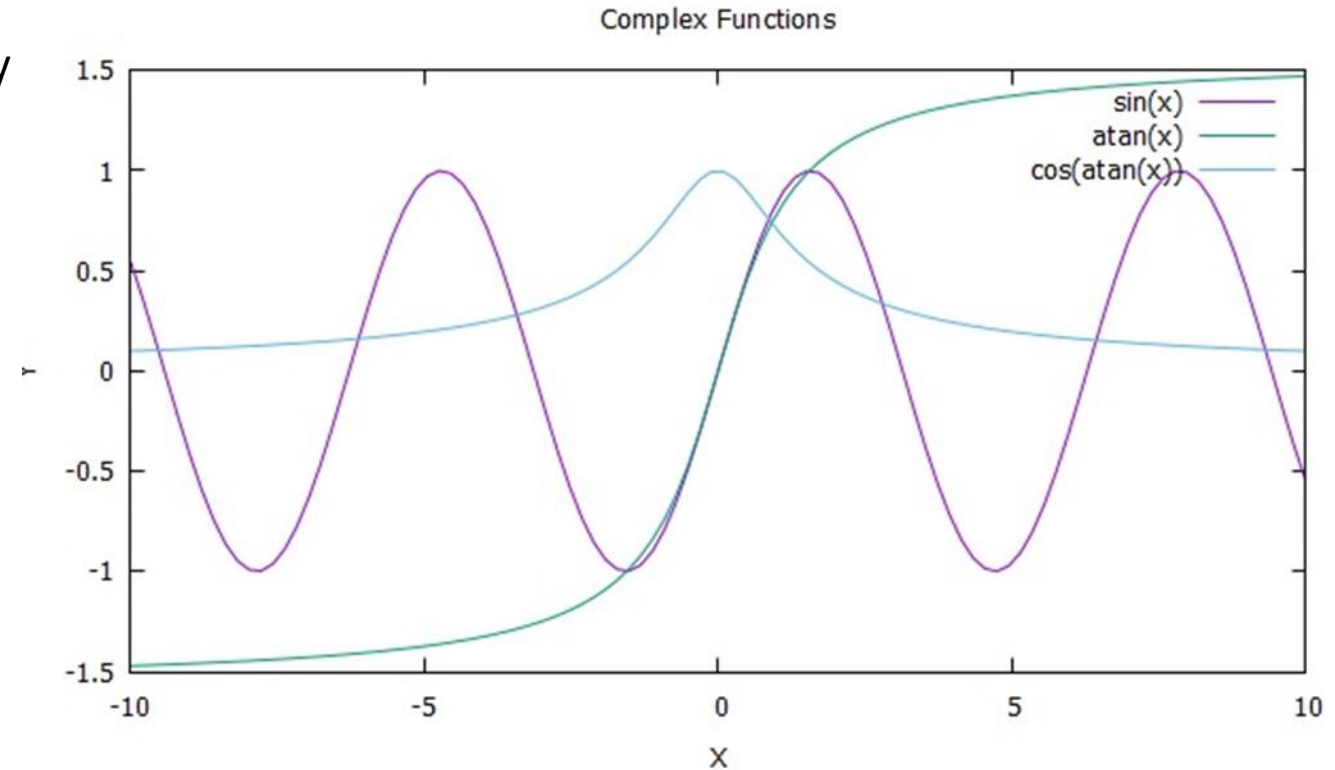
- User specifies data parameters

2. Visualize Data:

- User request data visualization
- System utilizes gnuplot to visualize data

Features and Functionalities

- With a modification of the code, the user can display the desired function
- Enhanced Understanding
- Data Exploration
- Detection of Anomalies
- Decision-Making Support

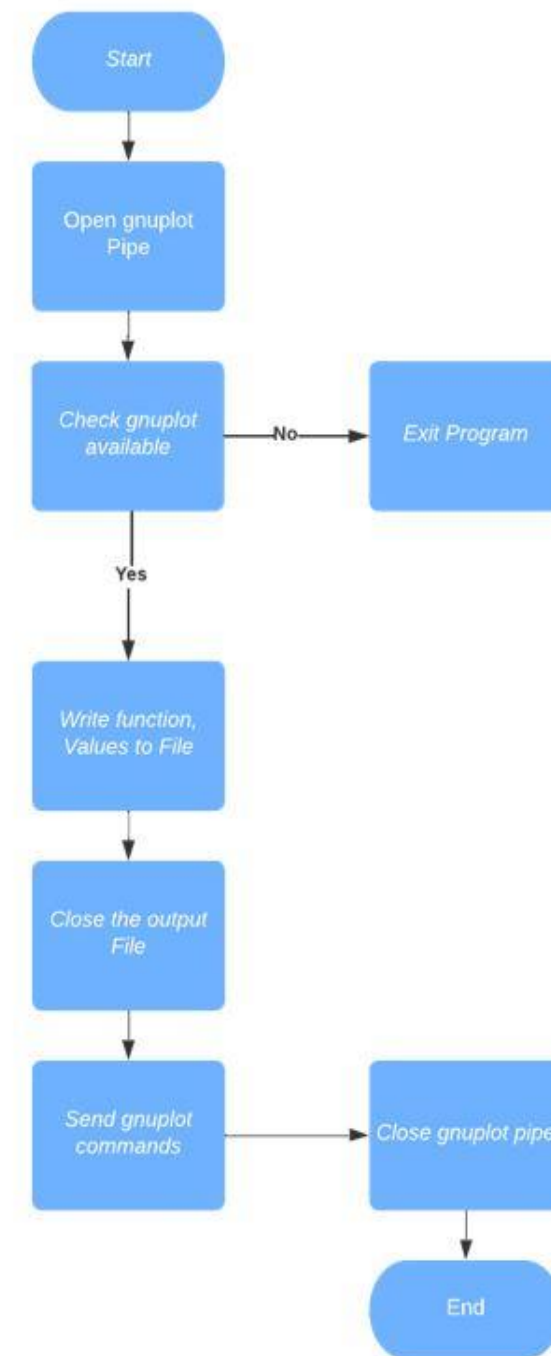


Scheduling Table

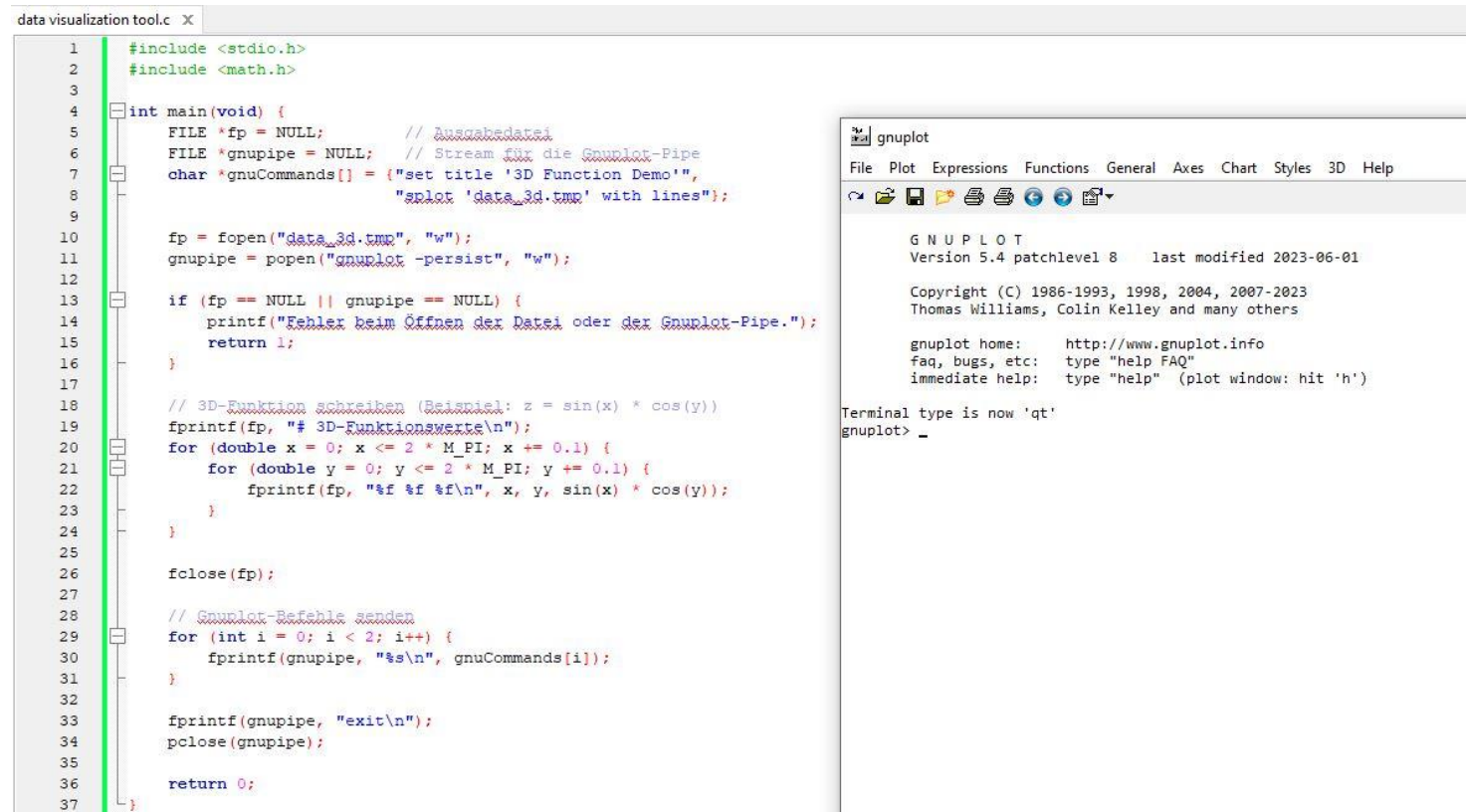
Task	Responsible Team Member	Deadline
Project Planning	Mohamad Kisanieh	30.10.2023
Development	Can Ay Sang-Joon Han Mohamad Kisanieh Trong Khang Vu	07.01.2024
Testing/ Debugging and Refinement	Mohamad Kisanieh Sang-Joon Han	10.01.2024
Documentation	Trong Khang Vu	12.01.2024

Algorithm Flowchart and Technology Used

- Codeblocks 20.03
- Gnuplot ver 5.4 patchlevel 8



Graphical User Interface (GUI)



The image shows a C program in a text editor and a terminal window. The C program, named 'data visualization tool.c', uses `gnuplot` via a pipe to generate a 3D plot. It includes `<stdio.h>` and `<math.h>`. The `main` function opens a file 'data_3d.tmp' for writing, opens a pipe to `gnuplot -persist`, and writes a series of `gnuplot` commands to the pipe. These commands include setting a title '3D Function Demo', plotting the data from 'data_3d.tmp' with lines, and exiting. The program also includes a loop to write 3D function values to the file. The terminal window shows the `gnuplot` version (5.4 patchlevel 8) and the prompt `gnuplot>`.

```
1 #include <stdio.h>
2 #include <math.h>
3
4 int main(void) {
5     FILE *fp = NULL; // Ausgabedatei
6     FILE *gnupipe = NULL; // Stream für die Gnuplot-Pipe
7     char *gnuCommands[] = {"set title '3D Function Demo'",
8                             "splot 'data_3d.tmp' with lines"};
9
10    fp = fopen("data_3d.tmp", "w");
11    gnupipe = popen("gnuplot -persist", "w");
12
13    if (fp == NULL || gnupipe == NULL) {
14        printf("Fehler beim Öffnen der Datei oder der Gnuplot-Pipe.");
15        return 1;
16    }
17
18    // 3D-Funktion schreiben (Beispiel: z = sin(x) * cos(y))
19    fprintf(fp, "# 3D-Funktionswerte\n");
20    for (double x = 0; x <= 2 * M_PI; x += 0.1) {
21        for (double y = 0; y <= 2 * M_PI; y += 0.1) {
22            fprintf(fp, "%f %f %f\n", x, y, sin(x) * cos(y));
23        }
24    }
25
26    fclose(fp);
27
28    // Gnuplot-Befehle senden
29    for (int i = 0; i < 2; i++) {
30        fprintf(gnupipe, "%s\n", gnuCommands[i]);
31    }
32
33    fprintf(gnupipe, "exit\n");
34    pclose(gnupipe);
35
36    return 0;
37 }
```

gnuplot

File Plot Expressions Functions General Axes Chart Styles 3D Help

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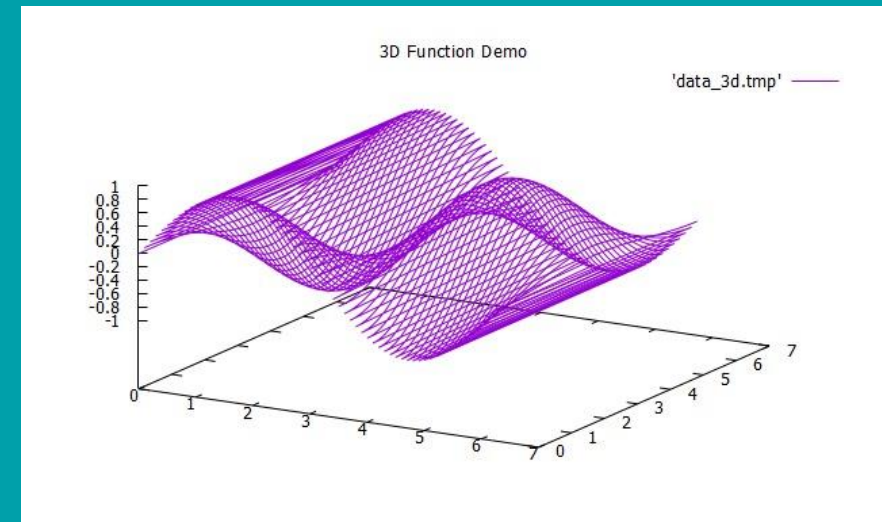
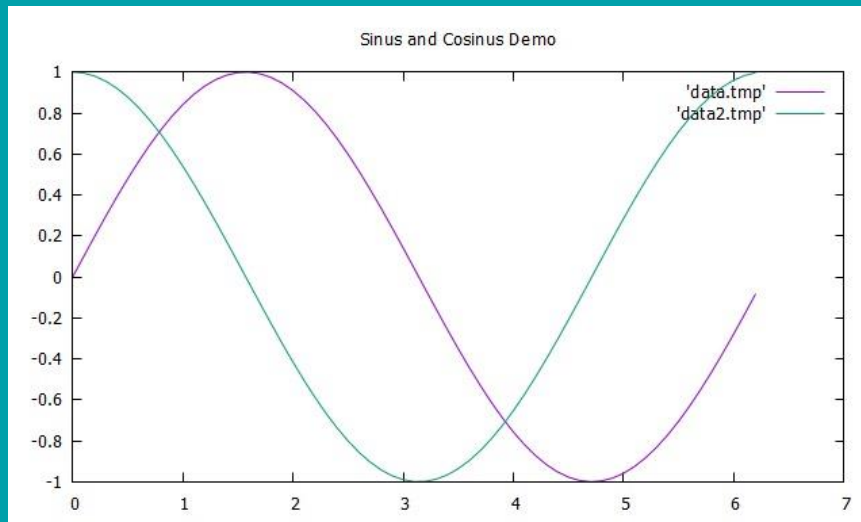
Future Development Plan

- The next step could be to further develop the program by inputting the functions or function values in a separate file.
- The program would then read these values automatically and graphically represent them.



Conclusion

- The realization of this project will create a data visualization tool in C, with applications in various fields, including science, education and data analysis. It will also demonstrate the capability of creating charts and graphs in C and showcase the potential of the Gnuplot library.





Thank you for your attention!

Scources

- [1] <https://pixabay.com/illustrations/question-mark-question-response-1019820/> 14.01.2024