Course Project Documentation

2D Graph Plotter

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Contents:

Introduction

Graphs play a very important role in understanding the basic concepts of various mathematical functions as well as to study their nature .If we are able to plot a graph of any function we can easily get a very precise estimate of the function y=f(x)

Also it helps us to know some more important things. For example, by just looking at the curve we can say exactly whether how many times y attains a negative or a positive value in a certain range. It also helps us to compare between two different functions for a particular value of x.

Finally sometimes functions are too complex to be plotted on graph. For eg, ln(sqrt(cos(tan(x^2+1))).So this creates an urgent need for a precise graph plotter which can easily plot such complex functions and so we came up with our project “2D Graph Plotter”to make our work easier.

Our project is a simple command-language based program which can plot the graph of the function you provide by just clicking on the buttons to enter your function as input. After entering the input, graph is being plotted in no time with a very good accuracy.

Problem Statement

The main goal of this project to understand the nature and shapes of the graphs of some basic mathematical functions. We intended to form complex functions as well.

So our basic aim of making this project was being able to take the input form the user easily and to make it as user-friendly as possible. Also the user should be able to give input of any complex function very easily whose graph is to be plotted.

After taking input our main aim was to give the required output as graph with lot of accuracy and precision. We wanted to deliver the output within the range defined by the user in which he wishes his graph to be plotted.

Requirements

Software Requirements:

-Code Blocks

-any operating systems like windows, Ubuntu, linux .etc

Other Requirements

The user should have knowledge of certain basic mathematical functions. The user should also be familiar with certain basic operations like differentiation, slope, modulus .etc as well as curves of some basic functions like sinx ,cosx, tanx etc.

Also the user should be familiar with the concepts of quadratic and cubic equations.

Implementation

In graphplotter user is provide with an option to give range as input. If a user gives an input z , then the program maps it accordingly in the canvas from –z to z. And the various options are provided for the user to choose their desired function as the window is opened and the plotter is initialized with condition y=x. The graph is being drawn from left to right.

Functionality:

In the beginning of the code the user is provided with an option to choose between a graph plotter and equation solver.

First we will discuss about graph plotter.

In the beginning various variables and functions are defined. Also 4 types of arrays with 400 elements each (x,y,xactual,actual).x and y will define the function and xactual and yactual will be the actual coordinates that will plot the graph. As the range is provided by the user the canvas will open with appropriate range and the x and y values will be varied according to the range provided by the user. The user can simply click on the functions which are detected using somefunction() and the function updatecoordinate() updates value accordingly.

Int somefunction(int button) : this function detects which button has been placed and returns the corresponding integer to be stored in the main program.

Double updatecoordinate(x,y,xactual,yactual,) This function receives value of real coordinates and next coordinates using this function and with the help of switch statements the mathematical functions are executed as it returns the value to the graph plotter and plots the graph accordingly. This function enables the program to increment the value i+1, after computing i.

Initcanvas

This was basically used to create the interface that provides options for the user to choose a function with coordinates so that when the button is pressed correct input is being taken.

Second we will discuss about quadratic and cubic equation solver.

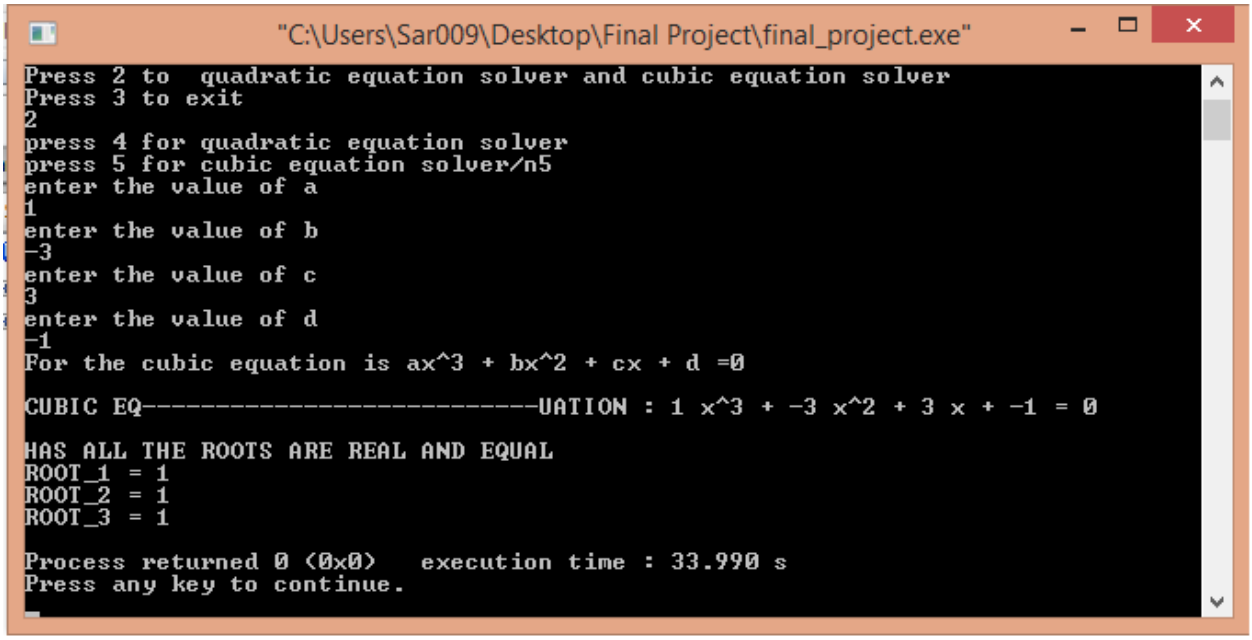
The user is basically provided with an option to select between quadratic and cubic equations.

If the user chooses quadratic equation solver then he has to enter the value of a, b, c in the equation ax^2+b^x+c. The algorithm is based on the method to find the discriminant with formula b^-4ac and fives the roots accordingly and also detects whether the roots are real and different or real and same or unreal roots.

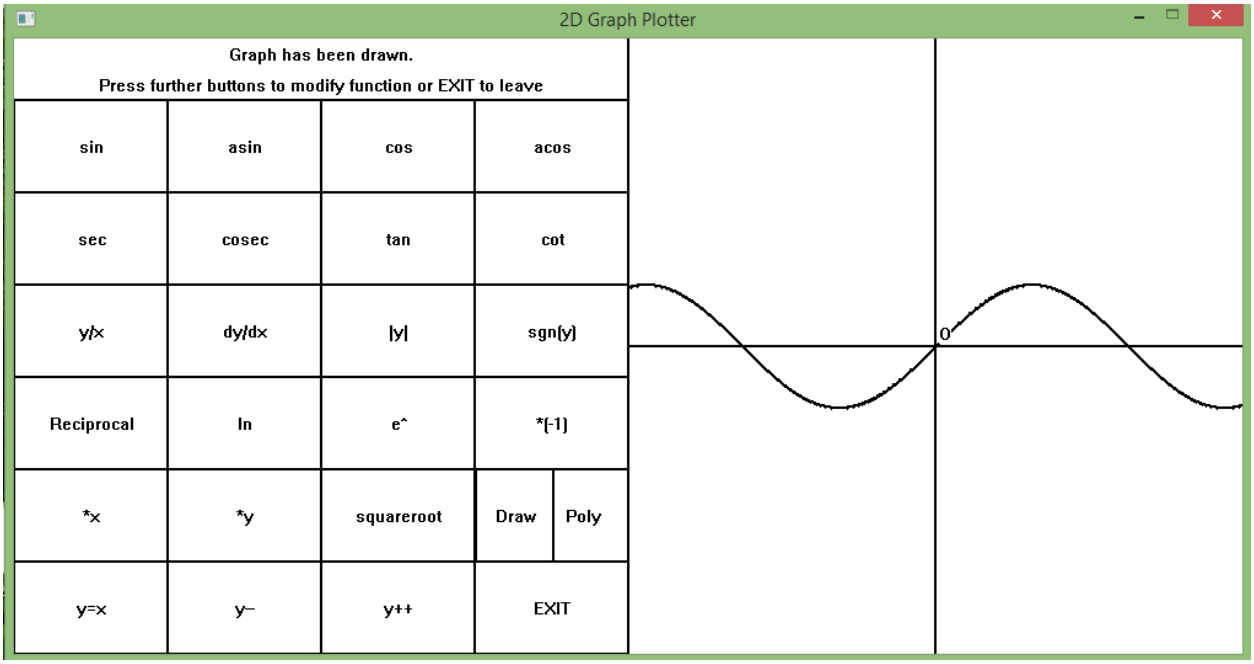
If the user chooses cubic equation solver then the user has to give the values of a, b, c, d as the input to the equation ax^3+bx^2+cx+d. The algorithm is based on the method to find discriminant again .also we have include the use of

trigonometric and hyperbolic methods to solve the equation where we substitute x=ucos(theta) where u and theta are some parameters.

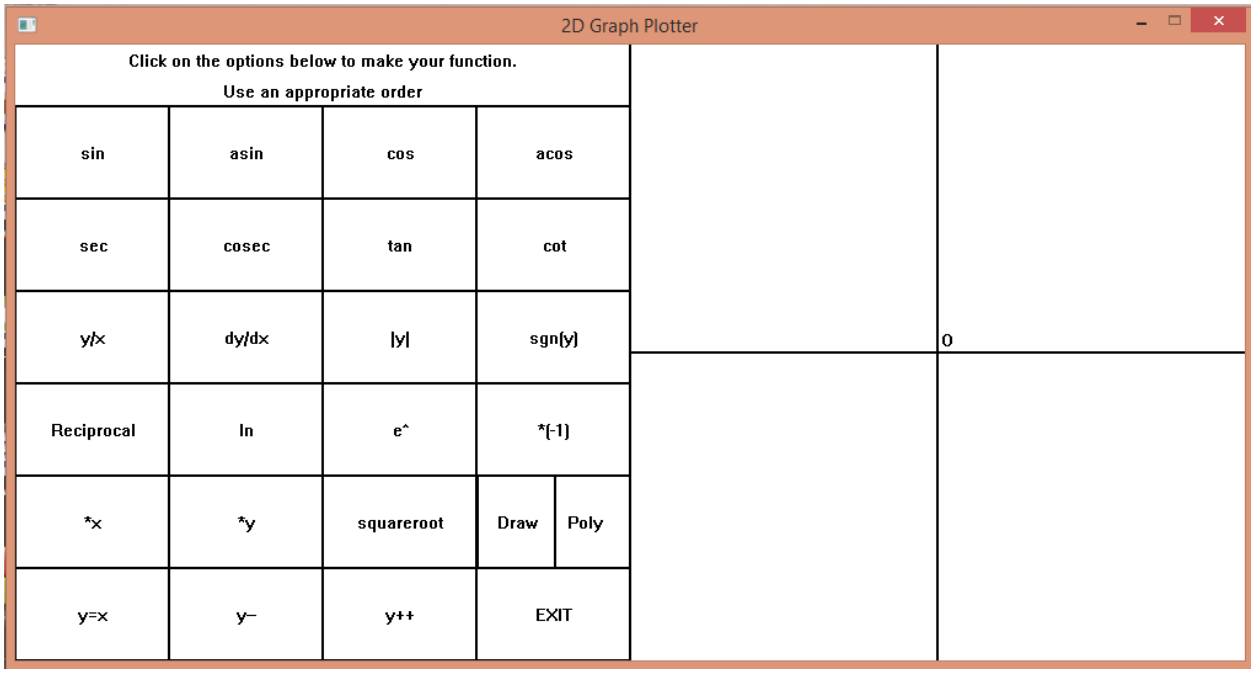
Quadratic and cubic equation solver



2.Sine curve


2D Graph Plotter
Graph has been drawn.
Press further buttons to modify function or EXIT to leave
sin
asin
cos
acos
sec
cosec
tan
cot
y/x
dy/dx
|y|
sgn(y)
Reciprocal
ln
e^
*(-1)
*x
*y
squareroot
Draw
Poly
y=x
y--
y++
EXIT
0

3.Normal Inteface



Discussion of program

What worked as per the plan?

-We were able to create a basic interface which could take the input by the user easily and give appropriate output.

-We were able to map the range accordingly as specified by the user.

What we added more than discussed in SRS?

-We added an extra feature of quadratic and cubic equation solver which can take input from the user to form the required equations and give the desired output using various mathematical techniques.

Changes made in plan

We intended to make a general quadratic and cubic equation graph plotter. But unfortunately the values which we take as input from the user to form he equation we were not able to transfer them in the updatecoordinate() function and as a result a general quadratic and cubic graph plotter couldn’t be created.

However there is an option which enables you to create graph of y=x^2+x+1 and u can multiply this function by x many times to form graphs of cubic ,degree 4, degree 5 .etc equations as well.

Future plan

-In our future work we intend to use the actual coordinates and map them accordingly using the range parameter as defined by the user.

-Also we intend in being able to plotter curves at a time.

-It would also be great if it was possible to find area between two curves.

-Also a 3D graph plotter would prove very useful in future.

Contributions:

Sarvesh :Did almost all the graphplotter part and learnt trigonometric and hyperbolic method to solve cubic equations and did major documentations.

Chiranjiv Sen: Did the quadratic equation solver part and rest of the cubic equation solver and helped in graphplotter as well.

Deepak Kumar: He helped in all the coding work done as well and helped a lot in user manuals and documentation stuff and tested the code thoroughly.

Conclusion

We learnt a lot by doing this project as a team and now that we are successful in completing the project we have gained a lot of confidence in program coding. This project made us learn a lot of new things and concepts which will surely be of great use in our near future. This program will surely prove to be of great use .Provided with the never ending need of mathematics in various fields with graphs forming a significant part of it, this program with a vast scope of development can truly prove its usefulness in near future.