

Linear Equation Solver

21CSS101J – PROGRAMMING FOR PROBLEM SOLVING

Mini Project Report

Submitted by

**SHRIDHAR TIWARI [Reg. No.: RA2211003011925]
B.Tech. CSE - CORE**

**MD DILSHAD ALAM [Reg. No.: RA2211003011917]
B.Tech. CSE - CORE**



**SCHOOL OF COMPUTING
COLLEGE OF ENGINEERING AND TECHNOLOGY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
(Under Section 3 of UGC Act, 1956)
S.R.M. NAGAR, KATTANKULATHUR – 603 203
KANCHEEPURAM DISTRICT
December 2022**

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Problem Statement:

Create a program in Python to accept three equations coefficient values and find their values and plot their graphs.

Pre-Requisites:

- Python IDLE 3.10 64-bit
- Pip (Package/Library Manager)
- NumPy
- Matplotlib

Procedure:

First of all, I installed the pip (Package Manager) in my Python Folder. Using pip command, I installed NumPy and Matplotlib library using the pip command in command prompt.

After successful install of NumPy and Matplotlib moving towards Python IDLE and writing the code.

Methodology/Algorithm :

1. Start
2. Importing NumPy and Matplotlib Libraries
3. From Matplotlib use some of its tools for the graph use
4. Explaining the user how to write the coefficient values for the equations using the print keyword.
5. Accept the coefficients values for the first equation using 4 variables in one statement using map(returns a map object after applying the given function to each value) keyword, float(data type),input and split() function to split the coefficients values.
6. Repeat Step 5 two more times.
7. Now, solving the linear equation using NumPy and using linalg.solve() function which is predefined function used for solving linear equations.
8. Print the value for the three variables.
9. Now, plotting a graph for the equations. First making the grid using linspace to create the numeric sequence for x, y and z axis.
10. Now, creating the grid using the meshgrid() function.
11. Creating the 3D Graphics using figure() function taking plot elements.
12. And using many other Matplotlib functions.
13. And at last using show() function, showing the 3D Graph
14. STOP

Source Code

```
"""This Is A Source Code For Solving
Linear Equation For Three Variables
Which Will Take 3 Equations Values And
Plotting the Graph Using Matplotlib"""

#importing Libraries

import numpy as np                #Importing NumPy Module

import matplotlib.pyplot as plt   #Importing Matplotlib Module

from mpl_toolkits.mplot3d import Axes3D    #Importing Axes3D for Graphs
|
from matplotlib import cm

# MAIN

print("The 3 equations are entered individually")
print("Each value of the equation is entered separated by a space")
print("For example: \nInput = 6 5 -3 4 \nThis will be equal to  $6x + 5y - 3z = 4$ ")

#Accepting Values

print('Enter values for equation 1: ')
a, b, c, d = map(float, input().split())

"""Using map() for a map object after applying the given function
to each value and float type data value and using split() function"""

print('Enter values for equation 2: ')
e, f, g, h = map(float, input().split())

print('Enter values for equation 3: ')
i, j, k, l = map(float, input().split())
```

```

#Solving the Linear Equation

A = np.array([[a,b,c],[e,f,g],[i,j,k]])
#Storing Coefficient Values

b_a = np.array([d,h,l])

sol = np.linalg.solve(A,b_a)
"""Solving the Linear Equation using linalg.solve()
pre-defined function which solves the Linear Equation"""

#Printing The Solution
print(sol)

#Making Grids

x,y = np.linspace(0,10,10), np.linspace(0,10,10)
#Using linspace() function to create the numeric sequence for axes

X,Y = np.meshgrid(x,y)
#Using meshgrid() function to create the grid

Z1 = (d-a*X-b*Y)/c
Z2 = (h-e*X-f*Y)/g
Z3 = (l+X-Y)/k

#Creating 3D Graphics

fig = plt.figure() #Taking plot elements
ax = fig.add_subplot(111,projection='3d') # Add axes to the figure

#Using the other Matplotlib tools to create the graphics and plot the graph

ax.plot_surface(X,Y,Z1,alpha=0.5,cmap=cm.Accent,rstride=100,cstride=100)
ax.plot_surface(X,Y,Z2,alpha=0.5,cmap=cm.Paired,rstride=100,cstride=100)
ax.plot_surface(X,Y,Z3,alpha=0.5,cmap=cm.Pastell,rstride=100,cstride=100)
ax.plot((sol[0]),(sol[1]),(sol[2]),lw=2,c='k', marker='o', markersize=7, markeredgecolor='g', markerfacecolor='white')
ax.set_xlabel('X axis')
ax.set_ylabel('Y axis')
ax.set_zlabel('Z axis')

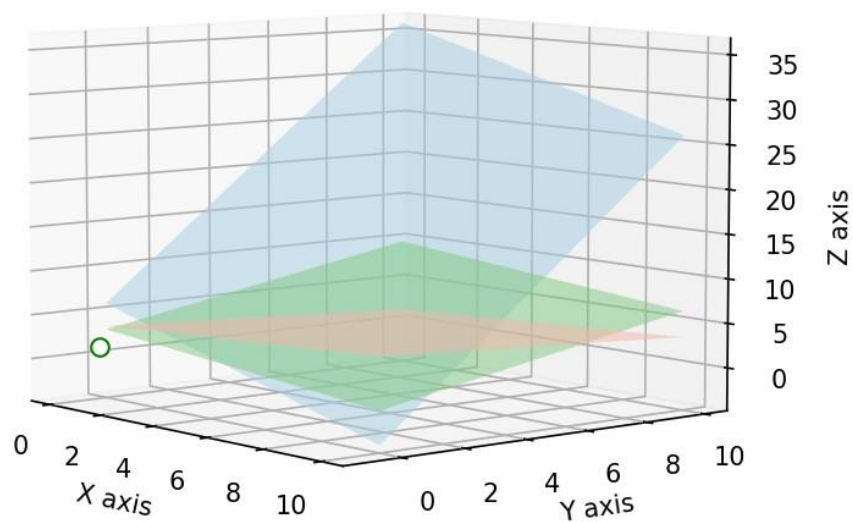
#At last showing the 3D Graph
plt.show()

```

Output

```
The 3 equations are entered individually
Each value of the equation is entered separated by a space
For example:
Input = 6 5 -3 4
This will be equal to  $6x + 5y - 3z = 4$ 
Enter values for equation 1:
1 -2 3 9
Enter values for equation 2:
-1 3 -1 -6
Enter values for equation 3:
2 -5 5 17
[ 1. -1.  2.]
```

Figure 1



Conclusion

My project will help me in solving the 3 variables in a linear equation with the 3D graph.

We just need to enter the coefficient values of the 3 equations and we will get the values of the variables along with the 3D Graph .

