Adamson University
College of Engineering
Computer Engineering Department

Linear Algebra

Laboratory Activity No. 5

Multi-Dimensional Vectors

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I. Objectives

This laboratory activity aims to implement the principles and techniques of using python programming Multi-Dimensional Vectors through the help of the past lessons about vectors and its higher dimensions.

II. Methods

$$A = \begin{cases} 4y \\ 3x + 11y \end{cases}$$

```
[2]  import numpy as np
     import matplotlib.pyplot as plt

     A = np.array([
        [0, 4],
        [3, 11]
     ])

     plt.xlim(-5,15)
     plt.ylim(-5,15)

     plt.quiver(0,0, A[0,0], A[0,1], angles='xy', scale_units='xy',scale=1, color='blue')
     plt.quiver(0,0, A[1,0], A[1,1], angles='xy', scale_units='xy',scale=1, color='red')


     plt.quiver([0,0],[0,0], A[:,0], A[:,1],
             angles='xy', scale_units='xy',scale=1,
             color=['green','yellow'])
     plt.show()
```

Figure 1: Represents the Codes that have been used for Task 1

Figure 1 is a representation about the codes that represent a general linear equation in a 2-dimensional plane, the Linear Equation is also presented in a LaTeX format.

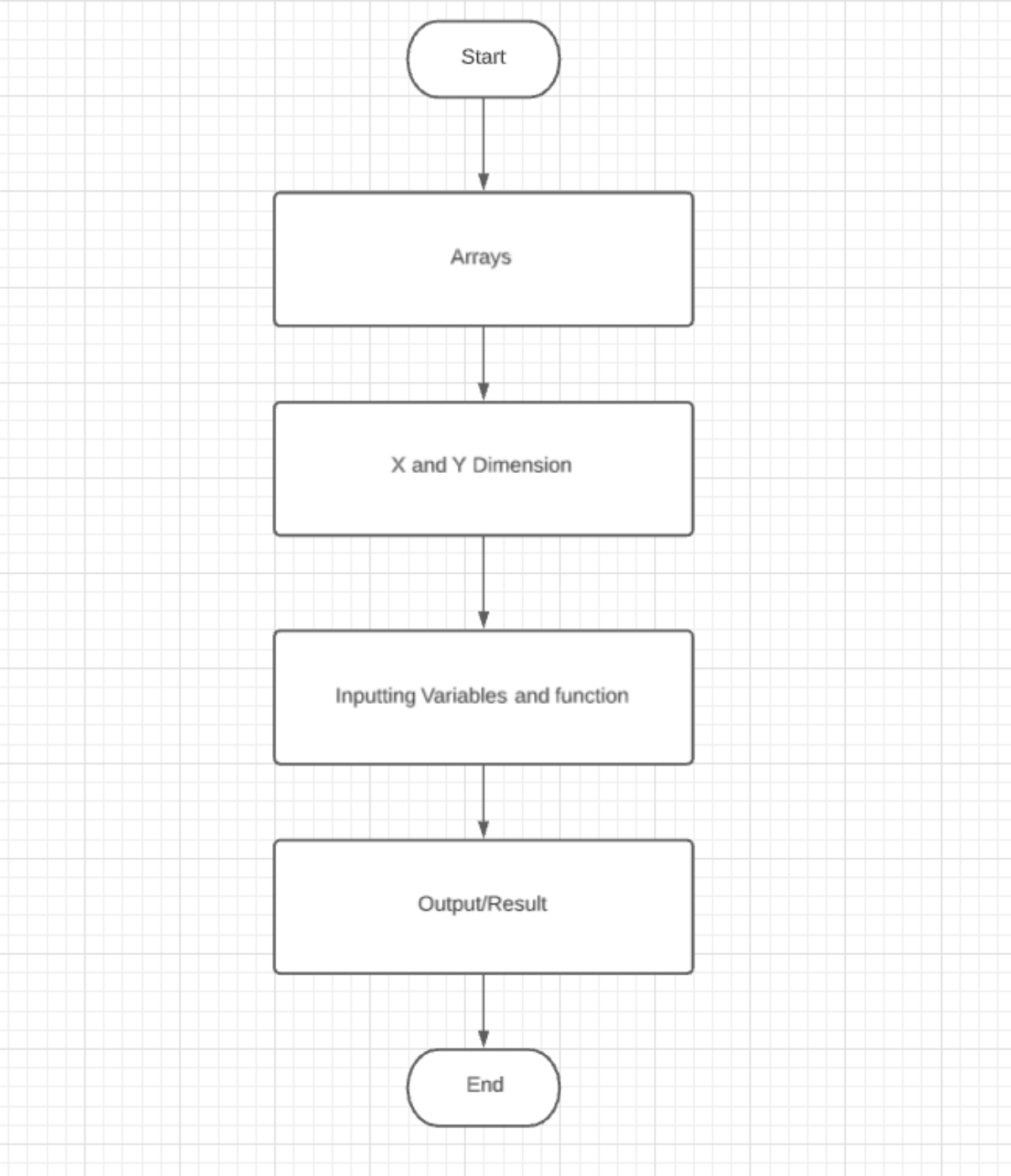

Figure 2: Flowchart of Task 1 and 2

Figure 2 represents the flowchart of task 1 to identify the step-by-step flow on how the program was executed by the student.

$$B = \begin{cases} 3x + y + 5z \\ 2x + 4y + 6z \\ 3x + 6y + 15z \end{cases}$$

```
B = np.array([
   [3,1,5],
   [2,4,6],
   [8,6,9]
])

fig = plt.figure()

B1 = fig.gca(projection='3d')

B1.set_xlim([-5, 7])
B1.set_ylim([-5, 7])
B1.set_zlim([-5, 7])
origin = (-3,-3,-3)

B1.quiver(origin, origin, origin, B[:,0], B[:,1], B[:,2], arrow_length_ratio=0.05, colors=['red','blue','orange'])

plt.show()
```

Figure 3: Representation of the codes that have been used for task 2

The figures above are the representation or visualization of the Linear equations in python language form wherein it describes the LaTeX form of the equations and as well as the methods and steps that have been used. Also shown in the figures the usage of plt.quiver and NumPy and MatPlotLib in order for the program to work successfully otherwise the program will not proceed or run the output without the functions of it

.

III. Results

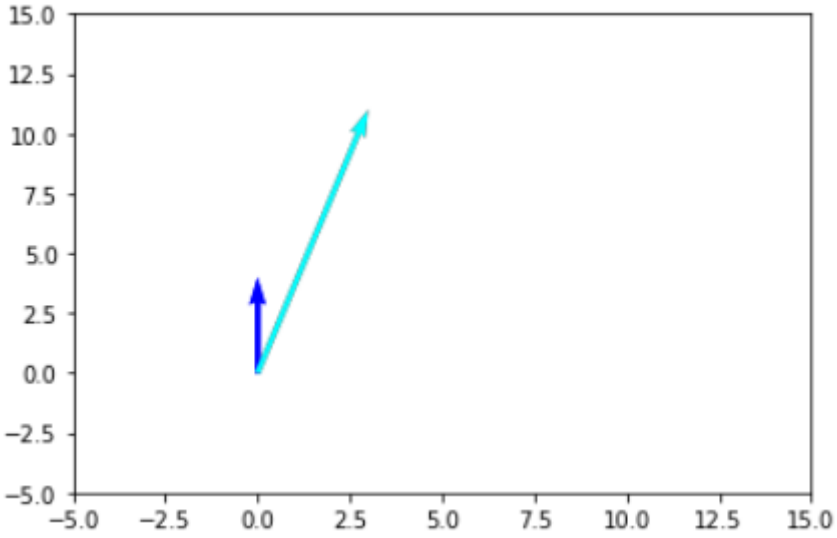

Figure 4: Result of Task: 1

Figure 4 represents the result of the first task in the activity wherein the result shows the graph of the given arrays in a 2-Dimensional plane which is composed of the x and y-axis only.

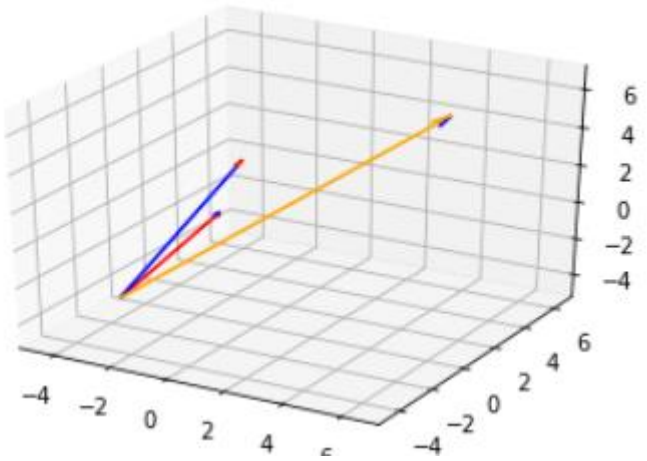

Figure 5: Result of Task: 2

Figure 5 is the visualization of the result of task 2 wherein illustrated in the figure is a graph of the Arrays in a 3-Dimensional plane that consists of 3 axes namely the X, Y, Z-axis that represents each point of the arrays given in the task.

IV. Conclusion

In conclusion, with the given Laboratory tasks, I am able to expand my knowledge about plotting 2-Dimensional and 3-Dimensional array graphs, as well as using the functions such as NumPy and MatPlotLib in order to equate the given arrays and graph it.

I have concluded as well that Yes, It is possible to have more than 3 dimensions due to the fact that analyzing data and objects are not just in a 2-dimensional perspective there are situations that it is not just about the height and the width, you need to know the size, length, depth and the isometric point of view on an object or shape.

Applying the concept of vectors in the business application can give the companies advantages with the usage of the plotting of the stability of the status of the company, let alone the stocks, profits, and as well as the negative outcomes or results of the company which will lead to the improvement of the company in the future.

References

[1] D.J.D. Lopez. “Adamson University Computer Engineering Department Honor Code,” AdU-CpE Departmental Policies, 2020.

[2] Dipanjan (DJ) Sarkar, “The Art of Effective Visualization of Multi-Dimensional Data”, 2018. https://towardsdatascience.com/the-art-of-effective-visualization-of-multi-dimensional-data-6c7202990c57 (accessed on April 30, 2021)

Github Repo: https://github.com/Gatchplease/Linalg-LabAct5/upload