Adamson University
College of Engineering
Computer Engineering Department

Linear Algebra

Laboratory Activity No. 5

Multi-dimensional Vectors

Submitted by:
Columba, Lorenzo Miguel L.

Instructor:
Engr. Dylan Josh D. Lopez

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I. Objectives

The purpose of this laboratory activity is to apply the principles and techniques of vector operation in "Python", such as vector 2d and 3d dimensional ,vector addition, vector subtraction, vector multiplication, vector division, the modulus of a vector, and the vector operation as a docking to the vector dot product and visualizing vector in python programming language.

II. Methods

These practices include the use of various vector operations in Python, such as vector addition, vector subtraction, vector multiplication, vector division, vector coefficients, and vector dot product. These vector manipulation operations are used to capture the artifacts of activities that perform and visualize vector manipulations using Python.

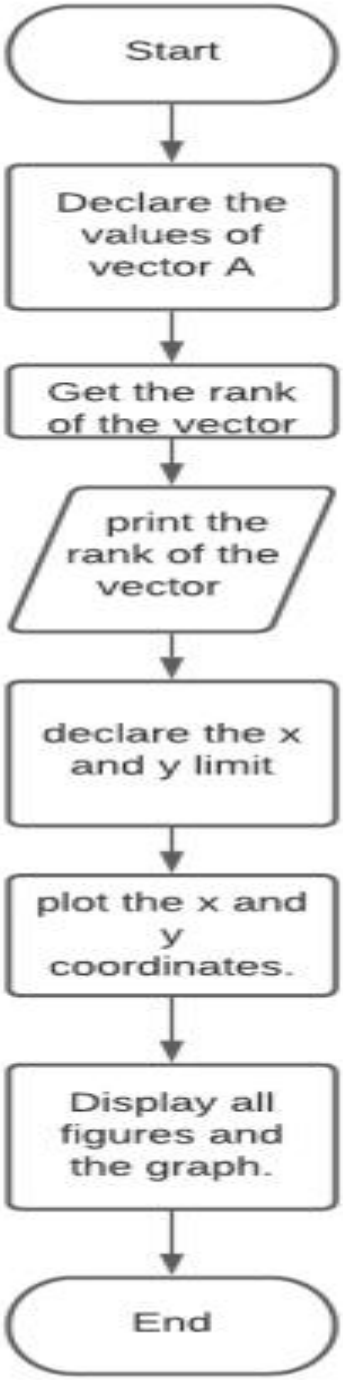

Figure 1: The flowchart of task 1

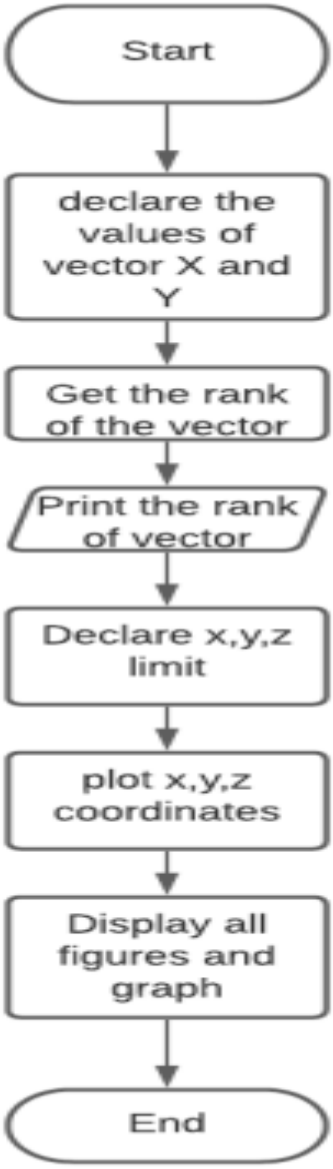

Figure 2: The flowchart of task 2

III. Results

$$A = \{2x + 4y$$

```
[1]  import numpy as np
     import matplotlib.pyplot as plt
     %matplotlib inline
```

```
[2]  A = np.array([2,4])
```

```
[4]  plt.xlim(0,10)
     plt.ylim(0,10)

     plt.quiver(0,0, A[0], A[1],angles='xy', scale_units='xy',scale=1, color='y')
     plt.title(" 2D plane with Rank 1")
     plt.show()
```

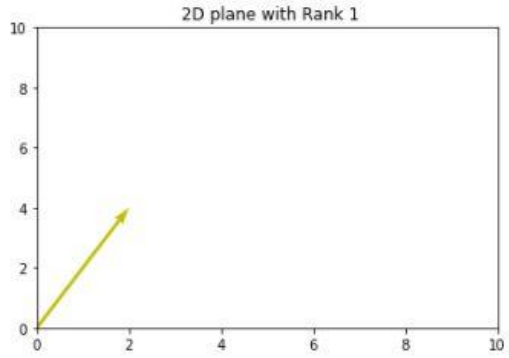

Figure 3: A vector of 2-dimensional plane

Figure 3 shows the vector of task 1 and the graph plane of the vector. I use the xlim() and ylim() function in pyplot module of matplotlib library that used to get or set the x-limits and y-limits of the current axes[1]. I use the function plt.quiver to locate or plot the direction of the vector at the carthesian coordinates x and y axis. The result of the task 1 is range of 2 at x-axis and range of 4 at y-axis the figure is in a 2D plane.

$$A = \begin{cases} 4x + 7y + 6z \\ 3x + 4y + 7z \end{cases}$$

Double-click (or enter) to edit

```
[ ]  v1 = np.array([
                    [4,5,6],
                    [3,4,7]

     ])
```

```
[ ]

     fig = plt.figure()
     ax1 = fig.gca(projection='3d')

     ax1.set_xlim([0,8])
     ax1.set_ylim([0,8])
     ax1.set_zlim([0,8])
     plt.title(" 3d plane with rank 2 vectors")

     origin= (0,0,0)
     ax1.quiver( origin,origin,origin, v1[0,0], v1[0,1], v1[0,2],
                 arrow_length_ratio = 0.05,linestyles= '--', color = 'crimson'  )
     ax1.quiver( origin,origin,origin, v1[1,0], v1[1,1], v1[1,2],
                 arrow_length_ratio = 0.05, linestyles= '--',color = 'cyan')
     plt.show()
```

Figure 3: A vector of 3-dimensional plane

Figure 4 shows the code and the function I have use to obtain the task 2. The function I use to indicate the result in to a 3D plane is ax1 = fig.gca(projection = '3d'). The function ax1.set_xlim(), ax1.set_ylim and ax1.set_zlim function in axes module of matplotlib library is used to set the x-axis view limits[3]. And again I use quiver locate or plot the direction of the vector at the carthesian coordinates x and y axis.

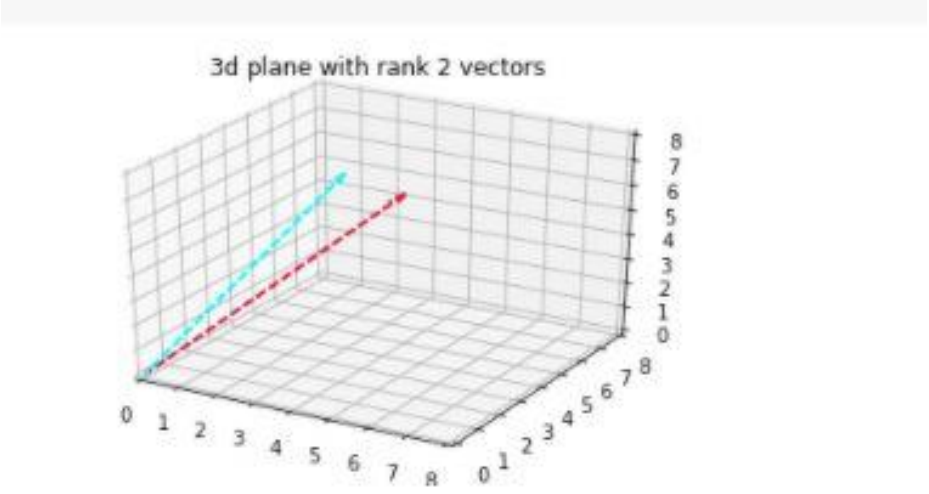

Figure 5: The result of vector of 3-dimensional plane

IV. Conclusion

In this laboratory activity provided knowledge of vector operations such as the vector of a 2D and 3D plane. Laboratory activities have also shown that they can be used to perform vector operations without the help of programming languages, Python, or unmeasurable libraries. Nevertheless, Numphy has been suggested to be an easier and more efficient way to solve its insurance business. Finally, these vector actions can be visualized using the preset functions provided by the matplotlib library. The concept of this activity in business applications is about the survey sales of the market of the company, it can use to monitor the sales of a company.

References

[1] SHUBHAMSINGH10Small things always make you to think big, SHUBHAMSINGH10, and Small things always make you to think big, “Matplotlib.pyplot.xlim() in Python,” GeeksforGeeks, 27-Apr-2020. [Online]. Available: https://www.geeksforgeeks.org/matplotlib-pyplot-xlim-in-python/. [Accessed: 06-Nov-2020].

[2] “matplotlib.pyplot.quiver¶,” matplotlib.pyplot.quiver - Matplotlib 3.3.2 documentation. [Online]. Available: https://matplotlib.org/3.3.2/api/_as_gen/matplotlib.pyplot.quiver.html. [Accessed: 06-Nov-2020].

[3] “Matplotlib.axes.Axes.set_xlim() in Python,” GeeksforGeeks, 19-Apr-2020. [Online]. Available: https://www.geeksforgeeks.org/matplotlib-axes-axes-set_xlim-in-python/. [Accessed: 06-Nov-2020].