Assignment 1

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***Abstract*—This document explains how to find the point of intersection of a line and a plane.**

Download the python code from

https://github.com/vishalashok98/AI5006/tree/master/Assignment1

and latex-tikz codes from

https://github.com/vishalashok98/AI5006/tree/master/Assignment1

1 Problem

Find the co ordinates of the point when the line through $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ crosses the plane [2 1 1]x=7 and perpendicular to the two lines

2 Explanation

Equation of the plane is

$$2x + y + z = 7 \tag{2.0.1}$$

Direction ratios of line passing through points $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ is given by [1,-1,-6]

Parametric equations of co-ordinates of any point on line passing through $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ are

$$x = r + 3 \tag{2.0.2}$$

$$y = -4 - r \tag{2.0.3}$$

$$z = -5 - 6r \tag{2.0.4}$$

3 Solution

Since the line intersects plane, by substituting equations 2.0.2,2.0.3 and 2.0.4 in equation 2.0.1 we get

$$2(r + 3) - 4 - r - 5 - 6r = 7 \tag{3.0.1}$$

$$-5r - 3 = 7 \tag{3.0.2}$$

$$r = 1 \tag{3.0.3}$$

Substituting the value of r in parametric equations we get point of intersection as [1,-4,-5]

4 Plot

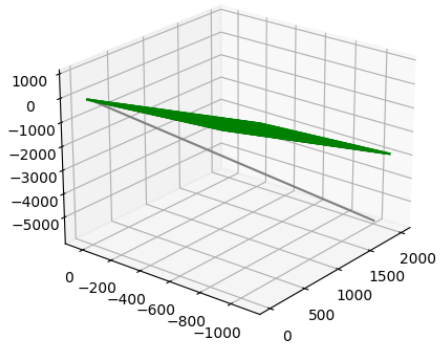

Fig. 0: Intersection of Plane and Line