Assignment 1

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Download all python codes from

https://github.com/Gayathri1729/SRFP/tree/main/Assignment3

and latex-tikz codes from

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1 CONSTR-2.33

Construct LIFT such that $LI = 4, IF = 3, TL = 2.5, LF = 4.5, IT = 4$.

2 Explanation

Given, $LI = 4, IF = 3, TL = 2.5, LF = 4.5, IT = 4$.

Consider $\triangle LIF$,

$$\|L - I\| + \|I - F\| = 7 > \|L - F\| \quad (2.0.1)$$
$$\|I - F\| + \|L - F\| = 7.5 > \|L - I\| \quad (2.0.2)$$
$$\|L - I\| + \|L - F\| = 8.5 > \|I - F\| \quad (2.0.3)$$

thus triangle inequality is satisfied.

Similarly in $\triangle LIT$,

$$\|L - I\| + \|I - T\| = 8 > \|L - T\| \quad (2.0.4)$$
$$\|L - T\| + \|I - T\| = 6.5 > \|L - I\| \quad (2.0.5)$$
$$\|L - I\| + \|L - T\| = 6.5 > \|I - T\| \quad (2.0.6)$$

and triangle inequality is satisfied.

$\therefore$ the given sides form a quadrilateral.And let the sides of the triangles be denoted by $LI = f, IF = l, TL = t, LF = i, IT = g$ Then,

$$f = 4, l = 3, t = 2.5, i = 4.5, g = 4 \quad (2.0.7)$$

Now,let

$$\mathbf{L} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{I} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}, \mathbf{F} = \begin{pmatrix} p \\ q \end{pmatrix}, \mathbf{T} = \begin{pmatrix} r \\ s \end{pmatrix} \quad (2.0.8)$$

Then we know that,

$$p = \frac{f^2 + i^2 - l^2}{2f} = \frac{4^2 + 4.5^2 - 3^2}{2 \times 4} = 3.406 \quad (2.0.9)$$

$$q = \pm\sqrt{i^2 - p^2} = \pm\sqrt{4.5^2 - 3.406^2} = \pm 2.94 \quad (2.0.10)$$

$$r = \frac{t^2 + f^2 - g^2}{2f} = \frac{2.5^2 + 4^2 - 4^2}{2 \times 4} = 0.781 \quad (2.0.11)$$

$$s = \pm\sqrt{t^2 - r^2} = \pm\sqrt{2.5^2 - 0.781^2} = \pm 2.374 \quad (2.0.12)$$

Consider q and s to be positive.Then the coordinates of the quadrilateral can be obtained from 2.0.8 ,

$$\mathbf{L} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{I} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}, \mathbf{F} = \begin{pmatrix} 3.406 \\ 2.94 \end{pmatrix}, \mathbf{T} = \begin{pmatrix} 0.781 \\ 2.374 \end{pmatrix} \quad (2.0.13)$$

Knowing all the coordinates we can now construct the quadrilateral.

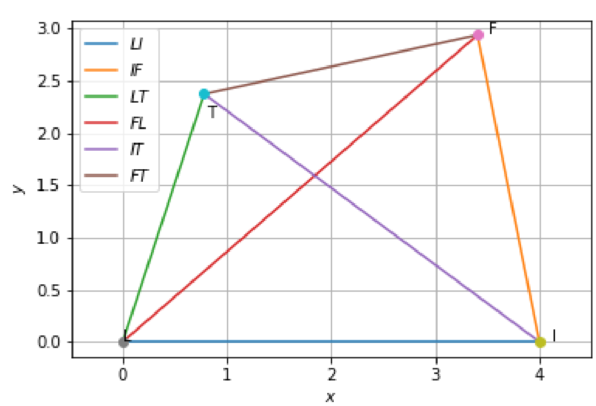

Fig. 2.1: Quadrilateral $LIFT$