BASICS OF PROGRAMMING ASSIGNMENT - 2

Sahin Hossain Chowdhury- SM21MTECH12002

CHAPTER III EX-V Q-2

Find the bisectors of the obtuse angles between the following pairs of lines

$$\mathbf{12x + 5y - 4 = 0}$$

$$\mathbf{3x + 4y + 7 = 0}$$

SOLUTION

Calculating gradient for the 2 lines :

$$y = mx + c \tag{1}$$

Here m is the gradient in this equation. Now Making The Above Equations In This Form

$$y_1 = -(12/5)x_1 + (4/5) \tag{2}$$

$$y_2 = -(3/4)x_2 + (7/4) \tag{3}$$

So,Gradient Descent m1 And m2 Are From The Equation (2) And (3):

$$\begin{pmatrix} m_1 \\ m_2 \end{pmatrix} = \begin{pmatrix} -12/5 \\ -3/4 \end{pmatrix} \tag{4}$$

Now, to get the angle between the lines, we use the formula:

$$\tan\theta = |(m1 - m2)/(1 + m1.m2)| \tag{5}$$

So Here Value is:

$$\tan\theta = |-(12/5) + (3/4)/(1 + (12/5).(3/4)| \tag{6}$$

$$\tan\theta = 0.3760 \tag{7}$$

Next, according to question, we are calculating the obtuse bisect

$$\Theta = (180^\circ - \arctan(\tan\theta))/2 \tag{8}$$

Now, we finally have two lines and an angle, and we have to find the bisector So after tweaking the previous equation, we will get

$$m2 = |(m1 - \tan\Theta)/(1 + m1 * \tan\Theta)| \tag{9}$$

Now By Doing The Calculation I Got

$$\begin{pmatrix} p_1 \\ p_2 \end{pmatrix} = \begin{pmatrix} 1.078 \\ 0.5 \end{pmatrix} \tag{10}$$

We are taking the minimum gradient from those two lines as final gradient

$$m = 0.5 \tag{11}$$

Again we are finding the intersection point of the lines because our bisector will go through the same line, and we can calculate c. 1st of all I've to find x0 and y0

$$ax + by + c = 0 \tag{12}$$

if we compare this with above equations we get

$$\begin{pmatrix} a_1 & 12 \\ b_1 & 5 \\ c_1 & -4 \end{pmatrix} \tag{13}$$

$$\begin{pmatrix} a_2 & 3 \\ b_2 & 4 \\ c_2 & 7 \end{pmatrix} \tag{14}$$

$$x0 = (b_1 * c_2 - b_2 * c_1)/(a_1 * b_2 - a_2 * b_1) \tag{15}$$

$$y0 = (c_1 * a_2 - c_2 * a_1)/(a_1 * b_2 - a_2 * b_1) \tag{16}$$

Now

$$x0 = (5 * 7 - 4 * (-4))/(12 * 4 - 3 * 5) \tag{17}$$

$$y0 = ((-4) * 3 - 7 * 12)/(12 * 4 - 3 * 5) \tag{18}$$

Calculating These Equations I Got:

$$\begin{pmatrix} x_0 & 1 \\ y_0 & 1 \end{pmatrix} \tag{19}$$

Now, by putting the values in

$$c = y - m * x \tag{20}$$

I Got Value of C:

$$C = 0.5 \tag{21}$$

Now The Final Equation Looks:

$$y = 0.5x + 0.5x \tag{22}$$

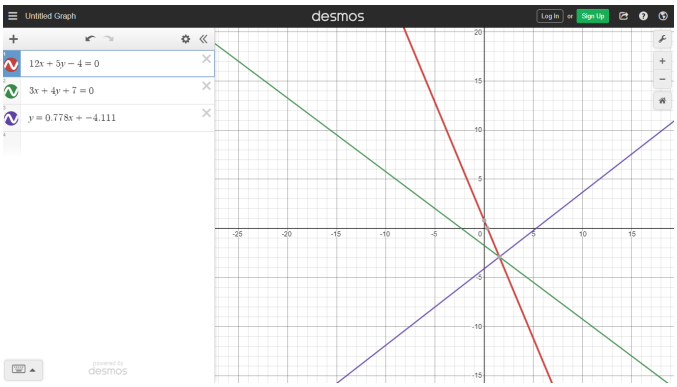

Fig. 0: Representation of the bisector