

Problema: Calcule la solución con el método del descenso más rápido.

$$3x_1 \cos(x_2 x_3) - y_2 = 0$$

$$x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06 = 0$$

utilice $x^{(0)} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$

$$e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3} = 0$$

$$g\left(\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}\right) = \left[3x_1 - \cos(x_2 x_3) - y_2\right]^2 + \left[x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06\right]^2$$

$$+ \left[e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3}\right]^2$$

$$\nabla g = 2 \begin{pmatrix} 3(3x_1 - \cos(x_2 x_3) - y_2) & 2x_1(x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06) - x_2 e^{-x_1 x_2} \left(e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3}\right) \\ -\sin(x_2 x_3)x_3(3x_1 - \cos(x_2 x_3) - y_2) & -1(2(x_2 + 0.1)(x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06)) - x_1 e^{-x_1 x_2} \left(e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3}\right) \\ -\sin(x_2 x_3)x_2(3x_1 - \cos(x_2 x_3) - y_2) & \cos x_3(x_1^2 - 81(x_2 + 0.1)^2 + \sin x_3 + 1.06) - 20(e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3}) \end{pmatrix}$$

$$J = \begin{pmatrix} 3 & 2x_1 & -x_2 e^{-x_1 x_2} \\ x_3 \sin(x_2 x_3) & -182(x_2 + 0.1) & -x_1 e^{-x_1 x_2} \\ x_2 \sin(x_2 x_3) & \cos x_3 & 20 \end{pmatrix}$$

$\alpha_1 = 0 \quad h(\alpha_1) = 111.97$
 $\alpha_2 = 0.5 \quad h(\alpha_2) =$
 $\alpha_3 = 1 \quad h(\alpha_3) = 93.5714$

$$\nabla g^{(0)} = 2 \begin{pmatrix} 3 & 0 & 0 \\ 0 & -182 & 0 \\ 0 & 1 & 20 \end{pmatrix} \begin{pmatrix} -3/2 \\ y_4 \\ 10\pi/3 \end{pmatrix} = 2 \begin{pmatrix} -9/2 \\ -81/20 \\ \frac{1}{4} + \frac{200\pi}{3} \end{pmatrix} \approx \begin{pmatrix} -9 \\ -8.1 \\ 419.38 \end{pmatrix}$$

$$\|\nabla g\|_2 = \sqrt{(-9)^2 + (-8.1)^2 + (419.38)^2} = 419.553778$$

$$\hat{U}_{cm} = \frac{1}{\|\nabla g\|} \nabla g = \begin{pmatrix} -0.2195\alpha \\ 0.01931\alpha \\ -0.9996\alpha \end{pmatrix}$$

α	1
0	111.97
0.5	
1	93.5714

Continuación problema macabro

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$$f_1 = 3x_1 - \cos(x_2 x_3) - \frac{\gamma}{2} = 0$$

$$f_2 = x_1^2 - 81(x_2 + 0.1)^2 + \sin(x_3) + 1.06 = 0$$

$$f_3 = e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3} = 0$$

$$\mathbf{x}^{(0)} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$g(\mathbf{x}) = (3x_1 - \cos(x_2 x_3) - \frac{\gamma}{2})^2 + (x_1^2 - 81(x_2 + 0.1)^2 + \sin(x_3) + 1.06)^2 + \left(e^{-x_1 x_2} + 20x_3 + \frac{10\pi - 3}{3}\right)^2$$

$$h(\alpha) = g(\mathbf{x}^{(0)})$$

$$\hat{\mathbf{v}}^{(0)}_{cm} = \begin{pmatrix} -0.02148 \\ -0.01931 \\ 0.9996 \end{pmatrix}$$

$$\mathbf{x}^{(0)} = \begin{pmatrix} -0.02148 \\ -0.01931 \\ 0.9996 \end{pmatrix} \approx \begin{pmatrix} 0.010728 \\ -0.009655 \\ -0.9998 \end{pmatrix}$$

$$y(x) = ax^2 + bx + c$$

$$c = 111.975$$

$$a(0.5)^2 + b(0.5) + c = 2.5354$$

$$a(1)^2 + b(1) + c = 180.714$$

$$|-10.94396 \quad .5|$$

$$a = \frac{-100.2372}{-400.952} = 0.25$$

$$25 + 0.5b + c = 2.5354$$

$$25 + 0.5b = -10.94396$$

$$a + b = -18.9036$$

$$b = -419.3548$$

$$\alpha_{new} = -\frac{b}{2a} = \frac{419.3548}{2(-400.952)} = -0.5229$$

$$g(\mathbf{x}^{(1)}) \approx 2.3773$$

$$\mathbf{x}^{(1)} = \mathbf{x}^{(0)} - \alpha^{(0)} \hat{\mathbf{v}}^{(0)} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} - (0.5229) \begin{pmatrix} -0.02148 \\ -0.01931 \\ 0.9996 \end{pmatrix} = \begin{pmatrix} 0.01122 \\ 0.01050 \\ -0.52279 \end{pmatrix}$$

$$J(x) = \begin{pmatrix} 3 & 2x_1 - x_2 e^{-x_1 x_2} \\ x_3 \sin(x_3) - 17(x_1 + 1) & -x_1 e^{-x_1 x_2} \\ x_2 \sin(x_2) \cos(x_3) & 20 \end{pmatrix} = Z^T J(x)^t F(x)$$

$$J(x)^t = \begin{pmatrix} 3 & 0.02244 & -0.0101 \\ 0.00276 & -17.3512 & -0.01122 \\ -0.00053 & 0.56648 & 20 \end{pmatrix}$$

$$F(x^{(1)}) = \begin{pmatrix} -1.91133 \\ -0.42697 \\ 0.01806 \end{pmatrix} \quad \nabla F^{(1)} = \begin{pmatrix} -0.817214 \\ 15.008502 \\ -0.006879 \end{pmatrix}$$

$$\|\nabla F\|_2 = 17.40685 \quad \hat{v}_{cm}^{(1)} = \begin{pmatrix} -0.50454 \\ 0.86222 \\ -0.00840 \end{pmatrix}$$

$$\alpha_1 = -1 \quad l(-1) = 5598.8883$$

$$\alpha_2 = 0 \quad l(\alpha_2) =$$

$$\alpha_3 = 1 \quad l(\alpha_3) = 1934.7205$$

$$\alpha_1 x^{(1)} - \hat{v}_{cm}^{(1)} = \begin{pmatrix} 0.0112 \\ 0.0101 \\ -0.51227 \end{pmatrix} - \begin{pmatrix} 0.50454 \\ 0.86222 \\ -0.00840 \end{pmatrix} \rightarrow l(-1) = 5598.8883$$

$$\alpha_3 x^{(1)} - \hat{v}_{cm}^{(1)} = 1934.7205$$

$$\alpha = \frac{l(1) - l(-1)}{2} \approx \frac{1934.7205 - 5598.8883}{2} = -1832.379$$

$$\beta \approx 5764.182$$

$$\alpha h = \frac{-1832.379}{2(5764.182)} = 0.84$$

$$\beta = 1934.7205 - (5598.8883 - 2.3273) = -1832.379$$

$$x^{(1)} = \begin{pmatrix} 0.0112 \\ 0.0101 \\ -0.51227 \end{pmatrix} + 0.2434 \begin{pmatrix} 0.50454 \\ 0.86222 \\ -0.00840 \end{pmatrix} = \begin{pmatrix} 0.1352 \\ -0.1999 \\ -0.5221 \end{pmatrix}$$

$$g(x^{(1)}) = 7.267$$