

Дополнение к работа 5

Дополнение Задача 5

Метод ортогонализации

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 3 & 3 & 4 & 4 \\ 3 & 0 & 1 & -2 \end{array} \right) = \bar{a}_1 x_1 + \bar{a}_2 x_2 + \bar{a}_3 x_3 = b$$

$$\bar{a}_1 \quad \bar{a}_2 \quad \bar{a}_3 \quad b$$

$$f_{12} = \frac{(\bar{r}_1, \bar{a}_2)}{r_1^2} = \frac{1 \cdot 1 + 3 \cdot 3 + 3 \cdot 0}{1 + 9 + 9} = \frac{10}{19}$$

$$\bar{r}_2 = \bar{a}_2 - f_{12} \cdot \bar{r}_1 = \begin{pmatrix} \frac{9}{19} \\ \frac{28}{19} \\ \frac{30}{19} \end{pmatrix}$$

$$f_{13} = \frac{(\bar{r}_1, \bar{a}_3)}{r_1^2} = \frac{16}{19}$$

$$f_{23} = \frac{(\bar{r}_2, \bar{a}_3)}{r_2^2} = 0.96$$

$$\bar{r}_3 = \bar{a}_3 - f_{13} \bar{r}_1 - f_{23} \bar{r}_2 = \begin{pmatrix} -\frac{3}{10} \\ \frac{1}{10} \\ 0 \end{pmatrix}$$

$$A = R \cdot T$$

$$\begin{pmatrix} 1 & \frac{9}{19} & -\frac{3}{10} \\ 3 & \frac{28}{19} & \frac{1}{10} \\ 3 & \frac{30}{19} & 0 \end{pmatrix} \cdot \begin{pmatrix} 1 & \frac{10}{19} & \frac{16}{19} \\ 0 & 1 & 0.96 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 3 & 3 & 4 \\ 3 & 0 & 1 \end{pmatrix}$$

$$x_3 = \frac{(\bar{r}_3, b)}{(\bar{r}_3, \bar{a}_3)} = \frac{-1}{-1} = 1$$

$$\bar{b}^{(1)} = b - a_3 x_3 = \begin{pmatrix} 0 \\ 0 \\ -3 \end{pmatrix}$$

$$x_2 = \frac{(\bar{r}_2, \bar{b}^{(1)})}{(\bar{r}_2, \bar{a}_2)} = \frac{1}{1} = 1$$

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$$b^{(0)} = \bar{b} - a_2 x_2$$

$$x_1 = \frac{(\bar{b}, \bar{b}^{(0)})}{(\bar{a}_1, \bar{a}_1)} = 1$$

$$\bar{x} = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$$

Метод Якоби

$$\begin{pmatrix} 1 & 1 & 1 \\ 3 & 3 & 4 \\ 3 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 4 \\ -2 \end{pmatrix}$$

~~$$\begin{aligned} x_1 &= x_2 + x_3 + 1 \\ x_2 &= x_1 + \frac{4}{3}x_3 + \frac{4}{3} \\ x_3 &= x_1 - 2 \end{aligned}$$~~

$$\begin{cases} x_1 = -x_2 - x_3 + 1 \\ x_2 = -x_1 - \frac{4}{3}x_3 + \frac{4}{3} \\ x_3 = -3x_1 - 2 \end{cases}$$

$$x^{(0)} = \begin{pmatrix} \frac{4}{3} \\ \frac{4}{3} \\ -2 \end{pmatrix}$$

Метод не работает!!!

2 онлайн калькулятора и 2 самописных скрипта уходят в INF для данной матрицы

$$\delta_{23} = \frac{(m_2, a_3)}{r_2} = \frac{\frac{8}{19} + \frac{108}{19} - \frac{20}{19}}{\frac{81}{361} + \frac{829}{361} + \frac{900}{361}} = \frac{\frac{88}{19}}{\frac{1710}{361}} = \frac{88}{19} = 4.63$$

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Вариант 20 → 19

$$\varepsilon = 0.05$$

$$\left(\begin{array}{ccc|c} 3 & 26 & 4 & 4 \\ 1 & 4 & 0 & 10 \\ 0 & 1 & 4 & -2 \end{array} \right) \quad x = \begin{pmatrix} 2 \\ 2 \\ -1 \end{pmatrix}$$

Метод Якоби

$$\left(\begin{array}{ccc|c} 1 & 4 & 0 & 10 \\ 0 & 1 & 4 & -2 \\ 3 & 2 & 6 & 4 \end{array} \right) \quad x^0 = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

k	x_1	x_2	x_3	d_1	d_2	d_3	d_{max}
1	-4.33	1.5	-3	5.333	1	8.5	8.5
2	6.33	2.83	-0.835	7.666	2.125	1.333	7.666
3	1.194	0.916	-1.208	5.138	0.333	1.917	5.139
4	3.138	2.201	-0.929	1.944	0.489	1.025	1.944
5	1.324	1.815	-1.050	1.844	0.321	0.486	1.815
6	2.29	2.169	-0.929	0.966	0.127	0.453	0.966
7	1.84	1.927	-1.0422	0.545	0.113	0.241	0.545
8	2.132	2.064	-0.981	0.387	0.060	0.136	0.388
9	1.92	1.966	-1.015	0.241	0.034	0.096	0.241
10	2.06	2.019	-0.991	0.132	0.025	0.052	0.132
11	1.97	1.986	-1.005	0.084	0.013	0.033	0.083
12	2.018	2.007	-0.996	0.048	0.008	0.020	0.048

$$x_1 = 2.018 \quad x_2 = 2.007 \quad x_3 = 0.996$$

Memag Beieigen

K	x_1	x_2	x_3	d_1	d_2	d_3	d_{max}
1	-1.3	2.833	-1.208	5.833	7.166	0.791	7.166
2	1.861	2.084	-1.008	3.194	0.438	0.189	3.194
3	1.994	2.001	-1.000	0.133	0.033	0.008	0.133
4	1.999	2.000	-1.000	0.006	0.001	0.000	0.005

$$\underline{x_1 = 1.999 \quad x_2 = 2.000 \quad x_3 = -1.000}$$

d_{max}

8.5

7.666

5.139

1.944

1.815

0.966

0.545

0.383

0.241

0.132

0.083

0.048