

MATLAB – FILL-IN

DIAG

RIGA 1

COLONNA 1

```
>> a=2*eye(6)
```

```
>> a(1,2:6)=0.2
```

```
>> a(2:6,1)=0.2
```

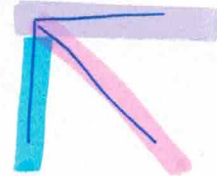
```
>> [l,u,p]=lu(a)
```

l =

1.0000	0	0	0	0	0
0.1000	1.0000	0	0	0	0
0.1000	-0.0101	1.0000	0	0	0
0.1000	-0.0101	-0.0102	1.0000	0	0
0.1000	-0.0101	-0.0102	-0.0103	1.0000	0
0.1000	-0.0101	-0.0102	-0.0103	-0.0104	1.0000

u =

2.0000	0.2000	0.2000	0.2000	0.2000	0.2000
0	1.9800	-0.0200	-0.0200	-0.0200	-0.0200
0	0	1.9798	-0.0202	-0.0202	-0.0202
0	0	0	1.9796	-0.0204	-0.0204
0	0	0	0	1.9794	-0.0206
0	0	0	0	0	1.9792



DIAG

RIGA N (=6)

```
>> a=2*eye(6)
```

```
>> a(6,1:5)=0.2
```

2.0000	0	0	0	0	0
0	2.0000	0	0	0	0
0	0	2.0000	0	0	0
0	0	0	2.0000	0	0
0	0	0	0	2.0000	0
0.2000	0.2000	0.2000	0.2000	0.2000	2.0000

COLONNA N

```
>> a(1:5,6)=0.2
```

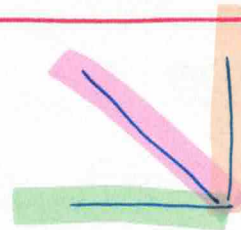
```
>> [l,u,p]=lu(a)
```

l =

1.0000	0	0	0	0	0
0	1.0000	0	0	0	0
0	0	1.0000	0	0	0
0	0	0	1.0000	0	0
0	0	0	0	1.0000	0
0.1000	0.1000	0.1000	0.1000	0.1000	1.0000

u =

2.0000	0	0	0	0	0.2000
0	2.0000	0	0	0	0.2000
0	0	2.0000	0	0	0.2000
0	0	0	2.0000	0	0.2000
0	0	0	0	2.0000	0.2000
0	0	0	0	0	1.9000



Fattorizzazione di matrici tri diagonali (no pivot)

$$A = \begin{bmatrix} a_1 & c_1 & 0 & 0 & 0 \\ b_2 & a_2 & c_2 & 0 & 0 \\ 0 & b_3 & a_3 & c_3 & 0 \\ 0 & 0 & b_4 & a_4 & c_4 \\ 0 & 0 & 0 & b_5 & a_5 \end{bmatrix}$$

Banda $p=1$
" $q=1$

$$L = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_2 & 1 & 0 & 0 & 0 \\ 0 & \beta_3 & 1 & 0 & 0 \\ 0 & 0 & \beta_4 & 1 & 0 \\ 0 & 0 & 0 & \beta_5 & 1 \end{bmatrix} \cdot U = \begin{bmatrix} \alpha_1 & \gamma_1 & 0 & 0 & 0 \\ 0 & \alpha_2 & \gamma_2 & 0 & 0 \\ 0 & 0 & \alpha_3 & \gamma_3 & 0 \\ 0 & 0 & 0 & \alpha_4 & \gamma_4 \\ 0 & 0 & 0 & 0 & \alpha_5 \end{bmatrix}$$

$$L \cdot U = A$$

$$R_1 C_1: \alpha_1 = a_1 \quad [A]_{1, \cdot}$$

$$R_1 C_2: \gamma_1 = c_1$$

$$R_2 C_1: \beta_2 \alpha_1 = b_2 \quad \beta_2 = \frac{b_2}{\alpha_1}$$

$$R_2 C_2: \beta_2 \gamma_1 + \alpha_2 = a_2 \quad \alpha_2 = a_2 - \beta_2 \gamma_1 \quad [A]_{2, \cdot}$$

$$R_2 C_3: \gamma_2 = c_2$$

$$R_3 C_2: \beta_3 \alpha_2 = b_3 \quad \beta_3 = \frac{b_3}{\alpha_2}$$

$$R_3 C_3: \beta_3 \gamma_2 + \alpha_3 = a_3 \quad \alpha_3 = a_3 - \beta_3 \gamma_2 \quad [A]_{3, \cdot}$$

$$R_3 C_4: \gamma_3 = c_3$$

$$R_5 C_4: \beta_5 \alpha_4 = b_5 \quad \beta_5 = \frac{b_5}{\alpha_4}$$

$$R_5 C_5: \beta_5 \gamma_4 + \alpha_5 = a_5 \quad \alpha_5 = a_5 - \beta_5 \gamma_4 \quad [A]_{5, \cdot}$$

(n-esima)

1^a Riga: $\alpha_1 = a_1$
 $\gamma_1 = c_1$

Riga 2, ..., n

$$\beta_i = \frac{b_i}{\alpha_{i-1}}$$

$$\alpha_i = a_i - \beta_i \gamma_{i-1}$$

$$\gamma_i = c_i$$

file trifat.mv

$$R_i: \begin{bmatrix} -1 & 2 & -1 \end{bmatrix}$$

$$f_1 = f_n = 1 \quad f_i = 0 \quad i = 2, \dots, n-1$$

Risoluzione del sistema

$$A \underline{x} = \underline{f}$$

file triex.m

$$L \underline{x} = \underline{f}$$

$$(U \underline{x} = \underline{y})$$

• $L \underline{y} = \underline{f}$

$$y_1 = f_1$$

$$\beta_2 y_1 + y_2 = f_2$$

$$\beta_3 y_2 + y_3 = f_3$$

⋮

$$\beta_n y_{n-1} + y_n = f_n$$



$$y_1 = f_1$$

$$i = 2, \dots, n$$

$$y_i = f_i - \beta_i * y_{i-1}$$

end

• $U \underline{x} = \underline{y}$

$$\alpha_1 x_1 + \gamma_1 x_2 = y_1$$

$$\alpha_2 x_2 + \gamma_2 x_3 = y_2$$

⋮

$$\alpha_{n-1} x_{n-1} + \gamma_{n-1} x_n = y_{n-1}$$

$$\alpha_n x_n = y_n$$



$$x_n = \frac{y_n}{\alpha_n}$$

$$i = n-1, \dots, 1 \text{ (step -1)}$$

$$x_i = \frac{1}{\alpha_i} (y_i - \gamma_i x_{i+1})$$

end

file ex_tri.m