

Pràctica voluntària - Descomposició matriu tridiagonal i tridiagonal amb cantonades

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1 Descomposició matriu tridiagonal

Output de la terminal:

```
(xenial)user@localhost:~/Downloads/gitrepos/school/algebranumerica/00
  ↳ _practiques/02_tridiagonal$ ./ex1_combined data/a.mt data/p.mt
  ↳ data/x.mt
Llegint matriu A de mida 26...

Calculant descomposicio LU...
alpha[0]=2.2018000000000000 beta[0]=-0.5583613407212
alpha[1]=-0.9896592242711 beta[1]=-0.4755172168952
alpha[2]=5.4293202379802 beta[2]=0.2042244611477
alpha[3]=4.3349924194255 beta[3]=0.4412925825263
alpha[4]=5.9705527818030 beta[4]=-0.7129993076980
alpha[5]=-3.8326216119587 beta[5]=-0.4350546881010
alpha[6]=2.1405511774474 beta[6]=2.2412918927363
alpha[7]=12.9065011915939 beta[7]=-0.1099755835396
alpha[8]=-0.9214750025856 beta[8]=3.3296616743708
alpha[9]=-6.7053680292551 beta[9]=-0.0282758528947
alpha[10]=-4.4529188573189 beta[10]=1.1016145043688
alpha[11]=0.9130931041085 beta[11]=3.2007688885719
alpha[12]=18.0762805933636 beta[12]=0.2608279936599
alpha[13]=5.4740055028203 beta[13]=-0.2943731056116
alpha[14]=-1.6703335397589 beta[14]=1.7413288608333
alpha[15]=6.3332118035560 beta[15]=0.4525665789972
alpha[16]=4.2187982064696 beta[16]=0.9479476865869
alpha[17]=-1.0876348914573 beta[17]=3.8167219832733
alpha[18]=-7.1797039533331 beta[18]=-0.1082217324071
alpha[19]=-4.4940053701067 beta[19]=-0.5024471076559
alpha[20]=-4.0304715325366 beta[20]=0.8904169080538
alpha[21]=4.2778866245167 beta[21]=0.3934185610144
alpha[22]=5.3482117240648 beta[22]=0.0718370961776
alpha[23]=4.2248621696736 beta[23]=-0.7682144102350
alpha[24]=4.4230545581870 beta[24]=-0.6107996101923
alpha[25]=7.7560252571985
```

Acabat de calcular la descomposicio LU

Error (maxim de les diferencies entre coeficients): 4.44089e-16

Determinant: 1687055218002259.75000000000000

Trobat la solucio al sistema $Ly=p...$

Trobat la solucio al sistema $Ux=y...$

Solucio trobada! Es la seguent:

```
-2.9163553544901 1.9783761511920 -1.3265669173034 -0.5705903116591
  → -0.6730379542474 -0.6094285700724 1.3882877828963 0.7994228577873
  → 2.1439142484715 1.1250450564887 0.2577237979462 1.4709482399834
  → -1.0949142341777 -0.0497476277350 0.5783855000361 -1.1054712483720
  → 2.2093400542163 1.1114797915722 -1.5029502167431 0.8573503405069
  → 0.2086672256317 0.4045302758455 -0.5121383193276 0.3269832110938
  → -1.2524552842569 -0.0944507822803
```

Escrivint a 'data4/x.mt' el vector solucio x...

```
(xenial)user@localhost:~/Downloads/gitrepos/school/algebranumerica/00
  → _practiques/02_tridiagonal$ ./residu data/a.mt data/x.mt data/p.mt
```

Vector r:

```
-4.44089e-16
4.44089e-16
8.88178e-16
3.33067e-16
0
-1.38778e-15
5.55112e-16
8.88178e-16
2.22045e-16
8.88178e-16
-2.22045e-16
-4.44089e-16
6.66134e-16
0
0
8.88178e-16
2.22045e-15
1.33227e-15
9.99201e-16
-8.88178e-16
-6.93889e-17
3.33067e-16
0
-4.44089e-16
0
```

```
0
Norma sub_1: 1.45578e-14
Maxim norma: 2.22045e-15
```

2 Descomposició matriu tridiagonal amb cantonades

Output de la terminal:

```
(xenial)user@localhost:~/Downloads/gitrepos/school/algebranumerica/00
  ↳ _practiques/02_tridiagonal$ ./ex2_combinat data5/a_cantonades.mt
  ↳ data5/p.mt data5/x.mt
Llegint matriu A de mida 26...

Calculant descomposicio LU...
alpha[0]=2.20180000000000 beta[0]=-0.5583613407212
alpha[1]=-0.9896592242711 beta[1]=-0.4755172168952
alpha[2]=5.4293202379802 beta[2]=0.2042244611477
alpha[3]=4.3349924194255 beta[3]=0.4412925825263
alpha[4]=5.9705527818030 beta[4]=-0.7129993076980
alpha[5]=-3.8326216119587 beta[5]=-0.4350546881010
alpha[6]=2.1405511774474 beta[6]=2.2412918927363
alpha[7]=12.9065011915939 beta[7]=-0.1099755835396
alpha[8]=-0.9214750025856 beta[8]=3.3296616743708
alpha[9]=-6.7053680292551 beta[9]=-0.0282758528947
alpha[10]=-4.4529188573189 beta[10]=1.1016145043688
alpha[11]=0.9130931041085 beta[11]=3.2007688885719
alpha[12]=18.0762805933636 beta[12]=0.2608279936599
alpha[13]=5.4740055028203 beta[13]=-0.2943731056116
alpha[14]=-1.6703335397589 beta[14]=1.7413288608333
alpha[15]=6.3332118035560 beta[15]=0.4525665789972
alpha[16]=4.2187982064696 beta[16]=0.9479476865869
alpha[17]=-1.0876348914573 beta[17]=3.8167219832733
alpha[18]=-7.1797039533331 beta[18]=-0.1082217324071
alpha[19]=-4.4940053701067 beta[19]=-0.5024471076559
alpha[20]=-4.0304715325366 beta[20]=0.8904169080538
alpha[21]=4.2778866245167 beta[21]=0.3934185610144
alpha[22]=5.3482117240648 beta[22]=0.0718370961776
alpha[23]=4.2248621696736 beta[23]=-0.7682144102350
alpha[24]=4.4230545581870
eps[0]=-1.00000000000000
eps[1]=-0.5583613407212
eps[2]=-0.2655104307616
eps[3]=0.0542237246514
eps[4]=-0.0239285274856
eps[5]=-0.0170610235315
eps[6]=-0.0074224782712
eps[7]=0.0166359403732
```

```
eps[8]=0.0018295472503
eps[9]=-0.0060917733607
eps[10]=-0.0001722500874
eps[11]=0.0001897531947
eps[12]=-0.0006073561220
eps[13]=0.0001584154787
eps[14]=0.0000466332565
eps[15]=-0.0000812038353
eps[16]=0.0000367501420
eps[17]=-0.0000348372121
eps[18]=0.0001329639531
eps[19]=0.0000143895894
eps[20]=0.0000072300075
eps[21]=-0.0000064377210
eps[22]=0.0000025327189
eps[23]=-0.0000001819432
eps[24]=4.9839998602286
delta[0]=0.4541738577527
delta[1]=0.6954465205389
delta[2]=-0.1981822418672
delta[3]=-0.0276221268576
delta[4]=-0.0206189107572
delta[5]=0.0045696404629
delta[6]=0.0079563853389
delta[7]=0.0025448841222
delta[8]=-0.0105189556065
delta[9]=-0.0045995354325
delta[10]=0.0044172045244
delta[11]=0.0025562024948
delta[12]=0.0005812880543
delta[13]=0.0003413391384
delta[14]=0.0001660988330
delta[15]=0.0001121765623
delta[16]=-0.0000302697101
delta[17]=0.0001126199699
delta[18]=0.0000096279927
delta[19]=-0.0000070318113
delta[20]=0.0000011204221
delta[21]=0.0000006776140
delta[22]=0.0000001799635
delta[23]=0.0000002075718
delta[24]=-0.6107997398022
alpha[25]=8.5469815570905
```

Acabat de calcular la descomposicio LU

Error (maxim de les diferencies entre coeficients): 4.44089e-16

Determinant: 1859100422690847.75000000000000

Trobant la solucio al sistema $Ly=p...$
Trobant la solucio al sistema $Ux=y...$

Solucio trobada! Es la seguent:

```
-2.7142623415271 1.8533505142907 -1.3143312102757 -0.5729199214249
  ↳ -0.6721952941633 -0.6107032357627 1.3884289533296 0.7990366617691
  ↳ 2.1437215681049 1.1248250674777 0.2577047706092 1.4710252962049
  ↳ -1.0948853229948 -0.0496333219847 0.5775658812110 -1.1051483848579
  ↳ 2.2075621070367 1.1096285064083 -1.5062161360526 0.8645047816356
  ↳ 0.1586073996475 0.4825167287106 -0.2772639467999 0.5847625092585
  ↳ -1.6467930199559 0.2555045457817
```

Escrivint a 'data5/x.mt' el vector solucio x...

```
(xenial)user@localhost:~/Downloads/gitrepos/school/algebranumerica/00
  ↳ _practiques/02_tridiagonal$ ./residu_2 data5/a_cantonades.mt data5
  ↳ /x.mt data5/p.mt
```

Vector r:

```
-8.88178e-16
4.44089e-16
0
-5.55112e-16
-4.44089e-16
3.88578e-16
5.55112e-16
-8.88178e-16
-2.22045e-16
0
2.22045e-16
0
-3.33067e-16
-8.88178e-16
0
-8.88178e-16
-4.44089e-16
-8.88178e-16
9.99201e-16
0
-2.91434e-16
1.11022e-16
-4.44089e-16
0
-8.88178e-16
8.88178e-16
Norma sub_1: 1.16712e-14
Maxim norma: 9.99201e-16
```


[illegible]

3.2 Descomposició matriu tridiagonal amb cantonades

Matriu L:

```

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
-0.558361 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 -0.475517 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.204224 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0.441293 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 -0.712999 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 -0.435055 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2.24129 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 -0.109976 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3.32966 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 -0.0282759 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1.10161 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 3.20077 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0.260828 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 -0.294373 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1.74133 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.452567 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.947948 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3.81672 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.108222 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.502447 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.890417 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.393419 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0718371 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.768214 1
0.454174 0.695447 -0.198182 -0.0276221 -0.0206189 0.00456964 0.00795639
↪ 0.00254488 -0.010519 -0.00459954 0.0044172 0.0025562 0.000581288

```


↪ 0.000341339 0.000166099 0.000112177 -3.02697e-05 0.00011262
 ↪ 9.62799e-06 -7.03181e-06 1.12042e-06 6.77614e-07 1.79964e-07
 ↪ 2.07572e-07 -0.6108 1

Matriu U:

2.2018 1.5154 0 -1
 0 -0.989659 1.5472 0 -0.558361
 0 0 5.42932 -0.6042 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.26551
 0 0 0 4.33499 -4.4568 0.0542237
 0 0 0 0 5.97055 -0.8494 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.0239285
 0 0 0 0 0 -3.83262 -3.727 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.017061
 0 0 0 0 0 0 2.14055 -4.1282 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ↪ -0.00742248
 0 0 0 0 0 0 0 12.9065 -3.8088 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0166359
 0 0 0 0 0 0 0 0 -0.921475 2.932 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.00182955
 0 0 0 0 0 0 0 0 0 -6.70537 -4.2764 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ↪ -0.00609177
 0 0 0 0 0 0 0 0 0 0 -4.45292 -0.5284 0 0 0 0 0 0 0 0 0 0 0 0 0
 ↪ -0.00017225
 0 0 0 0 0 0 0 0 0 0 0 0.913093 -4.1106 0 0 0 0 0 0 0 0 0 0 0 0
 ↪ 0.000189753
 0 0 0 0 0 0 0 0 0 0 0 0 18.0763 -3.2144 0 0 0 0 0 0 0 0 0 0 0
 ↪ -0.000607356
 0 0 0 0 0 0 0 0 0 0 0 0 0 5.47401 0.8128 0 0 0 0 0 0 0 0 0 0.000158415
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1.67033 -4.2772 0 0 0 0 0 0 0 0 4.66333e
 ↪ -05
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6.33321 1.1384 0 0 0 0 0 0 0 0 -8.12038e
 ↪ -05
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.2188 -4.0466 0 0 0 0 0 0 0 3.67501e-05
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1.08763 0.6138 0 0 0 0 0 0 -3.48372e
 ↪ -05
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -7.1797 -3.2822 0 0 0 0 0
 ↪ 0.000132964
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -4.49401 -0.6422 0 0 0 0 1.43896e
 ↪ -05
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -4.03047 -2.5872 0 0 0 7.23001e
 ↪ -06
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.27789 -1.4204 0 0 -6.43772e
 ↪ -06
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5.34821 -4.873 0 2.53272e-06
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.22486 2.7618 -1.81943e
 ↪ -07
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.42305 4.984
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8.54698

Matriu A:

2.2018 1.5154 0 -1
 -1.2294 -1.8358 1.5472 0
 0 0.4706 4.6936 -0.6042 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Matrui $r = L*U - A$:

10

[illegible]