Implementacio de l'algorisme del simplex primal

Nom	DNI	Conjunt de dades
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Índex

1 Breu explicació del funcionament del codi

La implementació que hem fet del simplex consta de dos fases, la fase I on trobem una SBF del PL donata partir d'afegir la matriu identitat a A i agafar com a VB inicials els corresponents al les columnes de la matriu afegida. Tot i que tenim les dos fases, fem tots els calculs dins de la mateixa funcio, anomenada iteració, a on li passem com a parametre un bool que marca si estem a la fase I o a la fase II.

Per tal de detectar la infactibilitat, despres d'aplicar la fase I mirarem si el valor de la funció objectiu de la fase inicial es major que 0, ja que en aquest cas s'hauria trobat una SBF optima del problema de fase I que depen de VB afegides que no pertanyen al PL original. En el cas de que detecti la infactibilitat, el problema retornara -1.

Per tal de detectar si el PL es il $\cdot$ limitat, a cada iteració de la fase II mirarem si totes les direccions basiques son majors o iguals a 0, i en el cas que es doni tal event, retornarem -1 de la funció de iteració i retornarem -2 de la funcio simplex. Les dades que es mostraran despres de informar que el problema es ilimitat seran la informació del ultim vertex que te una aressta amb direcció de descens negativa i θ^* infinita.

2 Solució dels problemes de Ruben Aciego

2.1 PL1

2.2 PL2

2.3 PL3

2.4 PL4

3 Solució dels problemes de Daniel Vilardell

3.1 PL1

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  PM/GM/FME Curs 2019-20, exercici implementacio del simplex : cjt. dades 65, problema PL1cl
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c=
-94 14 -8 -29 61 -86 77 80 57 52 -4 8 75 98 0 0 0 0 0 0

A=
-48 -92 33 67 65 -79 90 72 -63 85 73 35 34 73 0 0 0 0 0 0
45 -84 -82 -85 87 77 67 -54 27 -53 54 -4 90 23 0 0 0 0 0 0
-44 -63 -92 72 82 63 -14 -4 -53 90 41 -49 83 -85 0 0 0 0 0 0
-71 69 56 -87 -97 -30 82 95 87 -63 63 23 -66 83 0 0 0 0 0 0
58 98 98 91 93 81 51 80 62 52 97 72 61 79 1 0 0 0 0 0
86 85 -29 -7 -63 -22 -75 -32 -25 -68 88 -13 39 54 0 -1 0 0 0 0
 8 76 -55 -35 52 65 94 -60 -34 -53 -57 -49 19 90 0 0 1 0 0 0
-28 36 -8 0 81 21 25 -3 14 78 -67 -72 -10 81 0 0 0 -1 0 0
80 -67 91 22 16 -91 -55 -78 -17 88 -17 86 74 -9 0 0 0 0 -1 0
63 -81 15 7 -66 0 -70 58 -43 70 88 4 -52 42 0 0 0 0 0 -1

b=
345 108 27 144 1074 17 62 147 122 34

Inici simplex primal amb regla de Bland
Fase 1
      Iteracio 1: q = 1, rq = -149, theta* = 0.19767, B(p) = 26, z = 2050.5465
      Iteracio 2: q = 3, rq = -77.2442, theta* = 0.59448, B(p) = 30, z = 2004.6262
      Iteracio 3: q = 2, rq = -135.0664, theta* = 0.11256, B(p) = 29, z = 1989.4227
      Iteracio 4: q = 4, rq = -35.9051, theta* = 1.6727, B(p) = 23, z = 1929.3627
      Iteracio 5: q = 5, rq = -268.8273, theta* = 0.3362, B(p) = 2, z = 1838.9826
      Iteracio 6: q = 6, rq = -387.8135, theta* = 0.70785, B(p) = 22, z = 1564.4702
      Iteracio 7: q = 2, rq = -766.8659, theta* = 0.0414, B(p) = 27, z = 1532.7221
      Iteracio 8: q = 8, rq = -374.0105, theta* = 1.4445, B(p) = 28, z = 992.4668
      Iteracio 9: q = 7, rq = -311.8883, theta* = 0.16388, B(p) = 6, z = 941.356
      Iteracio 10: q = 9, rq = -401.6214, theta* = 1.2459, B(p) = 25, z = 440.9593
      Iteracio 11: q = 10, rq = -3.8883, theta* = 0.30279, B(p) = 3, z = 439.782
      Iteracio 12: q = 11, rq = -269.7581, theta* = 1.5294, B(p) = 24, z = 27.2068
      Iteracio 13: q = 3, rq = -86.2272, theta* = 0.31552, B(p) = 21, z = 4.9383e-13
Solucio basica factible trobada, iteracio 14

Fase II
      Iteracio 15: q = 6, rq = -93.8848, theta* = 0.89745, B(p) = 9, z = 115.9731
      Iteracio 16: q = 14, rq = -86.6067, theta* = 0.22449, B(p) = 8, z = 96.5306
      Iteracio 17: q = 20, rq = -0.54387, theta* = 347.5203, B(p) = 5, z = -92.4743
      Iteracio 18: q = 17, rq = -0.65525, theta* = 2.264, B(p) = 2, z = -93.9579
Solucio optima trobada, iteracio 19, z = -93.9579
Fi simplex primal

VB*=
3 7 4 11 6 1 17 14 20 10
```

```
xb*=
2.6406 1.0585 0.8530 1.9430 2.8486 1.1166 2.2640 1.4982 351.1615 1.5633

VNB*=
9 12 13 8 15 16 2 18 19 5

r*=
85.6070 53.3109 106.3220 36.2495 0.4333 0.0800 62.0609 0.6129 0.0007 50.2805

z*=
-93.9579
```

3.2 PL2

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  PM/GM/FME Curs 2019-20, exercici implementacio del simplex : cjt. dades 65, problema PL1cl
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c=
-74 -88 -24 -27 -28 -14 -41 -54 -98 -68 -7 -36 -60 -78 0 0 0 0 0 0 0 0 0 0

A=
66 31 18 32 15 75 68 98 7 52 83 70 63 0 -1 0 0 0 0 0 0 0 0 0
73 15 90 30 30 100 97 82 90 5 71 36 64 76 0 -1 0 0 0 0 0 0 0 0
7 37 38 2 0 89 87 29 91 98 27 63 79 29 0 0 -1 0 0 0 0 0 0 0
57 53 45 96 10 51 38 63 1 46 38 86 39 95 0 0 0 -1 0 0 0 0 0 0
35 37 61 66 31 33 46 27 7 80 70 5 85 13 0 0 0 0 -1 0 0 0 0 0
70 66 6 1 39 52 26 17 9 96 5 65 26 84 0 0 0 0 0 -1 0 0 0 0
63 24 93 17 37 41 32 65 16 27 50 92 4 10 0 0 0 0 0 0 -1 0 0 0
78 23 9 83 68 98 23 67 60 27 12 75 85 46 0 0 0 0 0 0 0 -1 0 0
40 2 96 16 26 87 71 21 59 33 87 89 21 24 0 0 0 0 0 0 0 0 -1 0
30 9 34 83 48 91 36 67 61 71 86 12 62 60 0 0 0 0 0 0 0 0 0 -1

b=
677 858 675 717 595 561 570 753 671 749

Inici simplex primal amb regla de Bland
Fase 1
      Iteracio 1: q = 1, rq = -519, theta* = 8.0143, B(p) = 30, z = 2666.5857
      Iteracio 2: q = 3, rq = -445.5143, theta* = 0.74315, B(p) = 31, z = 2335.5015
      Iteracio 3: q = 4, rq = -336.7047, theta* = 1.5488, B(p) = 32, z = 1814.0132
      Iteracio 4: q = 2, rq = -192.7397, theta* = 1.3688, B(p) = 28, z = 1550.1933
      Iteracio 5: q = 5, rq = -41.011, theta* = 2.7877, B(p) = 29, z = 1435.8666
      Iteracio 6: q = 6, rq = -270.9683, theta* = 3.9306, B(p) = 1, z = 370.7875
      Iteracio 7: q = 7, rq = -376.7737, theta* = 0.32828, B(p) = 33, z = 247.0986
      Iteracio 8: q = 1, rq = -49.866, theta* = 1.3193, B(p) = 26, z = 181.3084
      Iteracio 9: q = 8, rq = -202.0237, theta* = 0.53149, B(p) = 27, z = 73.9357
      Iteracio 10: q = 10, rq = -85.3255, theta* = 0.48253, B(p) = 25, z = 32.7638
      Iteracio 11: q = 9, rq = -14.13, theta* = 0.47865, B(p) = 5, z = 26.0005
      Iteracio 12: q = 11, rq = -36.8999, theta* = 0.70462, B(p) = 34, z = -1.954e-13
Solucio basica factible trobada, iteracio 13

Fase II
      Iteracio 14: q = 12, rq = -383.2391, theta* = 0.82303, B(p) = 6, z = -1001.6956
      Iteracio 15: q = 5, rq = -36.7532, theta* = 0.53926, B(p) = 10, z = -1021.515
      Iteracio 16: q = 13, rq = -127.3276, theta* = 0.085209, B(p) = 7, z = -1032.3645
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      Iteracio 17: q = 16, rq = -0.95732, theta* = 27.2954, B(p) = 5, z = -1058.4949
      Iteracio 18: q = 7, rq = -29.6914, theta* = 0.047624, B(p) = 13, z = -1059.9089
      Iteracio 19: q = 17, rq = -0.76396, theta* = 269.6311, B(p) = 12, z = -1265.8963
      Iteracio 20: q = 5, rq = -75.516, theta* = 0.275, B(p) = 1, z = -1286.6629
      Iteracio 21: q = 13, rq = -193.7704, theta* = 0.13865, B(p) = 5, z = -1313.5296
      Iteracio 22: q = 20, rq = -1.6552, theta* = 79.4492, B(p) = 13, z = -1445.0338
      Iteracio 23: q = 12, rq = -416.8653, theta* = 0.34983, B(p) = 4, z = -1590.867
      Iteracio 24: q = 19, rq = -2.3055, theta* = 14.8034, B(p) = 12, z = -1624.9964
      Iteracio 25: q = 18, rq = -2.4269, theta* = 102.8922, B(p) = 8, z = -1874.7079
      Iteracio 26: q = 10, rq = -5.3164, theta* = 2.4993, B(p) = 11, z = -1887.9951
      Iteracio 27: q = 15, rq = -0.3911, theta* = 129.676, B(p) = 3, z = -1938.711
      Iteracio 28: q = 21, rq = -1.757, theta* = 264.7259, B(p) = 9, z = -2403.8446
      Iteracio 29: q = 3, rq = -52.4042, theta* = 3.695, B(p) = 16, z = -2597.478
      Iteracio 30: q = 11, rq = -47.3794, theta* = 1.2301, B(p) = 7, z = -2655.7581
      Iteracio 31: q = 16, rq = -0.15138, theta* = 106.234, B(p) = 10, z = -2671.8394
      Iteracio 32: q = 22, rq = -4.0349, theta* = 716.7726, B(p) = 11, z = -5563.9497
      Iteracio 33: q = 12, rq = -219.7487, theta* = 5.8443, B(p) = 3, z = -6848.2214
      Iteracio 34: q = 24, rq = -9.9871, theta* = 2270.5, B(p) = 12, z = -29524
Problema il·limitat
VB*=
24 20 18 2 21 17 15 19 22 16

xb*=
1.0e + 04 *
0.2270 2.1582 1.7064 0.0335 0.7482 1.1739 0.9724 1.1818 0.6964 0.4175

VNB*=
7 6 5 14 10 1 4 8 3 13 9 11 23 12
r*=
1.0e + 03 *
3.0830 3.8140 1.1160 0.9780 1.3840 1.6860 0.6770 0.8700 4.2000 0.8640 2.4980 3.8210 -0.0440 3.8800

z*=
-2.9524e+04
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3.3 PL3

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  PM/GM/FME Curs 2019-20, exercici implementacio del simplex : cjt. dades 65, problema PL1cl
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c=
-21 99 -72 -24 -52 12 84 51 -41 54 -8 -54 -52 69 0 0 0 0 0 0

A=
83 47 39 13 -12 70 16 25 -23 -54 -79 32 -98 78 0 0 0 0 0 0
4 38 78 99 -16 35 31 -56 34 -79 24 -31 4 36 0 0 0 0 0 0
-95 34 -28 64 75 -27 51 22 56 99 20 62 40 -24 0 0 0 0 0 0
-13 40 30 67 9 -58 88 80 43 -95 95 2 -59 -91 0 0 0 0 0 0
65 95 63 70 97 98 81 90 85 55 51 81 83 51 1 0 0 0 0 0
5 13 38 -43 -71 87 -53 73 -39 -15 -1 18 38 -50 0 1 0 0 0 0
84 -26 7 -83 -38 -53 57 64 8 -13 75 -35 -52 28 0 0 1 0 0 0
23 1 -28 83 16 84 -100 24 12 14 -57 47 -21 33 0 0 0 -1 0 0
-38 -13 75 76 34 65 56 -40 -16 38 50 -75 -87 -24 0 0 0 0 1 0
100 -74 -12 71 -40 -29 70 -34 19 87 -25 81 85 95 0 0 0 0 0 1

b=
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```
137 201 349 138 1066 1 24 130 102 395

Inici simplex primal amb regla de Bland
Fase 1
      Iteracio 1: q = 1, rq = -218, theta* = 0.2, B(p) = 26, z = 2499.4
      Iteracio 2: q = 4, rq = -2291.8, theta* = 0.011261, B(p) = 27, z = 2473.5931
      Iteracio 3: q = 2, rq = -464.2024, theta* = 1.0294, B(p) = 21, z = 1995.7269
      Iteracio 4: q = 3, rq = -332.1584, theta* = 0.89126, B(p) = 2, z = 1699.6863
      Iteracio 5: q = 5, rq = -17.7027, theta* = 0.10861, B(p) = 29, z = 1697.7636
      Iteracio 6: q = 7, rq = -419.6348, theta* = 0.046464, B(p) = 5, z = 1678.2656
      Iteracio 7: q = 8, rq = -460.7314, theta* = 0.40909, B(p) = 24, z = 1489.7847
      Iteracio 8: q = 6, rq = -77.1208, theta* = 0.48414, B(p) = 3, z = 1452.4471
      Iteracio 9: q = 5, rq = -14.2188, theta* = 2.4552, B(p) = 28, z = 1417.5369
      Iteracio 10: q = 9, rq = -162.6241, theta* = 1.8231, B(p) = 5, z = 1121.0569
      Iteracio 11: q = 2, rq = -960.794, theta* = 0.12973, B(p) = 22, z = 996.409
      Iteracio 12: q = 5, rq = -360.1753, theta* = 0.23846, B(p) = 4, z = 910.5201
      Iteracio 13: q = 10, rq = -405.1462, theta* = 0.50997, B(p) = 5, z = 703.9088
      Iteracio 14: q = 3, rq = -396.2346, theta* = 0.75324, B(p) = 23, z = 405.4503
      Iteracio 15: q = 4, rq = -33.6774, theta* = 0.38834, B(p) = 7, z = 392.3721
      Iteracio 16: q = 12, rq = -158.8796, theta* = 1.0577, B(p) = 6, z = 224.3289
      Iteracio 17: q = 5, rq = -280.0892, theta* = 0.33606, B(p) = 30, z = 130.2027
      Iteracio 18: q = 6, rq = -209.5255, theta* = 0.15295, B(p) = 2, z = 98.1556
      Iteracio 19: q = 11, rq = -107.0259, theta* = 0.37676, B(p) = 4, z = 57.8326
      Iteracio 20: q = 2, rq = -89.3872, theta* = 0.14533, B(p) = 8, z = 44.8415
      Iteracio 21: q = 13, rq = -351.3243, theta* = 0.12764, B(p) = 25, z = 4.9738e-14
Solucio basica factible trobada, iteracio 22

Fase II
      Iteracio 23: q = 8, rq = -147.1981, theta* = 0.21505, B(p) = 2, z = -532.3667
      Iteracio 24: q = 16, rq = -0.40854, theta* = 57.4959, B(p) = 8, z = -555.8563
      Iteracio 25: q = 4, rq = -108.4475, theta* = 0.1321, B(p) = 6, z = -570.1818
      Iteracio 26: q = 17, rq = -0.54945, theta* = 183.0448, B(p) = 9, z = -670.7557
      Iteracio 27: q = 19, rq = -0.53234, theta* = 19.7222, B(p) = 16, z = -681.2546
      Iteracio 28: q = 7, rq = -249.4609, theta* = 0.088147, B(p) = 10, z = -703.2439
      Iteracio 29: q = 9, rq = -11.2338, theta* = 1.3466, B(p) = 7, z = -718.3709
      Iteracio 30: q = 20, rq = -0.047555, theta* = 30.2307, B(p) = 9, z = -719.8085
Solucio optima trobada, iteracio 31, z = -719.8085
Fi simplex primal

VB*=
12 4 3 19 13 1 20 17 11 5
xb*=
3.4374 0.5963 3.5509 73.5758 1.3523 1.1260 30.2307 226.2468 0.5299 3.1923
VNB*=
10 6 2 14 15 8 7 18 16 9
r*=
100.7620 76.6532 186.4573 131.2065 0.5167 79.4830 187.9212 0.5736 0.1674 1.0676
z*=
 -719.8085
```

3.4 PL4

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  PM/GM/FME Curs 2019-20, exercici implementacio del simplex : cjt. dades 65, problema PL1cl
-----------------------------------------------------------------------------------------
c=
-41 42 22 -19 -11 90 -98 -15 -72 -24 31 -51 2 -76 0 0 0 0 0 0

A=
85 -76 -72 18 54 91 81 -3 38 -56 -68 -36 97 -15 0 0 0 0 0 0
-41 -53 49 58 46 -96 57 57 19 0 83 -94 74 -1 0 0 0 0 0 0
-14 34 0 -92 -22 17 76 82 34 12 97 75 -60 30 0 0 0 0 0 0
4 80 38 -91 -47 29 -5 -44 34 37 -5 76 -16 -35 0 0 0 0 0 0
-76 33 -47 10 -72 93 42 32 30 15 27 54 -100 -21 1 0 0 0 0 0
79 84 85 19 -32 28 -25 34 -55 77 -29 -56 49 41 0 1 0 0 0 0
15 33 -7 -13 46 78 28 24 -6 -51 -73 42 -76 65 0 0 -1 0 0 0
100 41 84 75 5 70 48 10 6 51 45 79 47 21 0 0 0 1 0 0
89 98 45 80 96 33 5 26 3 3 88 69 94 93 0 0 0 0 1 0
65 89 7 22 20 81 81 88 87 94 93 94 31 18 0 0 0 0 0 1

b=
138 158 269 55 21 300 104 25 1 4

Inici simplex primal amb regla de Bland
Fase 1
      Iteracio 1: q = 1, rq = -306, theta* = 0.011236, B(p) = 29, z = 1071.5618
      Iteracio 2: q = 2, rq = -26.0562, theta* = 0.010204, B(p) = 1, z = 1071.2959
      Iteracio 3: q = 3, rq = -15.3163, theta* = 0.022222, B(p) = 2, z = 1070.9556
      Iteracio 4: q = 6, rq = -290.5333, theta* = 0.030303, B(p) = 3, z = 1062.1515
      Iteracio 5: q = 7, rq = -323.7576, theta* = 0.022487, B(p) = 30, z = 1054.8713
      Iteracio 6: q = 3, rq = -91.1675, theta* = 0.016898, B(p) = 6, z = 1053.3307
      Iteracio 7: q = 15, rq = -1, theta* = 19.7814, B(p) = 25, z = 1033.5493
      Iteracio 8: q = 16, rq = -1, theta* = 299.7618, B(p) = 26, z = 733.7875
      Iteracio 9: q = 18, rq = -1, theta* = 21.2803, B(p) = 28, z = 712.5072
      Iteracio 10: q = 5, rq = -45.0211, theta* = 0.0079468, B(p) = 3, z = 712.1494
Problema infactible
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