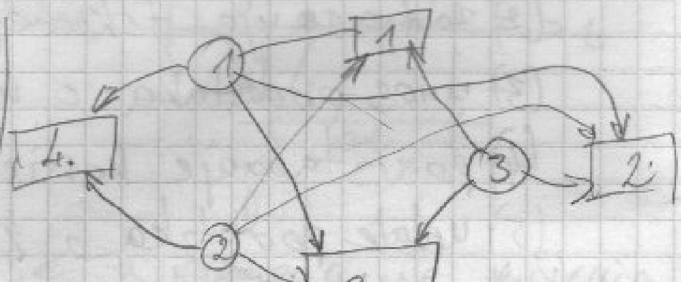
OREIST

30. 10. 2009.

○ izvor (skladište) $i = 1, m$

▭ odredište (prodavaonica) $j = 1, n$



$$\min Z = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} x_{ij}$$

$c_{ij} \left[\frac{kn}{kg} \right]$

uz

$$\left.\begin{aligned} \sum_{j=1}^{n} x_{ij} &\le Q_i \quad ; i = 1, m \\ \sum_{i=1}^{m} x_{ij} &\ge D_j \quad ; j = 1, n \end{aligned}\right\} \sum_{i=1}^{m} Q_i \ge \sum_{j=1}^{n} D_j$$

OPEIST	6. 11. 2009.

Transportni problem

- raspoloživih ima malo više od potrebnih (230 > 220),

	1	2	3	raspoloživo
1	3	2	1	100
2	4	5	6	70
3	2	1	3	60
potrebe	80	50	90	

zatvoreni transp. problem:

$$\sum_{i=1}^{m} Q_i = \sum_{j=1}^{n} D_j$$

c_{ij} — fiktivno odredište

	1	2	3	4	raspoloživo Q_i
1	3	2	1	0	100
2	4	5	6	0	70
3	2	1	3	0	60
potrebe	80	50	90	10	

$i = 1..m$

D_j, $j = 1..n$

$230 - 220 = 10$

$$\min z = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} x_{ij}$$

$$\left.\begin{aligned} &\sum_{j=1}^{n} x_{ij} = Q_i \; ; i = 1..m \\ &\sum_{i=1}^{m} x_{ij} = D_j \; ; j = 1..n \end{aligned}\right\} \; m+n \text{ jednadžbi}$$

$m+n-1$ linearno nezav. jedn.

- toliko ima i baznih var.

$\forall x_{ij} \geq 0$

	1	2	3	4	
1	80	20 −	+		100
2		30 +	40 −		40
3		+	50	10	60
	80	50	90	10	

23 se smanji za 1 (23 je u origin. tablici = 6)

$\frac{\Delta Z}{\Delta x_{13}}$: $f_{13} = 1 - 6 + 5 - 2 = -2$

$\Delta x_{13} = 1$

$f_{32} = 1 - 3 + 6 - 5 = -1$

sistematski postupak:

	1	2	3	4	u_i
1	3	2	1	0	3
2	4	5	6	0	6
3	2	1	3	0	3
v_j	0	−1	0	−3	

za bi. v. x_{ij} : $u_i + v_j = c_{ij}$

ta ide 0 jer od baz. var. (zaokr.) najveći trošak ima (tj. je) 6 za nebazične varijable: $f_{ij} = c_{ij} - (u_i + v_j)$

$f_{13} = 1 - (3+0) = -2$

$f_{14} = 0 - (3 + (-3)) = 0$

$f_{21} = 4 - (6 + 0) = -2$

$f_{24} = 0 - (6 + (-3)) = -3$ — donosi najveću uštedu (−3)

$f_{31} = 2 - (3+0) = -1$

$f_{32} = 1 - (3 + (-1)) = -1$

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novo baz. rješenje:

80 −	20 +			100
+	30 −	30	10	70
		60		60
80	50	90	10	

3	2	1	0	3
4	5	6	0	6
2	1	3	0	3
0	1	0	−6	

$f_{13} = 1 - 3 = -2$

$f_{14} = 0 - (-3) = 3$

$f_{21} = 4 - 6 = -2$

$f_{31} = 2 - 3 = -1$

$f_{32} = 1 - 2 = -1$

$f_{34} = 0 - (-3) = 3$

kandidati

$\Delta = 20$

$30 > 20$ pa uzimam

$\Delta = 30$ $\underline{f_{21}}$

50	50			100
30		30	10	40
		60		60
80	50	90	10	

	1	2	3	4	
1	3	2	1	0	5
2	4	5	6	0	6
3	2	1	3	0	3
	-2	-3	0	-6	

$f_{13} = 1 - 5 = -4$

$f_{14} = 0 + 1 = 1$

$f_{22} = 5 - 3 = 2$

$f_{31} = 2 - 1 = 1$

$f_{32} = 1 - 0 = 1$

$f_{34} = 0 + 3 = 3$

20	50	30	
60			10
	60		

(...)

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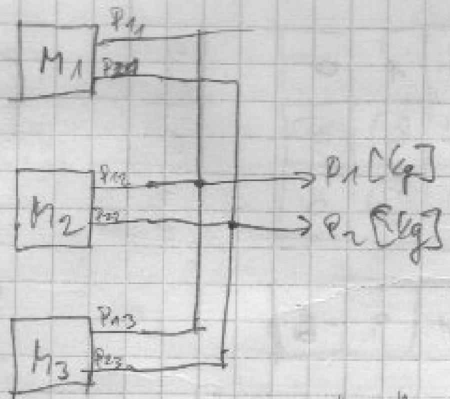
problem pridruživanja

min z =

p_{11} [kg] $\quad p_{21}$

$p_{12} \quad p_{22}$

$p_{13} \quad p_{23}$



$$\min z = \sum_{i=1}^{m} \sum_{j=1}^{n} p_{ij} \cdot n_{ij}$$

$M_1[n] + p[n] = M1uk[n] \leq 40$

$M_2[n] + p[n] = M2uk[n] \leq 40$

$M_3[n] + p[n] = M3uk[n] \leq 0$

Max $Dp = p$

Metoda granaija i ogradivanja

n poslova
n strojeva jedan na jedan

$O(n!)$

A1 trošak 7

$DG = 7 + 40 + 10 + 33 + 14 = 104$

$HG = 7 + 57 + 14 + 61 + 33 =$

$7 + 56 + 48 + 29 + 61 = 207$

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13. 11. 2009.

Ovo se može riješiti kao transp. problem:

ovo se riješ. post. Gran. i ograd.:

	1	2	3	4	
A	9	2	1	3	1
B	4	5	6	7	1
C	2	1	3	6	
D	5	3	9	4	

transf. u transp. → probl.

	1	2	3	4	
A	9	2	1	3	1
B	4	5	6	7	1
C	2	1	3	6	1
D	5	3	9	4	1
	1	1	1	1	

	1	2	3	4	
A	1 ε_1				$1+\varepsilon_1$
B		1 ε_2			$1+\varepsilon_2$
C			1 ε_3		$1+\varepsilon_3$
D				1	1
	1	1	1	1	
	$+\varepsilon_1$	$+\varepsilon_2$	$+\varepsilon_3$		

$4 + \varepsilon_1 + \varepsilon_2 + \varepsilon_3 = 7$ ✓

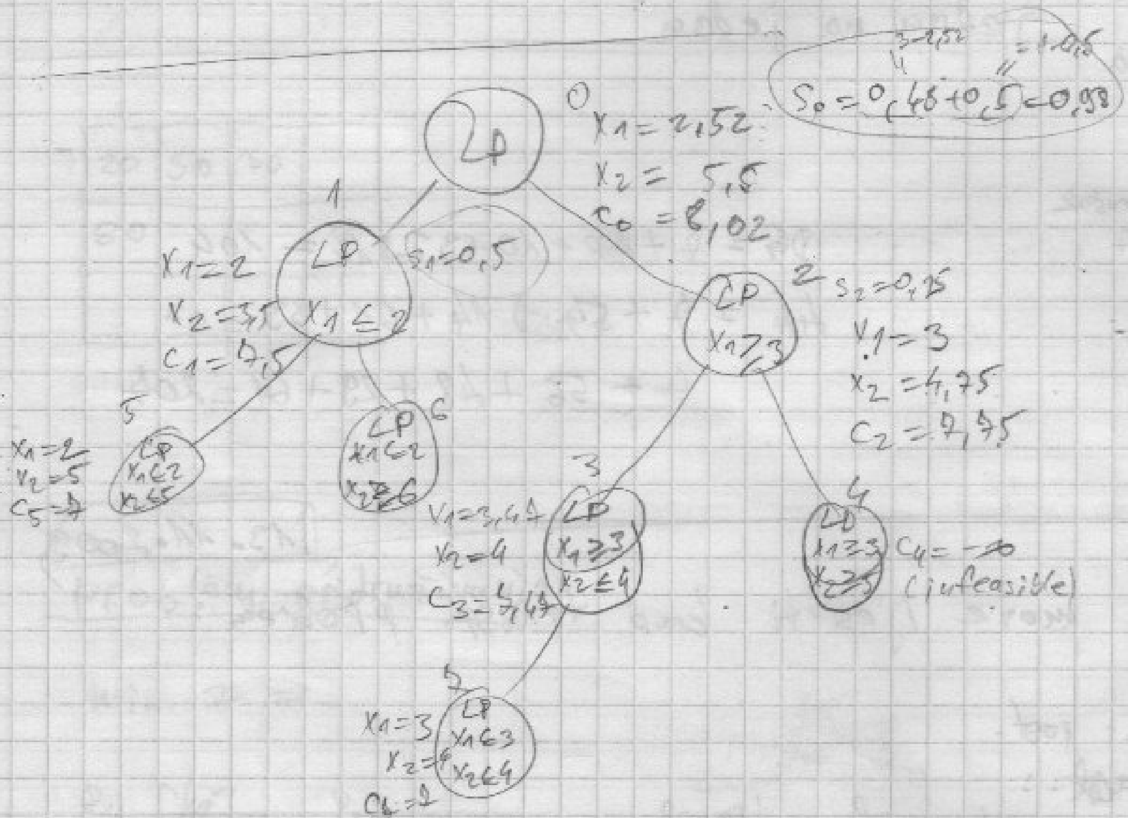
riješeno

Cjelobrojno programiranje

$\max z = x_1 + x_2$ ← slajd 52

$x_1 = 2{,}52$ → 3, 2

$x_1 \le 2 \qquad x_1 \ge 3$



← 2 ima veću f-ju cilja (7,75) pa idemo dalje iz 4

- rješenje (cijelo) je na slajdu 56 – na kraju uzimamo bilo koje rješenje (sva su ista) – alternativni optimumi.

$x_1 = 0, 1, 2, 3, \ldots 7$

$x_i = f_0 + 2f_1 + 4f_2$

$$x = \sum_{i=0}^{m} f_i \cdot 2^i$$

$j = 1, n$ čvorova
$i = 1, m$ grana

[16. 11. 2009.]

gubitak $= g\% \cdot$ snaga
↳ tijekom cijelog životnog vijeka voda

l_i – duljina grane i

$f_i = 0, 1$ – treba li i-tu granu graditi ili ne

$$\min z = \sum_{i=1}^{m} l_i \left(f_i + g \cdot p_i + g \, l_i \right)$$

$$\underbrace{p_i + l_i}_{\text{+ ide ili u jednom ili u drugom smjeru}} \leq c_i \cdot f_i$$

$$k(i,j) = \begin{cases} -1 & i \text{ izlazi iz } j \\ 0 & \text{ne koincidira} \\ 1 & i \text{ ulazi u } j \end{cases}$$ ⟵ matrica koincidencije

$$\sum_{i=1}^{m} k(i,j) \cdot p_i - \sum_{i=1}^{m} k(i,j) \, l_i = w_j \ ; \ j = 1, n$$

$p_i \geq 0, \ l_i \geq 0, \ i = 1, m$
$f_i = 0, 1, \ i = 1, m$

Separabilno programiranje:

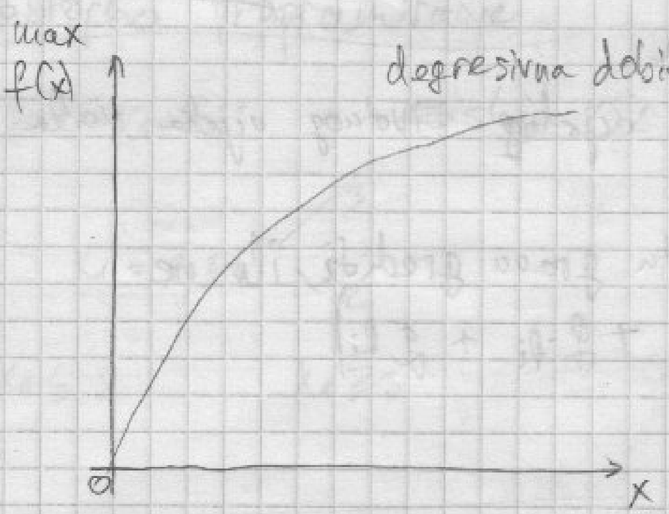
$$x = \sum_{i=1}^{n} y_i$$

$$f(x) = y_0 + \sum_{i=1}^{n} s_i y_i \quad ; \ y_i \leq g_i \ ; \ i = 1, n$$

mješovito cjelobr. progr.: $y_1 \leq g_1$
$y_1 \geq g_1 \cdot f_1$

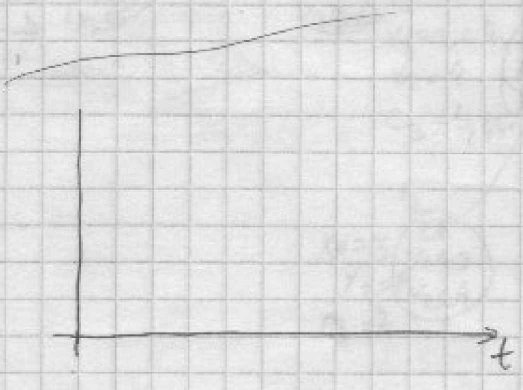
$f_1 = 0$	$f = 1$
$y_1 \leq g_1$	$y_1 = g_1$
$y_1 \geq 0$	

$y_2 \leq g_2 f_1$ ...
$y_2 \geq g_2 f_2$



degresivna dobit → može LP, ne mora SEP

— može LP, ne mora SEP



— međuispit – do (uključujući) separabilnog program.
(do slajda 62 (bez njega))

LP – odgovor na pitanja: što raditi, čime, iz čega, koliko
MP (mrežno planiranje) — kada?