Eröffnungsverfahren

NordWest-Ecken-Regel

$K_0 = 271$

$x_{11} = 10,\ x_{12} = 8,\ x_{22} = 5$

$x_{23} = 14,\ x_{24} = 3,\ x_{34} = 10$

	B_1		B_2		B_3		B_4		a_i
A_1	**2**	10	**6**	8	~~**5**~~		~~**7**~~		~~18~~ ~~8~~ 0
A_2	**2**		**7**	5	**9**	14	**4**	3	~~22~~ ~~17~~ ~~3~~ 0
A_3	**1**		**3**		**4**		**2**	10	~~10~~ 0
b_j	~~10~~ 0		~~13~~ ~~5~~ 0		~~14~~ 0		~~13~~ ~~10~~ 0		50

Methode der kleinsten Kosten

$K_0 = 219$

$x_{31} = 10,\ x_{24} = 13,\ x_{13} = 14$

$x_{12} = 4,\ x_{22} = 9$

	B_1		B_2		B_3		B_4		a_i
A_1	**2**		**6**	4	**5**	14	**7**		~~18~~ ~~4~~ 0
A_2	**2**		**7**	9	**9**		**4**	13	~~22~~ ~~9~~ 0
A_3	**1**	10	~~**3**~~		~~**4**~~		~~**2**~~		~~10~~ 0
b_j	~~10~~ 0		~~13~~ ~~9~~ 0		~~14~~ 0		~~13~~ 0		50

Vogelsche Approximation

$K_0 = 217$

$x_{11} = 10,\ x_{32} = 10,\ x_{13} = 8,\ x_{24} = 13,\ x_{22} = 3,\ x_{23} = 6$

	B_1		B_2		B_3		B_4		a_i	Δ_i		
A_1	**2**	10	~~**6**~~		**5**	8	~~**7**~~		~~18~~ ~~8~~ 0	**3**	1	1
A_2	**2**		**7**	3	**9**	6	**4**	13	~~22~~ ~~9~~ ~~6~~ 0	2	**3**	3
A_3	**1**		**3**	10	~~**4**~~		~~**2**~~		~~10~~ 0	1	1	
b_j	~~10~~ 0		~~13~~ ~~3~~ 0		~~14~~ ~~6~~ 0		~~13~~ 0		50			
Δ_j	1		**3**		1		2					
			3		1		2					
			1		**4**		3					

Verbesserungsverfahren

Startlösung: $x_{32} = 10,\ x_{13} = 14,\ x_{11} = 4,\ x_{21} = 6,\ x_{22} = 3,\ x_{24} = 13 \ \Rightarrow\ K_0 = 193$

Stepping Stone

Alle leeren Felder betrachten!

	B_1		B_2		B_3		B_4		a_i
A_1	**2**	4 **1** ⊖	**6**	**3** ⊕	**5**	14	**7**		18
A_2	**2**	6 **9** ⊕	**7**	3 **0** ⊖	**9**		**4**	13	22
A_3	**1**		**3**	10	**4**		**2**		10
b_j	10		13		14		13		50

Iteration 1:

$x_{12} \uparrow \ \Rightarrow\ x_{22} \downarrow \ \wedge\ x_{21} \uparrow \ \wedge\ x_{11} \downarrow$

$\bar{c}_{12} = 6 - 7 + 2 - 2 = -1 \ < \ 0$

$\bar{x}_{12} = \min(3,4) = 3$

$\bar{K}_0 = 193 + 3 * (-1)$

Iteration 2:

$x_{14}:\ \bar{c}_{14} = 7 - 4 + 2 - 2 = 3 \ > \ 0$

$x_{22}:\ \bar{c}_{22} = 7 - 2 + 2 - 6 = 1 \ > \ 0$

$x_{23}:\ \bar{c}_{23} = 9 - 4 + 2 - 5 = 4 \ > \ 0$

$x_{31}:\ \bar{c}_{31} = 1 - 2 + 6 - 3 = 2 \ > \ 0$

$x_{33}:\ \bar{c}_{33} = 4 - 3 + 6 - 5 = 2 \ > \ 0$

$x_{34}:\ \bar{c}_{34} = 2 - 3 + 6 - 2 + 2 - 4 = 1 \ > \ 0$

Startlösung: $x_{32}=10,\ x_{13}=14,\ x_{11}=4,\ x_{21}=6,\ x_{22}=3,\ x_{24}=13 \quad\Rightarrow\quad K_0=193$

	B_1		B_2		B_3		B_4		a_i	u_i	
A_1	**2**	4 **1**	**6**	**3**	**5**	14	**7**		18	0	0
A_2	**2**	~~6~~ **9**	**7**	~~3~~ **0**	**9**		**4**	13	22	0	0
A_3	**1**		**3**	10	**4**		**2**		10	-4	-3
b_j	10		13		14		13		50		
v_j	2		7		5		4				
	2		6		5		4				

MODI (Potenzialenmethode)
Alle leeren Felder betrachten! duales Problem mit Variablen $u_i,\ v_j\ \ (i=1..3,\ j=1..4)$. Für alle Basisfelder ij: $u_i+v_j=c_{ij}$

Iteration 1 (setzte $u_1=0$):

$\bar{c}_{12}=c_{ij}-(u_i+v_j)=6-7=-1\ >\ 0$

$\bar{c}_{14}=7-4=3\ >\ 0$

$\bar{c}_{23}=9-5=4\ >\ 0$

$\bar{c}_{31}=1-(2-4)=3\ >\ 0$

$\bar{c}_{33}=4-(5-4)=3\ >\ 0$

$\bar{c}_{34}=2-(4-4)=2\ >\ 0$

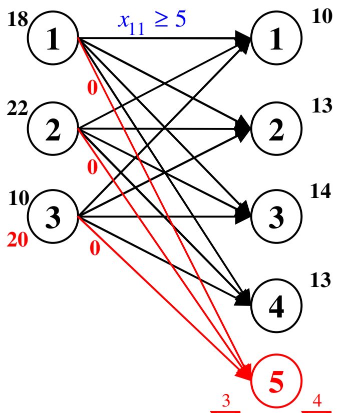
Iteration 2:

– neue Werte für u,v berechnen

– $\bar{c}_{ij}\geq 0\quad \forall ij: x_{ij}=0 \quad\rightarrow\quad$ Lösung optimal

$K_{gesamt}=190$

Erweiterungen (Folie 11)



$B_5=\sum_{i=1}^{3}a_i-\sum_{j=1}^{4}b_j=10$

1) $\sum_{i=1}^{3}a_i\neq\sum_{j=1}^{4}b_j$

2) $x_{11}\geq 5$ Mindestmenge Vorgabe
$a_1^{'}=a_1-5,\ \ b_1^{'}=b_1-5$
nach der Lösung des Problems den Wert für x_{11} nach oben korrigieren

3) $x_{11}=5$ ~> wie (2), zusätzlich $c_{11}^{'}=\infty$

4) max gx
$c_{ij}=-g_{ij}+\max_{ij}\{g_{ij}\},\quad c_{11}=-2+9=7$
$G_{\max}=C_{\min}-\max_{ij}\{g_{ij}\}*\sum_i a_i$