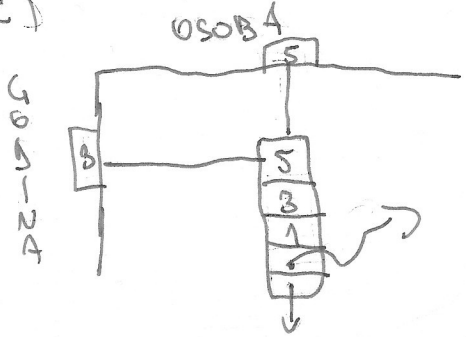
NASP-MI-2013

1) Razdoblje: 30 god
Osoba: $O = 3.000.000$
Aktivnj: $P \leq 255$ -> 1B u godini -> Prosječno 2

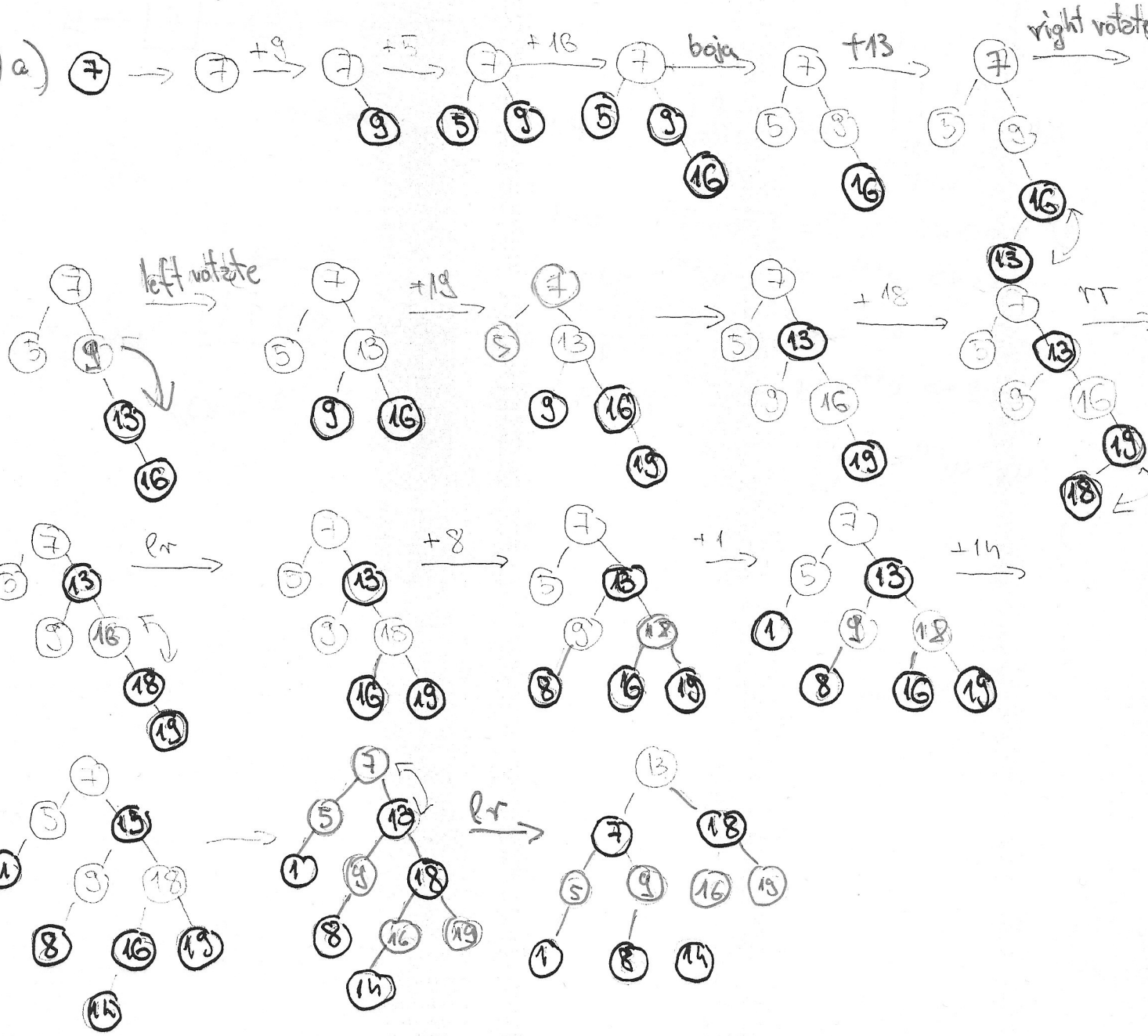
a) OBIČNA TABLICA: $3.000.000 \times 30 = 90.000.000$ B = 85.83MB
SPARSE TABLICA: $3.000.000 \times 2 \times 200 = 1,200.000.000$ B = 1144.41MB

b) OBIČNA TABLICA: $2130 : 100\% = 6.67\%$
SPARSE TABLICA 100%.

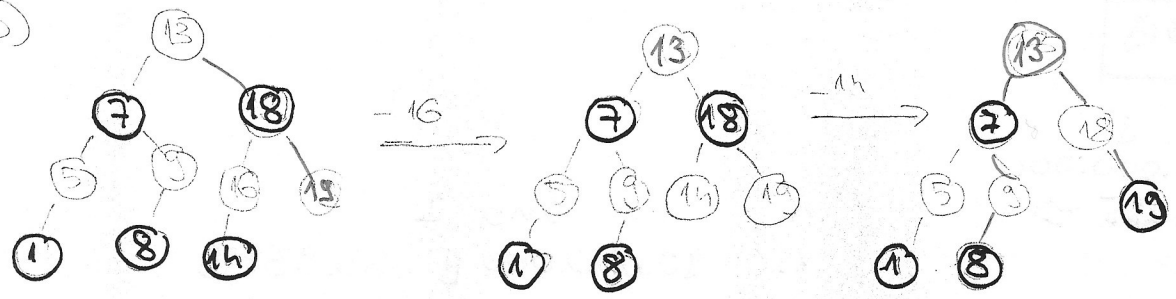
c)



2) a)



b)



(3) B-stabla 4. reda

(4) Osobitosti B-stabla:
1. popunjenost im je barem 50%.
2. savršeno su uravnotežena

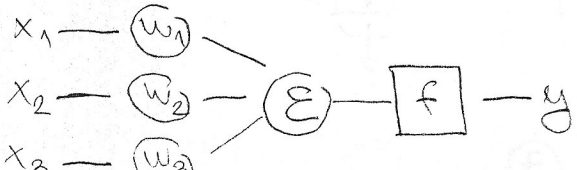
(5) a) c)

(6)

ulaz 1	ulaz 2	ulaz 3	izlaz
1	1	1	3
1	1	0	2

$$X_d = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & 0 \end{bmatrix}_{n \times p} \qquad y_d = \begin{bmatrix} 3 \\ 2 \end{bmatrix}_{p \times 1}$$

a)



$p < n$ ... beskonačno rješenja

b) $k=0 \Rightarrow w^{(0)} = [0\,0\,0]^T \quad \mu = 1$

$k=1 \Rightarrow e^{(0)} = x_{d,1}^T \cdot w^{(0)} - y_{d,1} = [1\,1\,1] \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} - 3 = -3$

$$w^{(1)} = w^{(0)} - \mu \frac{e^{(0)} [1\,1\,1]^T}{\|1\,1\,1\|^2} = [0\,0\,0]^T - 1 \cdot \frac{(-3)\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}}{3} = [0\,0\,0]^T + [1\,1\,1]^T$$

$k=2 \Rightarrow e^{(1)} = x_{d,2}^T \cdot w^{(1)} - y_{d,2} = \underset{1\times 3}{[1\,1\,0]} \underset{3\times 1}{\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}} - 2 = 2 - 2 = 0 \;//$

$$w = w^{(1)} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

c)

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(6.) d) $k=0 \Rightarrow w^{(0)} = [0\,0\,0]^T \quad \alpha = 1$

$k=1 \Rightarrow e^{(0)} = x_{d,1}^T \cdot w^{(0)} - y_{d,1} = [1\,1\,1]\begin{bmatrix}0\\0\\0\end{bmatrix} - y_{d,1} = -3$

$w^{(1)} = w^{(0)} - \alpha \cdot x_{d,1} \cdot e^{(0)} = [0\,0\,0]^T + 3[1\,1\,1]^T = \begin{bmatrix}3\\3\\3\end{bmatrix}$

$k=2 \Rightarrow e^{(1)} = x_{d,2}^T \cdot w^{(1)} - y_{d,2} = [1\,1\,0]\begin{bmatrix}3\\3\\3\end{bmatrix} - 2 = 4$

$w^{(2)} = w^{(1)} - \alpha \cdot x_{d,2} \cdot e^{(1)} = [3\,3\,3]^T - 4[1\,1\,0]^T = \begin{bmatrix}-1\\-1\\3\end{bmatrix}$

$k=3 \Rightarrow e^{(2)} = x_{d,1}^T \cdot w^{(2)} - y_{d,1} = [1\,1\,1]\begin{bmatrix}-1\\-1\\3\end{bmatrix} - y_{d,1} = 1 - 3 = -2$

$w^{(3)} = w^{(2)} - \alpha x_{d,2} \cdot e^{(2)} = [-1,-1\,3]^T + 2 \cdot [1\,1\,1]^T = [1\,1\,5]$

$k=4 \Rightarrow e^{(3)} = x_{d,2}^T \cdot w^{(3)} - y_{d,2} = [1\,1\,0]\begin{bmatrix}1\\1\\5\end{bmatrix} - 2 = 2-2 = 0 //$

$w = \begin{bmatrix}1\\1\\5\end{bmatrix} \rightarrow$ pogrešno

e) Ovako zadani LMS algoritam nije konvergentan jer smo odabrali preveliku stopu učenja zbog koje pogreška mijenja predznak iz koraka u korak. Treba smanjiti stopu učenja.

(7.)