ĆW 9. Sieci Hopfielda

Algorytm sieci Hopfielda
$t = 0$
$i = 1, \ldots, n$

$$x_i(0) = \begin{cases} 0 & \text{z prawdopodowieństwem } \frac{1}{2} \quad (\text{rand}()\%2 = 0) \\ 1 & \text{z prawdopodowieństwem } \frac{1}{2} \quad (\text{rand}()\%2 = 1) \end{cases}$$

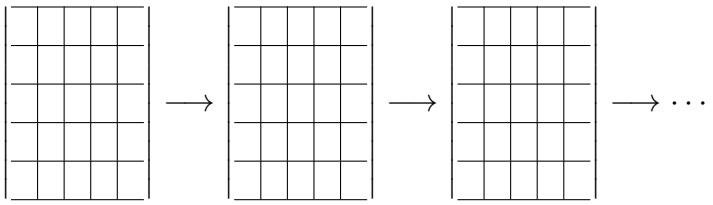
$t = 0, 1, 2, \ldots$
$i = 1, \ldots, n$

$$u_i(t) = \left\{ \sum_{j=1}^{25} w_{ij} x_j(t) \right\} - \theta_i$$

$$x_i(t+1) = \begin{cases} 0 & \text{gdy } u_i(t) < 0 \\ x_i(t) & \text{gdy } u_i(t) = 0 \\ 1 & \text{gdy } u_i(t) > 0 \end{cases}$$

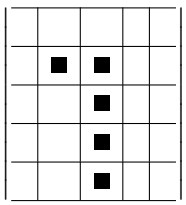
Zadanie. Implementować i uruchomić algorytm sieci Hopfielda dla poniżej podanych parametrów w_{ij}, θ_i i wyświetlić $x(t) = (x_1(t), \ldots, x_n(t))$ $(t = 0, 1, 2, \ldots)$.

$$x(0) \longrightarrow x(1) \longrightarrow x(2) \longrightarrow \cdots$$



Parametry w_{ij} i θ_i
$\square = 0.0$, $\blacksquare = 1.0$

$$z = (z_i)_{i=1}^{25} = (z_1, \ldots, z_{25}) = \quad \in \mathbb{R}^{25}$$



$1 \le i, j \le 25$

$$c_{ij} = \begin{cases} (z_i - \frac{1}{2})(z_j - \frac{1}{2}) & \text{gdy } i \neq j \\ 0 & \text{gdy } i = j \end{cases}$$

$$w_{ij} = 2c_{ij}, \qquad \theta_i = \sum_{j=1}^{25} c_{ij}$$

Notacja. (Propozycja)
$x_i(t) \rightsquigarrow x[i]$, $u_i(t) \rightsquigarrow u[i]$ (**Uwaga: Nie prowadzić kroków t!**)
$z_i \rightsquigarrow z[i]$
$c_{ij} \rightsquigarrow c[i][j]$
$w_{ij} \rightsquigarrow w[i][j]$, $\theta_i \rightsquigarrow theta[i]$