# Final 9.Hafta

Monday, December 23, 2019 9:22 AM

## Cellular Neural Network


"radius of neighboured"

↳ "Local connection" bağlantısı yapılır
↳ Sadece yakınındakiler ile bağlantı yapar

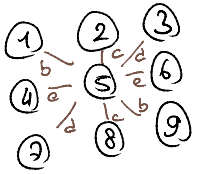
(2r+1) x (2r+1) tane "neighbourd" olur

## Hesaplama işlemleri

↳ "Symmetric Template" oluşturulur:

$T: \begin{Bmatrix} b & c & d \\ e & a & e \\ d & c & b \end{Bmatrix}$ ! Simetriye dikkat edin

↳ 1,2,3 adlandırması yapılır




↳ "Nonlinear differential equation" gösterimi

$\dot{x} = -x + Ay(x) + u$

$\dot{x}_i = -x_i + \sum_{j=1}^{n} a_{ij} \cdot y(x_{ij}) + u_i$

$x = [x_1, x_2, \dots x_n]^T$ "State cell"

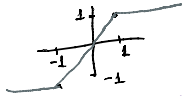
$A = \{a_{ij}\}_{n \times n}$ "feedback Matrix contains weights"

$u = [u_1, u_2, \dots u_n]^T$ "Inputs"

$y = [y(x_1), y(x_2) \dots y(x_n)]^T$ "Outputs"

## The Expression for y

$y(x_i) = \frac{1}{2}\left[|x_i+1| - |x_i-1|\right]$




"pece-wise linear" function

## Örnek Çözüm

① İndex numaralandırılır
sea
b = 1
c = 2
⋮

② Yakınındakileri ele al

b => {c, e, a, e, b} (2 4 5 1)

c => {b, e, a, e, d, c} (1 4 5 6 3 2)

③ Numara değerine göre tersten yaz.

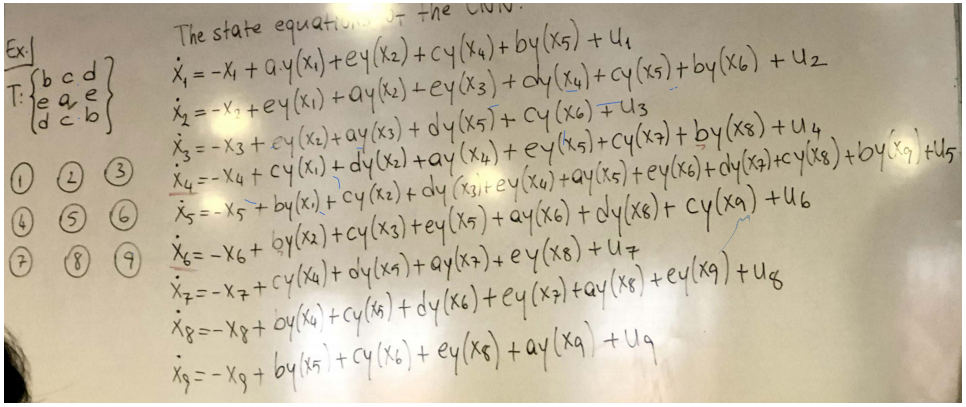
b => {a, e, c, b} (5 4 2 1)

c => {e, a, e, d, c, b} (6 5 4 3 2 1)

④ Diğer değişkenleri ekle

$-x_i + Ay(x_i) + u_i$

index numarası — yakınındaki numaralar

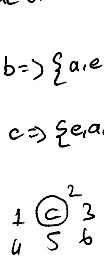



⑤ Matrix oluşturulan numaralı alanlar ele alınır, diğerleri 0 olur

"neighbouring"

b => {a, e, c, b} (1 2 4 5) [a e 0 c b 0 0 0 0]

c => {e, a, e, d, c, b} (1 2 3 4 5 6) [e a e d c b 0 0 0]




$\dot{X} = -X + A \cdot y(x) + u$

$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \\ \dot{x}_5 \\ \dot{x}_6 \\ \dot{x}_7 \\ \dot{x}_8 \\ \dot{x}_9 \end{bmatrix} = - \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \\ x_9 \end{bmatrix} + \begin{bmatrix} a & e & 0 & c & b & 0 & 0 & 0 & 0 \\ e & a & e & d & c & b & 0 & 0 & 0 \\ 0 & e & a & 0 & d & c & 0 & 0 & 0 \\ c & d & 0 & a & e & 0 & c & b & 0 \\ b & c & d & e & a & e & d & c & b \\ 0 & b & c & 0 & e & a & 0 & d & c \\ 0 & 0 & 0 & c & d & 0 & a & e & 0 \\ 0 & 0 & 0 & b & c & d & e & a & e \\ 0 & 0 & 0 & 0 & b & c & 0 & e & a \end{bmatrix} \begin{bmatrix} y(x_1) \\ y(x_2) \\ y(x_3) \\ y(x_4) \\ y(x_5) \\ y(x_6) \\ y(x_7) \\ y(x_8) \\ y(x_9) \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \\ u_7 \\ u_8 \\ u_9 \end{bmatrix}$