HomeWork 4

jordanyzw@mail.sjtu.edu.cn

1 .Brief introduction of SOM algorithm

Som algorithm is composedof three steps which include competition,cooperation and synaptic adaption.Here we should initialize the parameters alpha0,t1,delta0,t2

(1) Competitive process
    Input vector :X=[x1,x2,…,xm]’
    The weight of each neural :Wj =[wj1,wj2,…,wjm]’
    We aim to find the index of neural node which minimize i(x)=arg min||X-Wj||
(2) Cooperative process
    Hj,i(x) = exp(-Dji^2/(2*delta(n)))
    Dji^2=||rj-ri||^2
    delta(n) = delta0*exp(-n/t1) n=0,1,2,…
(3) Adaptive process
    Wj(n+1)=Wj(n)+alpha(n)*Hji(n)*(X(n)-Wj(n))
    Alpha(n) = alpha0*exp(-n/t2)

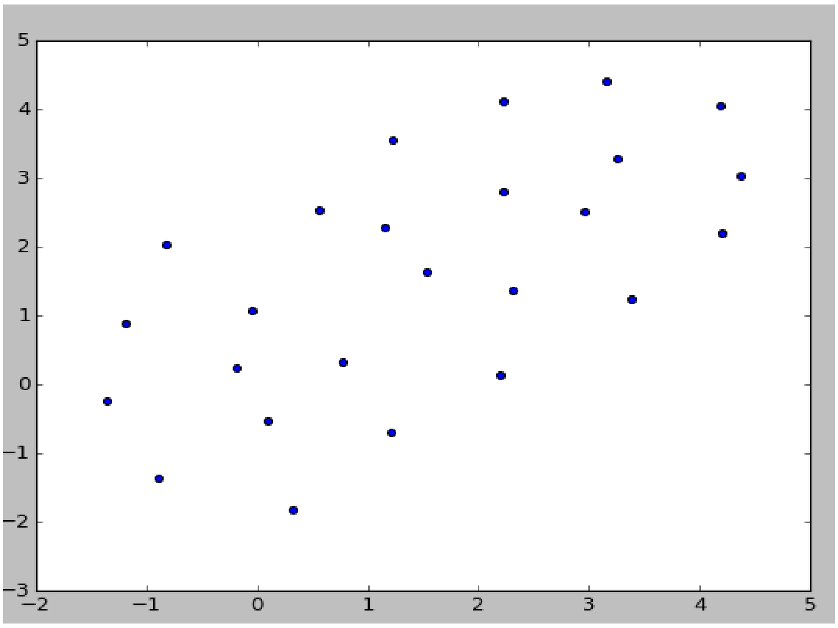
2 Implematation of Som

I put my source file into som.py. you have to install numpy and matplotlib packages in order to successfully run this python code,you can modify the parameters listed as x ,y, alpha0,t1,delta0,t2 of the interface cl = SOM(5,5,2.23,450,0.1,1000)

We often set the parameters in this way:
  alpha = 0.1
  t2 = 1000
  delta0 = the radius of the lattice
  t1 = 1000/log(delta0)

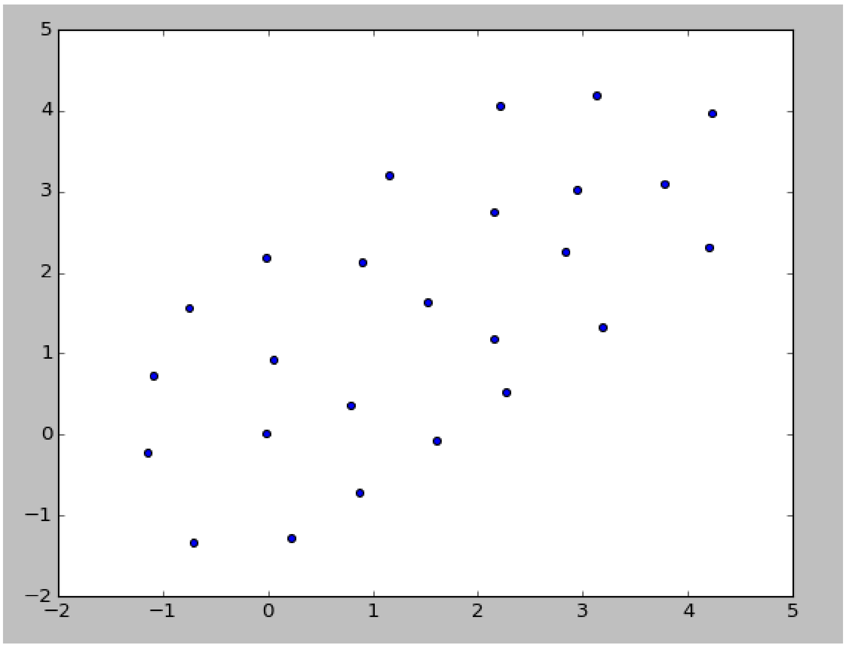
(1)Here is what the parameters mean:
  x,y : the scale of neural nodes.It is a two dimension array
  alpha0 : the initial value of the learning rate.It will decrease as the time goes on.
  delta0 : the initial value of the gussian distance fuction and it also decreases as time goes on.

(2)when I set SOM(5,5,2.23,450,0.2,1000),we get somthings like this



And it takes 2996 iterations to let the learning rate alpha less than 0.01

When we set SOM(5,5,2.23,450,0.1,1000) we get the figure



It also takes 2303 times to let the alpha less than 0.01