MADELINE NETWORK REPORT

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0.1 Madeline Network Introduction

The aim of this task is to write a program which implements a MADALINE (Multiple Adaptive Linear Elements) network for character recognition. The network should have a structure which is given in the following scheme:

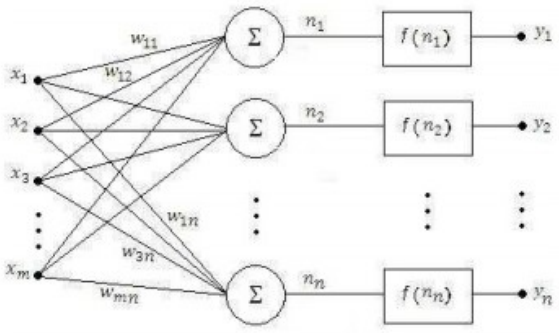

Figure 1: MADELINE Network scheme

where:

- the input layer should contain m copying neurons (neurons whose only task is to copy their single input onto their respective outputs)
- the output layer should contain n linear neurons, i.e. neurons with identity activation function

The number $m = p \cdot q$ is the product of the horizontal and vertical dimensions of a single character to be recognized, where p and q are the horizontal and vertical image dimensions respectively. The number of output neurons n of the MADALINE network should be equal to the number of training patterns stored in the weights of network's output neurons.

0.2 Output of Results

In our code, we are getting all the data from txt files, so we only need a txt file with the desired values (resolution, characters to recognize, etc.) to set up and to test the network.
Also the results are updated on a txt file.
Notice that our results are from a MADELINE network that recognize the letters X, Y and Z in a resolution of 4 pixels.
The results of the test:

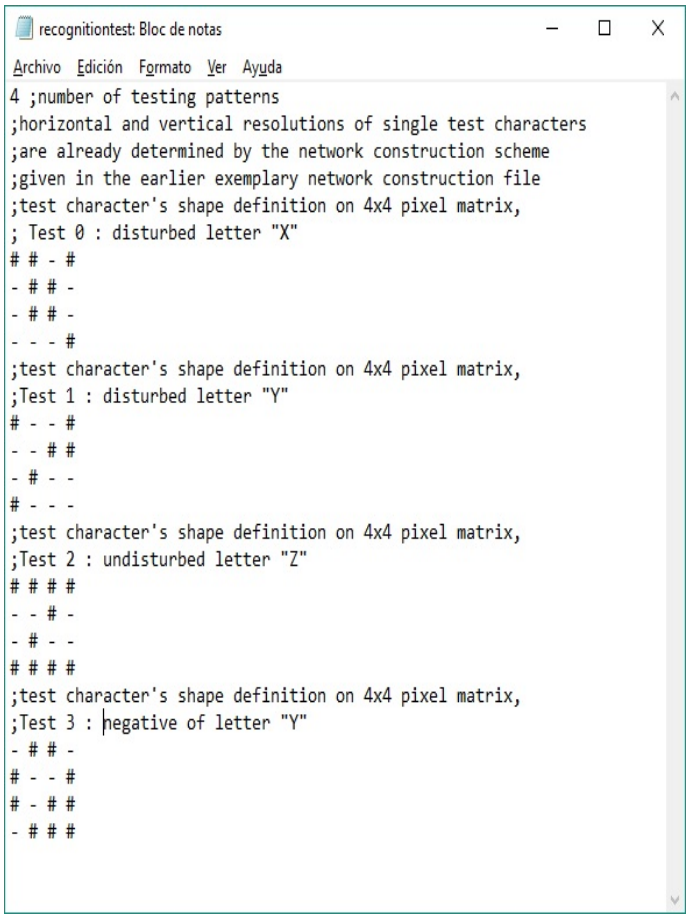

Figure 2: test input ('#' = 1 ; '-' = 0)

are:

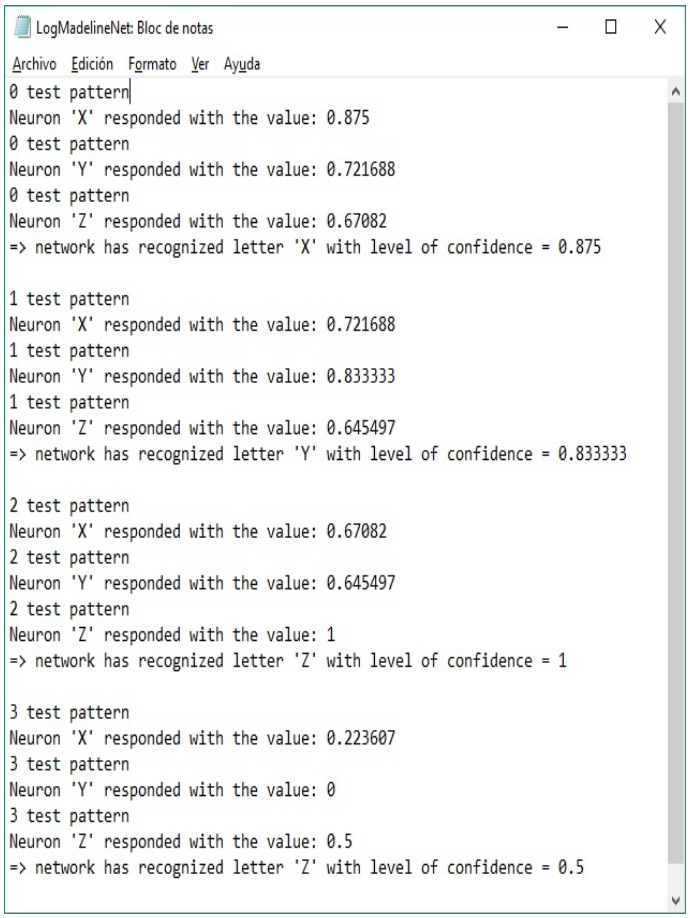

Figure 3: test results

0.3 Conclusions

In conclusion, we can see that the results are as expected.
It is necessary to remark that all the inputs an weights are normalized , thus, the maximum level of confidence is 1, and the minimum is 0.