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Neural Network for external devices control (finger print entry)

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Abstract: Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. As in nature, the network function is determined largely by the connections between elements. We can train a neural network to perform a particular function by adjusting the values of the connections (weights) between elements. Commonly neural networks are adjusted, or trained, so that a particular input leads to a specific target output. The network is adjusted, based on a comparison of the output and the target, until the network output matches the target. Typically many such input/target pairs are used to train a network. This paper takes the finger print as an input to the neural network .Once the finger print is recognized by the neural network , the output will be used to activate an external device giving access permission , welcome words and issuing a paper. In case of denial of the finger print by the neural network an alarm occurs and a denial message get displayed. A Matlab package is used for accomplishing the neural network algorithm plus an interface circuit is designed to drive the external devices.

Keywords:. neural network , finger print , external devices , Matlab ,interface.

I. INTRODUCTION

Neural networks have been trained to perform complex functions in various fields of application including pattern recognition, identification, classification, speech, and vision and control systems. Today neural networks can be trained to solve problems that are difficult for conventional computers or human beings. Throughout the toolbox emphasis is placed on neural network paradigms that build up to or are themselves used in engineering, financial and other practical applications. The supervised training methods are commonly used, but other networks can be obtained from unsupervised training techniques or from direct design methods. Unsupervised networks can be used, for instance, to identify groups of data. We do not view the Neural Network Toolbox is simply a summary of established procedures that are known to work well. Rather, we hope that it will be a useful tool for industry, education and research, a tool that will help users find what works and what doesn't, and a tool that will help develop and extend the field of neural networks.

II. METHODOLOGY

First of all, it is necessary to analyze the system operation. According to the analysis procedures, the system is designed . The finger print data acquisition circuit is used as an input . The output from the neural network is directed to the interface circuit ,which in its turn drives the devices connected to the system. The sequence of operations to be performed are :

- Finger print data acquisition circuit as input to the computer.
- Training the finger print data by the neural network using the Matlab package.

The number of epochs assumed is equal 300 as shown in equation (1).
Net.trainParam.epochs = 300 ; ……………(1)
Training is performed by equation (2).
[net.tr] = train [net , p , t] …………………(2)
Where ;
p = input , t = target

- Neural network output comes out from the computer parallel port..
- The interface circuit latches the computer output and enhances the current drive ability..
- The output of the interface circuit drives the output devices .

Figure (1) below shows the block diagram of the system design using neural network technique.

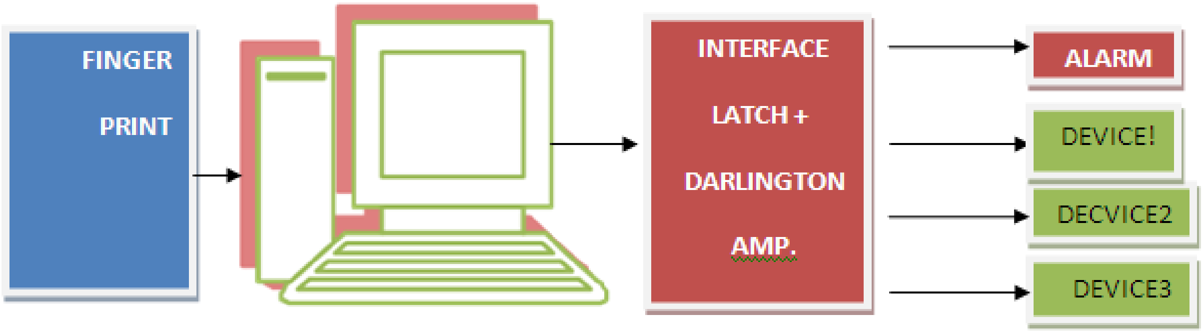

Figure (1) block diagram of the system design

The block diagram is an illustration of how to implement the design and the various parts involved in it. An alarm signal is put in the design in order to demonstrate finger print denial .

III. HARDWARE COMPONENTS

The main hardware components in the design are :.

1. **PC Computer:**

PC computer hosts developed software to drive the devices connected to the computer .The software dictates the processor to handle controlling process. A corresponding signal is then sent to the interface circuit.

2. HD74LS373 Latching IC:

The HD74LS373 is an eight bits latch. It is used as a buffer which stores signals coming from the computer.

3. ULN 2803A Darlington IC:

The ULN2803A is a high-voltage, high-current Darlington transistor array. The collector-current rating of each Darlington pair is 500 mA. The Darlington pairs may be connected in parallel for higher current capability.

4. **SIREN** :

A siren is used to produce a sound signal when the finger print is not identified.

5. **Devices :**

Three devices are used in the design .One is for access permission .The second is for giving welcome words. The third is for issuing a time record paper.

IV. SOFTWARE DESIGN

Neural network is implemented in Matlab package for finger print identification . Back propagation technique is used .The computer program captures the input data from the finger print device . The captured data get processed in order to take a decision .Then the decision pass to the interface circuit for driving the devices connected to the system.

The algorithm for the system operation is ;

Start
Initialization:
--- Clear all output devices .
Data acquisition:
… Check the incoming input data from the finger print.
… If in put data is received , then go to neural network processing.
… Go to data acquisition.

Neural network processing:
… Take a two dimensional discrete Fourier transform (FFT2).
… Train the neural network.
… If the finger print coincides with the target , then go to drive devices.
… If the finger print does not coincide with the target , then go to drive siren.

Drive devices :

… Operate device1 , Device2 ,Device3.
… Delay 20 seconds.
… Disable device1 , Device2 ,Device3.
… Go to Data acquisition.

Drive siren :
… Operate siren.
… Delay 30 seconds.
… Disable siren.
… Go to Data acquisition.

End.

V. RESULTS

The system model have been trained on five finger prints .These five finger prints represent samples for testing the system operation. Figure (2) shows the results while training a finger print to the system.

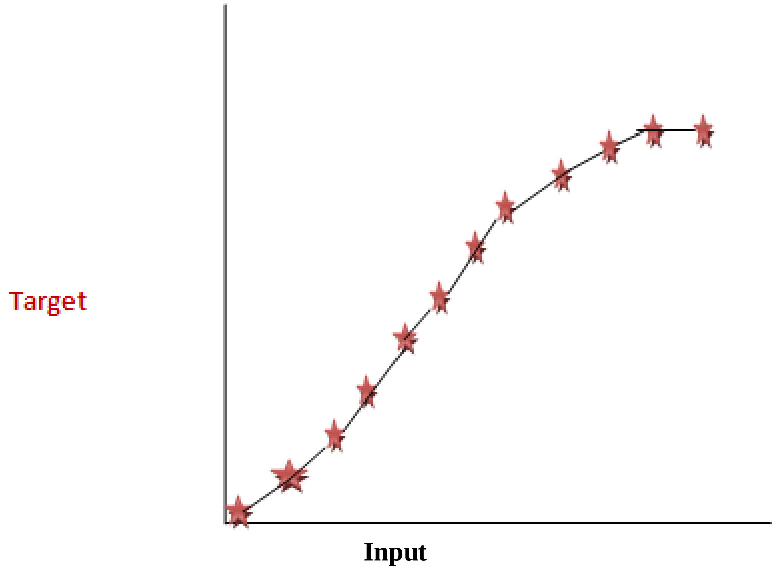

Figure (2)Results of identifying an input data (coinciding with the target)

VI. CONCLSION

This paper adopts a concept to design a system that acts as a platform to feed finger prints to the neural network and use its output to control external devices. There are a variety of kinds of design and learning techniques that enrich the choices that a user can make. The field of neural networks has a history of some five decades but has found solid application only in the past years, and the field is still developing rapidly. Thus, it is distinctly different from the fields of control systems or optimization where the terminology, basic mathematics, and design procedures have been firmly established and applied for many years. The system design is dynamic and further development and modification can be done. The system is made user friendly and it can be implemented for a variety of applications.

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