International Journal of Advance Research in Science and Engineering
Volume No. 12, Issue No. 07, July 2023
www.ijarse.com
IJARSE
ISSN 2319 - 8354

New approach of electrical conductivity for concrete by using neural network

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Abstract:

Concrete Electrical conductivity is the current passes through of concrete material by breakdown the depletion layers of materials. This method is used by applying c voltage on concrete to change characteristics of concrete. In electrical systems, electrical conductivity is the inverse of Electrical resistivity. When the DC voltage is increase across the concrete materials, the resistance is decrease as results the current will increase. In this method, the neural networks based on feed forward back propagation is applied on the data of voltage, current and resistance. The principle behind the measuring techniques is to quantify the conductive properties of the structure. This proposed method shows the features affecting the resistivity quantities and applications of the measured conductance in determining some parameters of concrete.

***Key words**: electrical conductivity, neural network, electrical equipments.*

Introduction:

The electrical conductivity of a specific material is its ability to transmission ions by using electric field. The conductivity is the inverse of resistivity[1] . The resistivity is the proportion to the applied possible difference to the current established. The resistivity significantly differs via the material specific [2] [3]. Practically electric resistance is create using standard testing methods and equipment. Wet concrete acts as a semiconductor, with resistivity in the range of 105 ohm-mm. whereas dry concrete has resistivity in the range of 1012 ohm-mm [4] [5]. Hence oven dry concrete acts as an insulator. The difference in the measured electrical resistivity in wet and dry concrete can be taken to discover that the electrical conductivity of concrete is a important effect of the evaporable water present in it [6] [7]. Consequently, it can be predictable that conductivity increases with increase in ion transfer, which increase in water cement ratio of concrete. Transfer of ions has to take place suggestively for the conductance of electricity in concrete, that can occur individual when microstructure with unnecessary amount of interconnections is present. The resistivity is fairly trivial in high strength concrete [8] [9] [10]. The electrical resistivity of concrete is similarly significantly influenced by aging of concrete, at least in early period of curing. The relationship between the volume section employed by water and the conductivity of concrete can be found from the conductivity laws [11] [12]. Nevertheless, for the natural concrete mixes, the ratio of water cement differs little from a given workability and categorizing. Here, the l conductivity is effected by the cement used, because the natural arrangement of cement [13] [14].

IJARSE
ISSN 2319 - 8354

The proposed method of electrical conductivity

An interconnected pore network with Concrete is called heterogeneous combination Based on the degree of the pores saturation which depending on moisture contents, concrete will exhibition conductivity features. The wet concrete has low resistivity as compare with dry. Several chemical and physical features of concrete causes the complexity of technique precise.in this proposed method, DC voltage is applied on concrete and current will passes through concrete, the ions in the pore solution align in an arranged way, that they can causes direct current. In this system, the DC voltage is directly proportional with concrete conductivity and inversely proportional with concrete resistivity. When the applied DC voltage is increase, the current will passes through due to conductivity of concrete.

The neural network is used to optimize the simulation results based on DC voltage, current, and resistivity. Figure 1 shows the practical test for concrete.

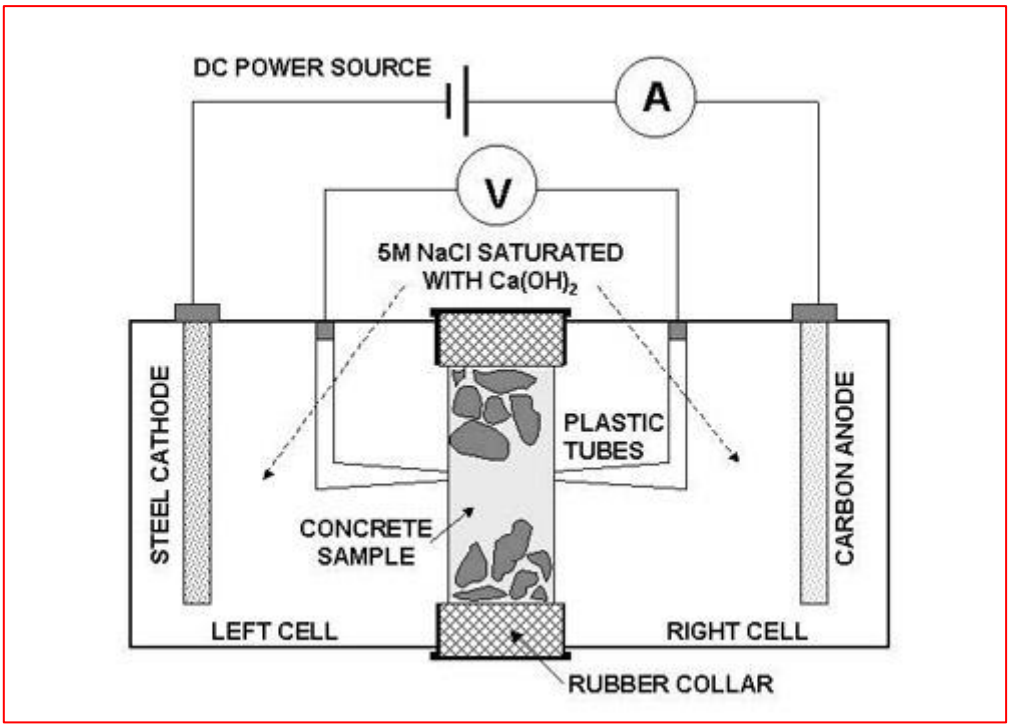

Figure 1: practical test of concrete

The neural network is used to optimize the internal current of concrete with applied DC voltage. The two inputs of NN are voltage with current and the resistivity with conductivity are the outputs of NN. Figures 2, and 3 show the performance and training the systemrespectively.

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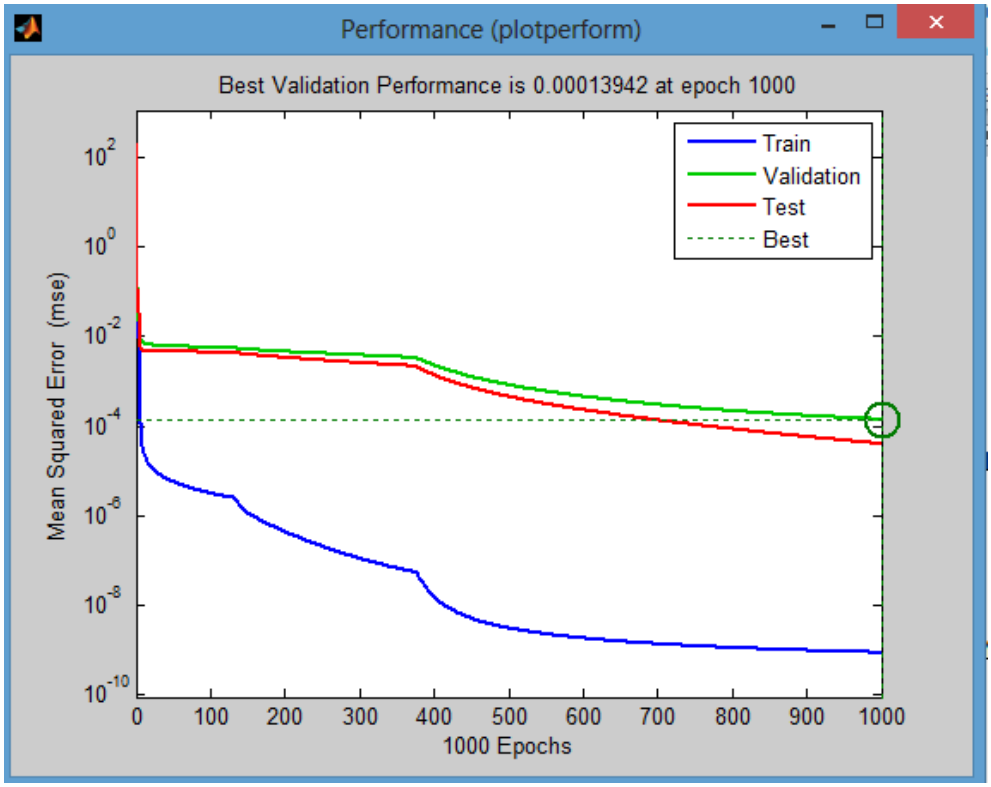
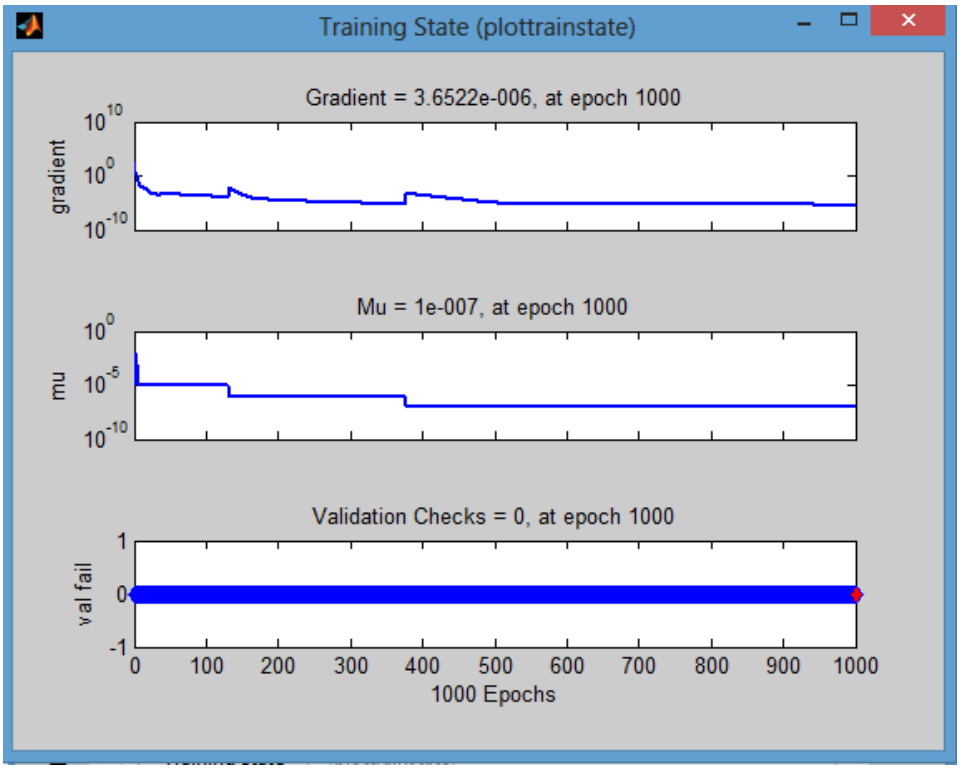


Figure2: system performance



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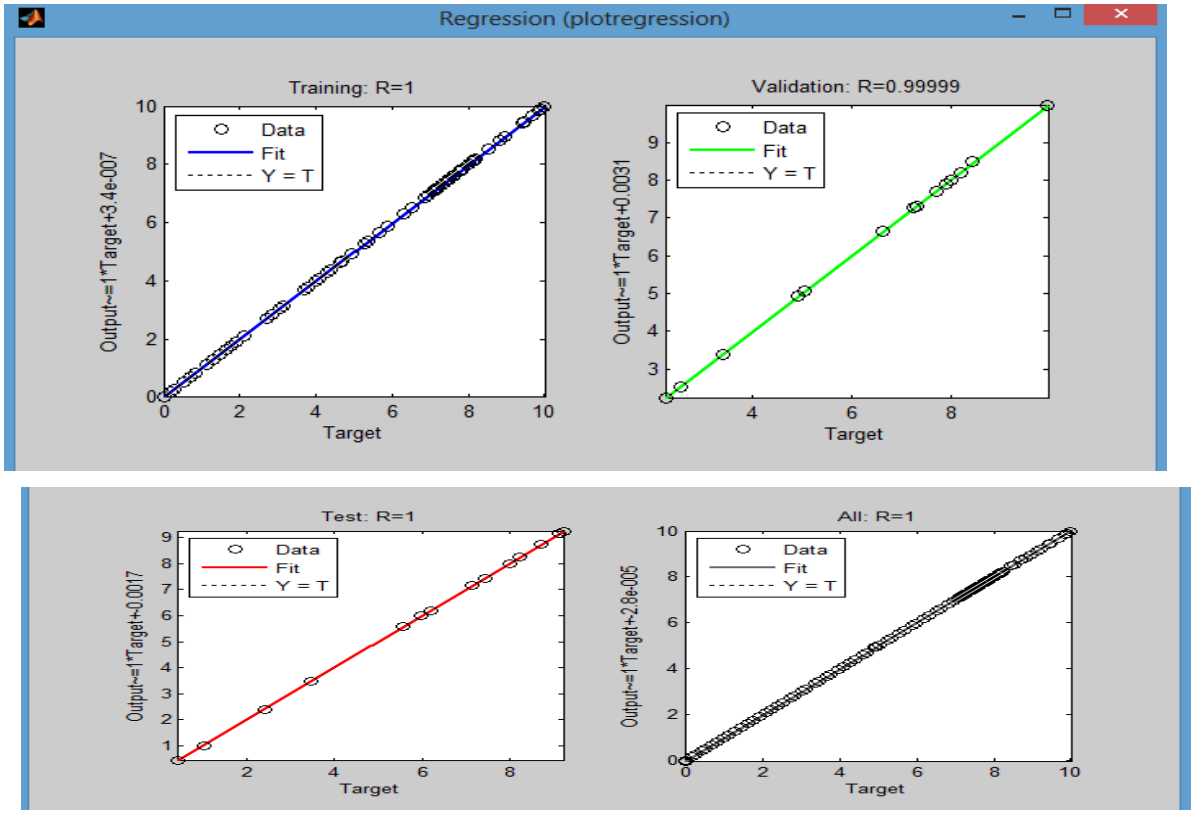

Figure 3: training system

The relationship between voltage and resistivity and the cureent are inversly proportional mean that when the voltage is increased the current is laso increase but the resistivity will decreaseand the conuctivity of concrete will increase as shown in figures 4,5, and 5.

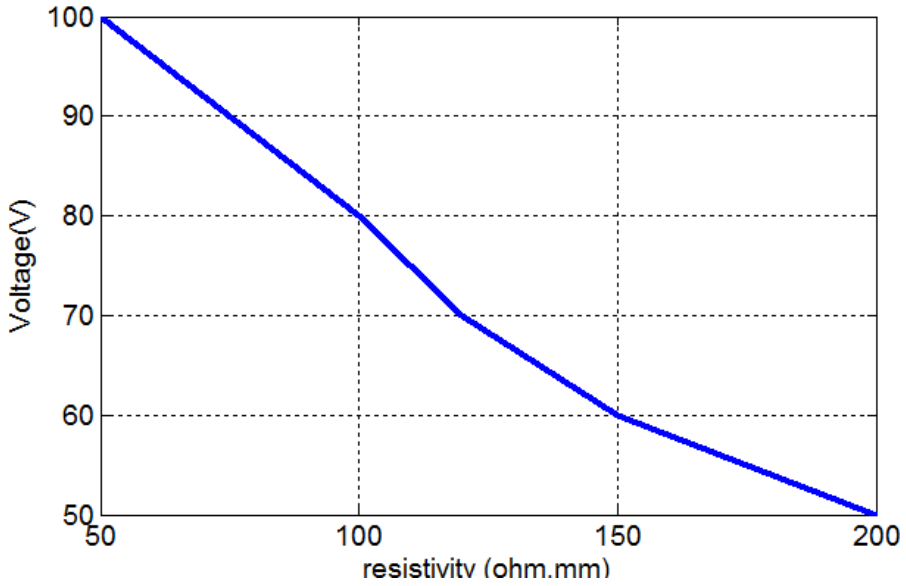

Figure 4: relation between voltage and resistivity

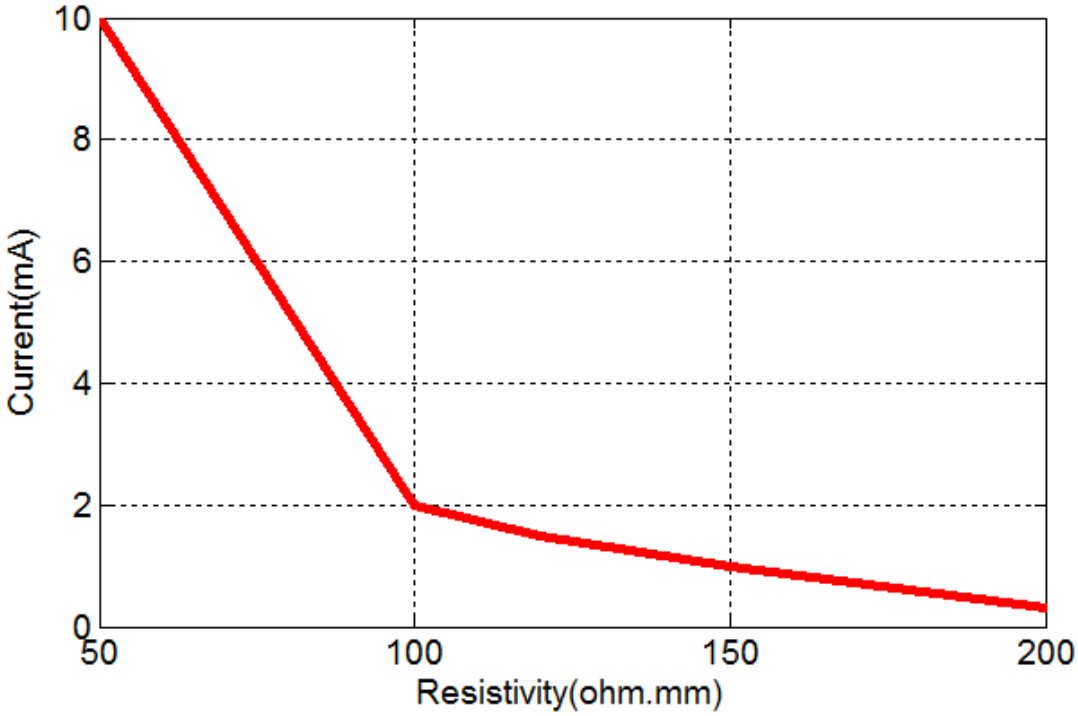

Figure 5: relation between current and resistivity

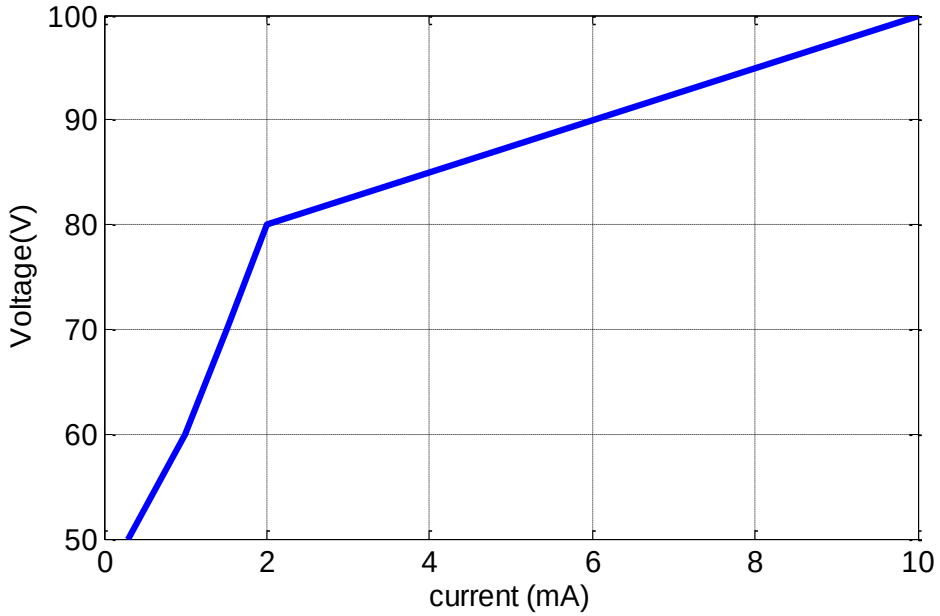

Figure 6: relation between voltage and current

Conclusion

In this method, it can be seen that the system is more reliability and results are smooth base on NN with matlab. The current is increase with increasing the voltage due to breakdown of depletion layers for concrete as results

the conductivity of concrete is increasing. The simulation results of system with NN has good results with new approach as compare with classical test

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