Journal of The Gujarat Research Society
ISSN: 0374-8588
Volume 21 Issue 8, August 2019

NEURAL NETWORKS MODELING OF VARIOUS SHAPED MICROSTRIP ANTENNAS: A STATE OF THE ART REVIEW

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Abstract

In the last decade, because of learning and generalization functionality, neural network-based modelling has been used to compute various output parameters of microstrip antennas. Most of the neural models generated are software simulation based. Because the neural networks naturally display significant parallelism, a parallel hardware must be generated by taking advantage of the parallelism of the neural networks to construct a faster computer machine. This paper demonstrates a generalized model of neural networks built on a reconfigurable hardware framework based on field programmable gate array (FPGA) to compute various performance parameters of microstrip antennas. Thus, the proposed approach offers a forum for microwave applications to build low-cost neural network-based FPGA simulators. The findings obtained by this method are also in very good agreement with the available calculated results in the literature.

Keywords: *Circular Microstrip Antenna (CMSA), Field Programmable Gate Array (FPGA), Microstrip Antenna, Rectangular Microstrip Antenna (RMSA).*

I. INTRODUCTION

In the last few decades, advancement in wireless technology has altered our lives. Technological advances have helped us to create new mobile communication services, such as voice, audio, video, and data services [1]. In addition, it has also helped us to achieve a higher data rate between portable devices and short-range computers [2]. By can the transmitting capacity or using broad

bandwidth, this high-speed data rate can be increased. Many portable devices operating with wireless technology, however, are battery-powered, so the solution for achieving high data rate would be a broad frequency bandwidth.

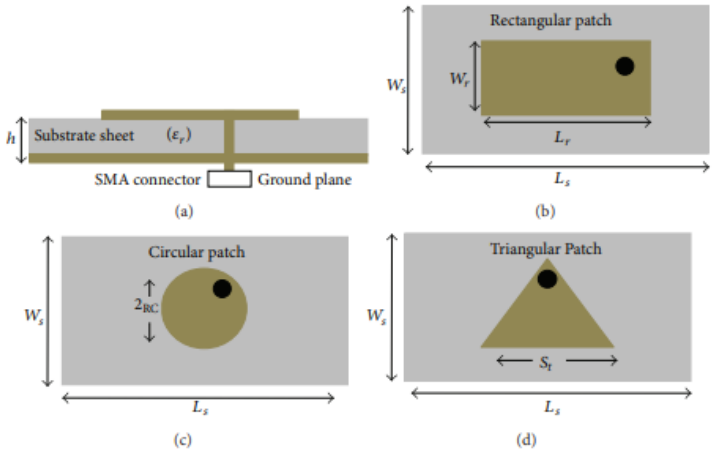

Fig. 1: Illustrates various shaped microstrip patch antennas [3]

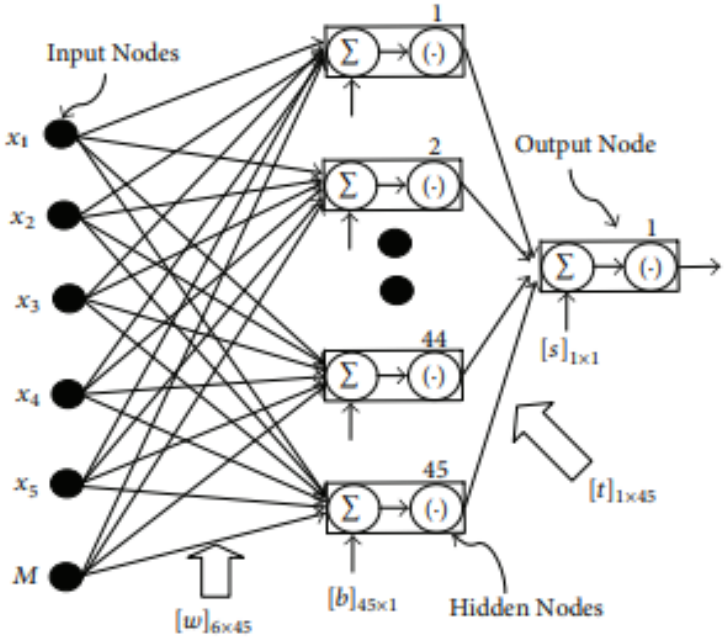

Fig. 2: Illustrates the planned RBF neural network [4]

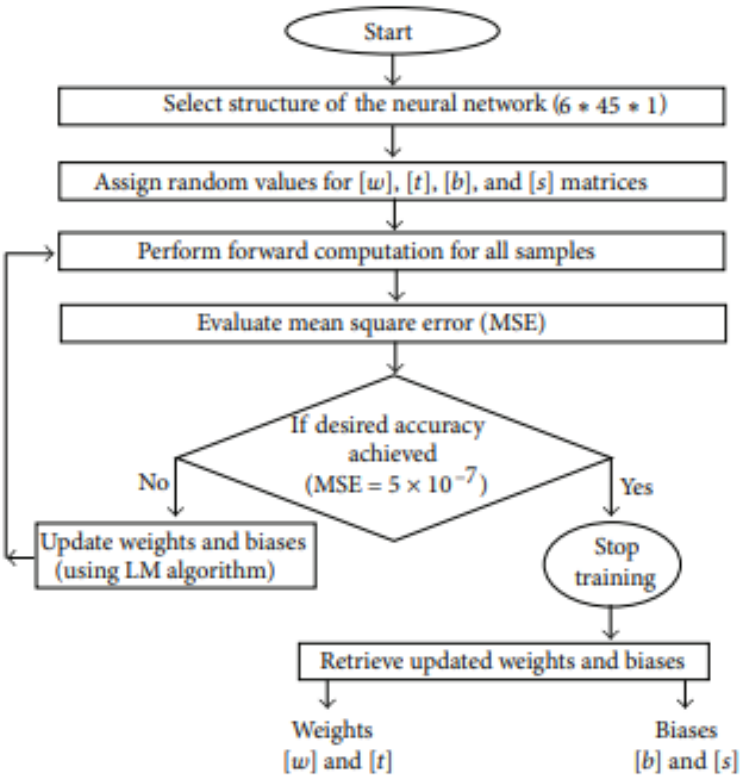

Fig. 3: Illustrates the flow chart for the training of the procedure [5]

In its simplest configuration, a microstrip antenna consists of a radiating conductive patch on one side of a relative permittivity 'εr' dielectric substratum and of thickness 'h' having a ground plane on the other side. Figure 1 displays the geometry of three different microstrip antenna shapes: the rectangular microstrip antenna (RMSA), the circular microstrip antenna (CMSA) and the triangular microstrip antenna (TMSA), respectively. Figure 2 illustrates the planned RBF neural network. Figure 3 illustrates the flow chart for the training of the procedure [6].

II. LITERATURE REVIEW

A survey on the microstrip antenna was performed by Afridi et al. An overview of the microstrip patch antenna and its design techniques is provided in this article. Basically, a microstrip patch antenna consists of a trace of some geometry of copper or some other metal on one side of a regular printed circuit board substratum with another side grounding. Using different feeding methods, such as coaxial, strip line, aperture coupling or proximity coupling techniques, the antenna is fed. The working theory and the mechanism of radiation have been defined as well. In the military, manufacturing and commercial industries, the microstrip patch antenna is commonly used [7].

III. DISCUSSION AND CONCLUSION

This study offers a roadmap for microwave applications to build neural networks on reconfigurable hardware. It can be used to build neural network-based FPGA simulators for microwave applications because the method is comparatively faster and has low manufacturing costs. For any number of microstrip antenna computing parameters, the proposed solution can also be generalized. But the structural structure, such as the number of nodes in the hidden layer or often the number of hidden layers, also increases as the dimensionality of the parameters to be computed or the dimensionality of the input patterns increases. This then results in a substantial increase in the time of reconfiguration and finally in the time of preparation. If implemented on a hardware platform, it can also need a wide memory space. There is thus a trade-off between the microstrip antenna computing parameters and the usable environment for the implementation of neural hardware networks.

IV. REFERENCES

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