POINT OF VIEW FOR THE COMMUNICATION EDUCATION

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The convergence of classical telecommunication networks and data networks is the first step in designing universal broadband integrated networks for different types of user services, inclusive of videoconference applications or multimedia services, and unified network management. The integrated network must be able to guarantee different transport parameters for different services. The problem is in the network elements, which must guarantee the required parameters and also offer a sufficiently broad bandwidth, all this at a reasonable price. That is why in the area of the development of high-speed networks the possibilities of increasing the throughput and effectiveness of active elements are sought.

Keywords: Convergenced network, Hopfield neural network, Ethernet

1. INTRODUCTION

Prospects of the education go from the prospects of the high-speed multimedia transmission through optical cables. An implementation area has intentionally been chosen where a comparatively simple operation is performed but where great demands are placed on the speed of executing these tasks. Optimizing the switching field of these active elements is a highly topical problem area. It is an area where a very effective use can be made of parallel processing. The education includes a switch architecture that contains an artificial neural network for optimizing priority switching. A procedure was developed for modelling mathematically the given problems and also for realizing this mathematical model using the Hopfield neural network first of all.

The mathematical background presented can also be used as a general description of how to apply effectively the Hopfield neural network in the solution of other types of optimization tasks. In the education a method is given that can be used to separate the limiting criteria from the objective function of optimization task, and to solve the optimization task components such that the two processes given do not act against each other. On the other hand it must be emphasized that in the case of solving the optimization problem with the aid of neural network we are concerned with a stochastic process and thus the network need not case select the best solution in every case.

Within the education solution a simulation environment was developed in the JAVA language to verify the validity of the mathematical relations derived. As shown by the results of extensive testing, the theoretical results obtained meet the expectations.

With the aid of software simulation a system was developed that can be used to control the switching field designed for switching data units, with the priority of individual data units taken into consideration. A possible continuation of this work could be a specific hardware implementation of the above model, for example via programmable logic circuits.

2. CONCEPTIONAL AND METHODOLOGICAL APPROACHES PROPOSED FOR THE EDUCATION

The IEEE 802.3 a (10 Gigabit Ethernet standard) is different in some respects from earlier Ethernet standards, for example in that it was only operate in the full-duplex mode (collision-detection protocols are unnecessary). Ethernet can now progress to 10 Gigabits per second while retaining its critical Ethernet properties, such as the packet format, and the current capabilities are easily transferable to the new standard.

The 10 Gigabit Ethernet standard extends the IEEE 802.3ae standard protocols to a line speed of 10 Gbps and expands the Ethernet application space to include WAN-compatible links. The 10 Gigabit Ethernet standard provides a significant increase in bandwidth while maintaining maximum compatibility with the installed base of 802.3a standard interfaces, thus protecting previous investment in research and development, and retains the existing principles of network operation and management.

Under the Open Systems Interconnection (OSI) model, Ethernet is fundamentally a Layer 1 and Layer 2 protocol, 10 Gigabit Ethernet retains the key Ethernet architecture, including the Media Access Control (MAC) protocol. 10 Gigabit Ethernet continues the evolution of Ethernet in speed and distance, while retaining the same Ethernet architecture as used in other Ethernet specifications.

Quite a number of optimization tasks belong to the group of so-called combinatorial optimization tasks. During the solution of a combinatorial optimization problem the best of several possible solutions is being sought. The limiting criteria specify the basic limitation of the problem and only define the set of valid solutions. After determining the evaluation of individual valid solutions, given by the objective function, some solutions was of greater, some of lesser advantage. The aim of optimization is to find the best, optimum solution, with the objective function reaching its extreme.

There is a special group of optimization problems, for which no algorithm is known that could be applied to seeking the result. The only possible way of finding an optimum solution is to try all the valid combinations, to calculate the objective function for each combination, and to select a combination with which the objective function reaches its extreme. The greatest disadvantage of these optimization problems is the fact that the number of valid solutions grows exponentially with the growing size of the problem. Consequently, the time necessary for finding the optimum solution also increases exponentially.

3. CONCLUSION

On the basis of active element architecture and on the basis of tasks which these elements realize it can be said that artificial neural networks could be used very effectively for their control.

The education result was also the design of an application of artificial neural networks in the area of optimizing the switching process, where great requirements are made on speed. It was the design of a switch architecture with artificial neural network for priority switching optimization. A procedure was developed how to model these problems mathematically and then how to realize this mathematical model using the neural network. The simulation model was complemented with hardware implementation.

The mathematical background presented within the solution can be used as a general description of using effectively the neural network in the solution of other types of optimization tasks. Generalized knowledge of neural networks in the direction of high-speed network elements was made use of when applying neural networks to the communication technique.

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