

Investigation of Characteristics of Multi-Layer Perceptron with Neurogenesis

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SUMMARY

It is said that there are about 10 billion neurons in the human's brain. The network is formed by connecting of more than one neuron. However, neurons had been considered to be lost with age until several years ago. It was impossible to generate new neuron in the adult brain. This process is called "neurogenesis". The neurogenesis in the hippocampus of the human brain was discovered in the late 1990s by Erickson et al [1]-[3]. Neurogenesis is that new neurons are generated in the human brain. We focus on characteristics of the neurogenesis with biologically. In the previous study, we have proposed artificial network model which was applied the neurogenesis to Recurrent Neural Network (RNN) [4] and Multi-Layer Perceptron (MLP) [5].

In this study, we investigate in more detail the influences of neurogenesis. We apply the behavior of neurogenesis to Multi-Layer Perceptron (MLP) which is one of a feed-forward neural networks. Then, we consider characteristics of extinction and generation of neurons. We explain how to introduce generated neurons and extinct neurons. We use that the MLP is composed of three layers (one input, one hidden, and one output layer). In this network, we choose the neuron which is smallest action and new neurons are generated there. At the same time, new neurons are generated in the hidden layer during the learning. Then, all the weights connecting to the generated neurons are newly set small random values. In this study, we assume the process to generated neurons and connection to "neurogenesis." After that, the connection weights are newly calculated. Figure 1 (b) shows a structure of the proposed network. We consider that the proposed network is composed of three layers. The number of neurons in the input layer is 25, and the output layer is 3. Then, we set that the conventional MLP has 5 neurons in the hidden layer. Therefore, the proposed MLP are set that number of neurons in the hidden layer increases.

From Fig 1 (c), we compare the conventional MLP and the proposed MLP. We are able to obtain the good performance by generating new neurons in the hidden layer. We considered that the characteristic of neurogenesis can be applied well.

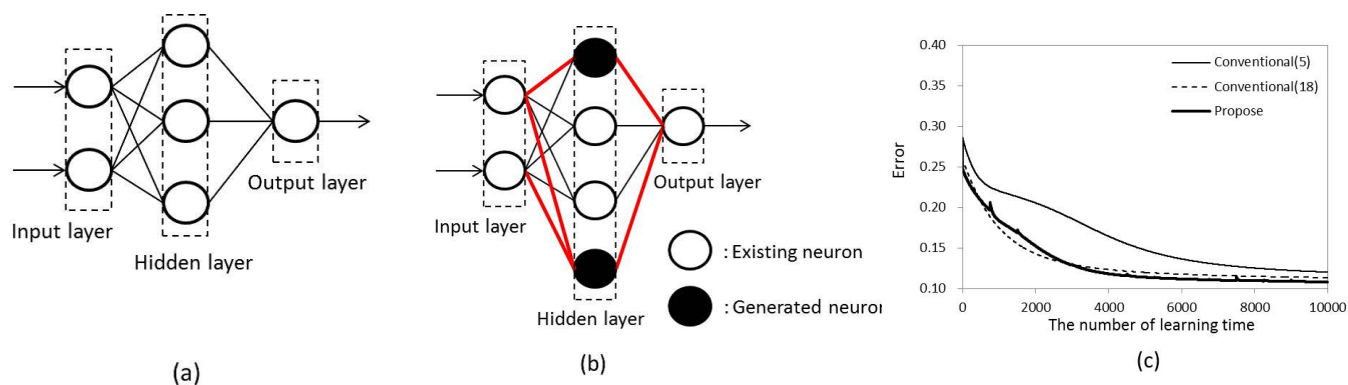


Fig. 1. (a) conventional network, (b) proposed network, (c) result.

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