Neural Network Model with Mean Field Output and Its Application to Reconstruction of Taste Map

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A taste map was reconstructed using a neural network model with mean field output. It is mapping from electric potential patterns obtained using a taste sensor to quantities characteristic of taste qualities. The neural network model used here is a new type of Boltzmann machine. The model proposed here yields a set of mean field output which reflects the collective behavior of groups of output elements. It was shown numerically that the neural network model could learn taste mapping. Moreover, it was found that the output fluctuated when the input electric potential pattern was quite different from the learned patterns.

1. Introduction

In some neural systems, it is suggested that collective behavior plays an important or essential role in information processing,[1,2] i.e., pattern recognition and learning.

In the present paper, we present a simplified model for describing the collective behavior as an output or a result of the pattern recognition process. The ability of pattern recognition in the network model was demonstrated by reconstructing the taste map obtained from a taste sensor.[3,4]

The sampled data used here are the tastes of amino acids. It is known that amino acids exhibit various kinds of tastes. The multichannel taste sensing system can discriminate various tastes of amino acids.[5] Simplified representation was achieved by principal component analysis, which was mapping from the signal from the transducer of the sensor

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