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Gray Scale Display Reflecting Each Slice of Learning Results Using Shooting SOM

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***Abstract*— The Self-Organizing Map (SOM) is popular algorithm for unsupervised learning introduced by Teuvo Kohonen. One of the most attractive applications of SOM is data visualization. In the previous study, we have proposed a new type of SOM algorithm, which is called Shooting SOM (SSOM) algorithm. The important feature of SSOM is that only some neurons near the cluster move toward the cluster to hit the area where input data are concentrated. Because of this feature, SSOM tends to self-organize each cluster along the figure of each cluster. We apply SSOM to data visualization problems.**

I. Shooting SOM (SSOM)

In this section, we introduce SSOM algorithm.

(SSOM1) The initial values of all the weight vectors of the neurons are given between 0 and 1 in a reticular pattern.

(SSOM2) An input data is inputted to all the neurons at the same time in parallel.

(SSOM3) We find the winner neuron by calculating the distances between the input data and the weight vector of the neuron.

(SSOM4) We measure whether the winner neuron or 1-neighborhood of the winner neuron or otherwise. Furthermore, we determine the update rate for each cases.

(SSOM5) The weight vectors of all the neurons are updated.

(SSOM6) The steps from (SSOM2) to (SSOM5) are repeated for all the input data.

II. Gray scale display

A. Display method

In this study, we propose a display method using SSOM. The proposed display method is that the shading is reflected by the number of becoming the winner as shown in Fig. 1(a). For example, because the neuron 5 becomes a winner 5 times, the shading of the circle color is the deepest. In contrast, because neurons 7 and 8 have never been a winner, the shading of these circles is the lightest. Namely, the more number of becoming the winner is deeper color. And the proposed display method reflects each slice of learning results as shown in Fig. 1(b). Therefore, we can see the positional relationship of input data and rough density.

B. Application of simulaiton results

We apply the gray scale display method to the learning results. The results are shown in Fig. 2. As we can see from Fig. 2(b), the conventional display method using the conventional SOM can not discriminate clusters well. However, we can see that the proposed gray scale method using SSOM visualizes the positional relationship of input data and rough density from Fig. 2(c).

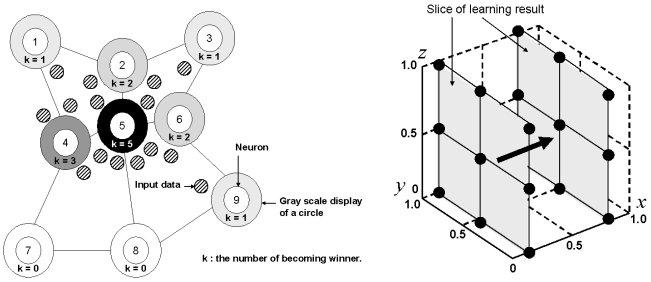

Fig. 1. Gray scale display method

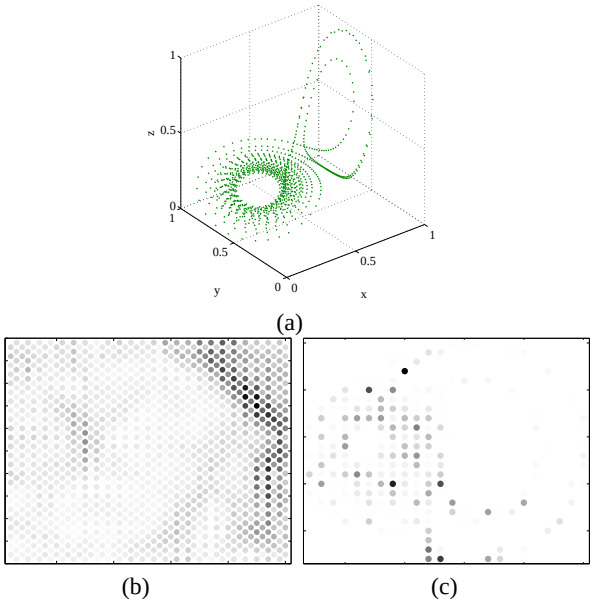

Fig. 2. Simulation results. (a) 3-dimensional input data of the Lorenz attractor. (b) The conventional SOM. (c) SSOM.

III. Conclusions

In this study, we have applied Shooting SOM (SSOM) to visualize the relationship of input data and have confirmed its efficiency by combining the best properties of SSOM and the proposed display method.

References

[1] M. Tomita, H. Matsushita and Y. Nishio, "Shooting SOM and its Application for Clustering," *Proc. of NOLTA'06*, pp. 199-202, 2006.