

A Cognitive Model for Loosely Categorization based on Value Judgment

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Abstract

We become aware of the world (our environment) on classifying all things by our conceptual categories. Conceptual categorization is dependent on value judgment of our behavior and experience of each individual. On the other hand, our behavioral criteria is determined by acquired categories and its value.

Therefore, categorization depends value judgment to the behavioral criteria and the action depend on value judgment to the category.

We take notice that the co-dependency between the hierarchical categorization and behavioral criteria based on value judgement. In this study, we propose a cognitive model which learns hierarchical category based on value judgement. Our cognitive model makes a categorization to a learned value information.

Our cognitive model uses three-layer feed-forward neural network which is one of machine learning. Our proposed cognitive model learns same input and output signal by the neural networks which have different number of neurons in its association layer. Difference of approximation accuracy on each neural networks makes hierarchical structure of categories. Our model can change behavioral criteria by switching the neural network that use in a judgment depending on the situation.

Also, in our cognitive model, categorization is performed by approximating the function value information acquired. Therefore, different granularity categories by the plurality of neural networks form “granularity category” not compartmented definitely.

In this study, we make a cleaning robot, which collect garbage in a room, implemented the proposed cognitive model. We were carried out a computer Experiment that the cleaning robot learns value and structure of categories. First, we confirmed that can acquire different hierarchical categories. In addition, we confirmed different hierarchical categories by different actions by changing the parameters of the robot. Finally, we carried out a experiment of the cleaning robot action that based on the value and the hierarchical categories to be acquired learning. As a result, a difference between random action of the cleaning robot of early learning affect the learning process of the external value structure and category of robots to form a structure.