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Large-scale experimentation of autonomous grammar sharing

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Modeling language acquisition is one of important themes in cognitive science, where we can find the skill called ‘automatization’ in the process of language evolution from primitive form to mature language. In this paper, we propose a model of grammar sharing using PCFG(Probabilistic Context-free grammar) and inductive logic programming. In that process, each processor exchanges utterances and recognizes the others, and the probability for the common grammar rules are tuned to be shared. We design an experimentation for a large-scale multiple computer.

When the mutual understanding of the conversation is examined, the general meaning of each word and the purpose of conversation should be required. In other words, it is desirable to cooperate movement by the conversation for each agent to achieve the purpose. However, it is difficult to indicate of the meaning and to express of the purpose in the Chomsky structure like context-free grammar.

In this paper, the meanings of words aren’t being given. Instead, as for finding some regularity, having sufficient meaning is considered with the outline of the minimum communication. In this paper, we do not give semantics for each word; instead, we try to find a regularity in words that exchanged in agents, and we consider that the regularity is the meaning of words.

The probability of a grammar rule is fixed in the probabilistic context-free grammar in the optional formation process. The model which gives each grammar rule the choice probability which depended on an execution process is proposed. Even the identical grammar rule tune the probability which is suitable for the use conditions by this. In other words, structural meaning can be found like the one related to complying with between the verbs used as an object with the noun used as a subject of the language used at the daily life.

This study simulating this multi-agents model aims in the distributed environment. Each agent behaves independent, and synchronize to exchange utterances between the each agents, and this is the execution environment that more than one process can be carried out. It can be said as the cooperation form of the agent who moves with the dispersion treatment environment that a dispersion treatment experiment is done with the multi-agent environment.

In this paper, each agent is assigned on different multiple processors an distributed environment. Each agent learns a common grammar in this environment, exchanging sentence expressed in bitwise sequences.

Agents speak each other, and the results of convesation are feed back to each agent. Grammar Sharing between the agents is done by self organization of the choice probability due to the following two approaches. when the value which selected the choice probability of the grammar rule are fixed Grammar Sharing was established when positive example and negative example were given to it. It is difficult to judge negative example positive example in the communication model between the agents.

There are two causes for this. One is the problem of the mutual understanding of the conversation stated before. Another one is that the generalstandard of the judgment in the conversation that it is absolute doesn't exist. In the real world, non-grammatical expressions are often used.

The mechanism of the Grammar Sharing in the group society is decided by the number of the group which tries to generalize and an influence. We could get the following result by this research in this viewpoint.

We could confirm the change which reflected the nature of the algorithm on the result which could get it by changing the establishment of each parameter in the experiment. Because each agent depended on the treatment speed of the assigned processor and talked, a difference in individual brought about each agent in the number of times which it talked about.

It improves us to explain the model proposed by this research theoretically as a future subject in the possible model. Then, we verify verification from the actual language data like the statistics toward the model.