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The medical diagnostic support system using extended Rough Neural Network and Multiagent

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Abstract

Multiagent technologies enable us to explore their sociological and psychological foundations. Amedical dignostic support system is built using this.

Moreover, We think that the data inputted can acquire higher diagnostic accuracy by sorting out using a determination table.

In this paper, the recurrence diagnostic system of cancer is built and the output error of Multiagents learning method into the usual Neural Network and a Rough Neural Network and Genetic Programming be compared.

The data of the prostates cancer offered by the medical institution and a renal cancer was used for verification of a system.

Keyword:

Multiagent System, Neural Networks, Medical Diagnostic Support System

1 Introduction

An agent is a computational entity such as a software program or a robot, and can be viewed as perceiving and acting upon its environment. This agent is autonomous in that its behavior at least partially depends on its own experience.

Multiagent systems have the capacity to play an important role in developing and analyzing models and theories of interactivity in human societies. Humans interact in various ways and at many levels: for instance, they observe and model one another, they request and provide information, they observe and model one another, they request and provide information, they negotiate and discuss, they develop shared views of their environment, they detect as terms, committees, and economies. Many interactive processes among humans are still poorly understood, although they are an integrated part of our everyday life. Multiagent technologies enable us to explore their sociological and psychological foundations.

A medical diagnostic support system is built using this. Moreover, We think that the data inputted can

acquire higher diagnostic accuracy by sorting out using a determination table.

In this paper, the recurrence diagnostic system of cancer is built and the output error of Multiagents learning method into the usual Neural Network and a Rough Neural Network and Genetic Programming be compared. Generally, medical data is complicated, and when building a diagnostic system using such data including some errors, the calculation with expression is difficult in many cases. Then, the diagnostic systems configuration from a data pattern is effective using the Neural Network who is excellent in pattern recognition to such a problem.

Furthermore, in order to treat effectively the error included in data, a Rough Neural Network is formed using the extended type Rough Neuron defined from Rough Aggregate Theory. Moreover, change of the diagnostic accuracy by using Genetic Programming to changing the number and combination of the data inputted is seen. Back Propagation generally used in a Neural Network is used for study of a network.

The data of the prostates cancer offered by the medical institution and a renal cancer was used for verification of a system.

2 Intelligent agents and Multiagent System

Artificial Intelligence (AI) has made great strides in computational problem solving using explicitly represented knowledge extracted from the task. If we continue to use explicitly represented knowledge exclusively for computational problem solving, we may never computationally accomplish a level of problem solving performance equal to humans. From this idea, the paper describes the development of a multiagent system that can be used to support the assessment of design performance in the cellular automata model. Agents represent objects or people with their own behavior, and take the structure of cellular automata lattice.

Intelligent agents and multiagent systems are one of the most important emerging technologies in computer science today Weiss21. The advent of multiagent systems has brought together many disciplines in an effort to build distributed, intelligent, and robust applications. They have given us a new way to look at distributed systems and provided a path to more robust intelligent applications.

Multiagent systems deal with coordinating intelligent behavior among a collection of autonomous

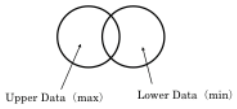

Figure 1: **Rough Neuron**

agents. Emphasis is placed on how the agents coordinate their knowledge, goals, skills, and plans jointly to take action or to solve problems. Constructing the multiagent systems is difficult Abul, Khosla14. They have all the problems of traditional distributed and concurrent systems plus the additional difficulties that arise from flexibility requirements and sophisticated interactions.

3 Rough Neural Networks

Rough neural network is the neural network which enabled that I input the value that considered an accidental error by having a revolving underwriting facility neuron into input with a rough set theory.

I get possible to handle uncertain data than a rough neuron.

I can think about a rough neuron in rough neural network like a pair of a neuron. Therefore I can gain the favor by a rough set theory as a rough neuron and define two normal neuron as revolving underwriting facility neuron of one and take a lower limit of input as the other with an upper limit of input including an accidental error for one input as input of revolving underwriting facility neuron.

Revolving underwriting facility neural network generally depends on medical data for normal neural network by what a lot of things including an accidental error input the upper limit and a lower limit into, and high diagnosis accuracy is provided.

4 Genetic Programming

In this section, we study evolution as it occurs in our model. Learning in an observable and non-stationary environment is still one of the challenging problems in the area of multiagent systems. Our algorithm of learning for our model requires learning from interactions in an environment in order to achieve certain goals. At each time step, the agent observes its environment and selects the next actions based on that observation. In the next time step, the agent obtains

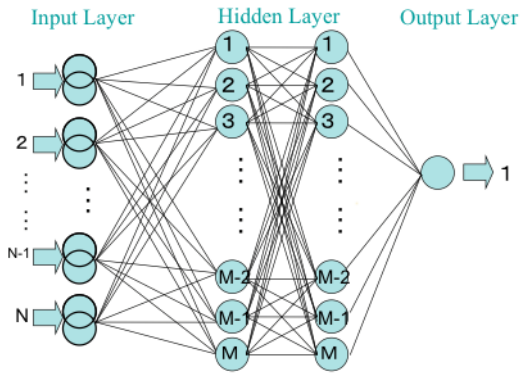

Figure 2: **Rough Neural Network**

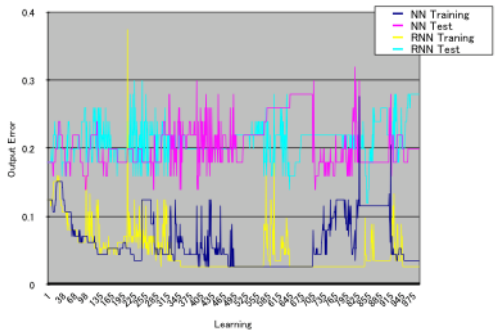

Figure 3: **The precision comparison in Neural Network and Rough Neural Network**

the new observation that may reflect the effects of its previous action and a payoff value indicating the quality of the selected action.

The Rough Neural Network hidden layer considered in this subsection is 2 states where states are denoted 0, 1. The learning or evolution of the rule that the agent may use is achieved by using technique similar to genetic programming Koza6.

An individual in the population of genetic programming is a tree structure form; therefore, the agent needs to convert the rule into tree structure. Followed that applied the genetic operators. The mutation operation will modify the rule of the agent, while the crossover operator depends on the interaction between the agent's rule and the neighbor agents' rules.

The function set is AND, OR, NAND, NOR, NOT, IF, XOR.We can summarize the evolutionary algorithm as: Step1: Convert the agent 's rule and the rules of its neighbors into trees. Step2: Perform mutation operation according to the probability Pm on the tree of the agent. Step3: Perform crossover operation according to the probability Pc between the agent 's tree and randomly selected tree from the neighbors. The offspring tree is replaced with the agent 's tree. Step3: convert offspring tree into rule and store it in the agent controller.

5 The medical diagnostic support system using Multiagent

In this section, we study combined as it occurs in genetic Techniques into agent learner. We used as a tool for searching wide and complex solution space in Intelligent agent learns data. Intelligent agent using complex techniques of related research. It combined on genetic programming same function of genetics algorithm using rough neural network input data. These techniques supported by graphical data in tree structure that retrieval of optimal end point. Because, This techniques consider with using Intelligent Agent Learner expanded of diagnostic support.

Multiagent is state in a filed. These fields include other Learner kept in Intelligent Agent. Other Learner support anything AI techniques and genetic techniques of input data. Intelligent Agent has made combined these techniques into the Machine Learning.

The medical diagnostic support systems create other Agent Learner. This Agent learner using Neural Network, Rough Neural Network, Neural Network combined Genetic Programming and Rough Neural Network combined Genetic Programming.

Agent Learner used to Neural Networks parameter : Input Layer Neuron of 12, Hidden Layer of 2, and Neural Network in Neuron of 30. Other Learner used to Two Rough Neuron combinative Input Layer Neuron of 12, Hidden Layer of 2, and Neural Network in Neuron of 30.

The data of the prostatic cancer offered by the medical institution and a renal cancer included to this Renal cancer 20 % (Difficult Problems).

Rough Neuron sends to input data : Chief Complaint, Grade, pT2, pN2, NHS2, PS, Score, pV2, INF2, PDT2, The diameter of a tumor. but Age and Men or Female using default neuron of input data.

Training Data check Republication of 5 years after of output data. Intelligent Agent using case of Learner in training Data 112 and Test Data:50.(Figure 3)

Figure 3 shows the change in output error for the untrained dataset of the proposed neural network then Rough Neural Network.

Intelligent Agent includes other learning method

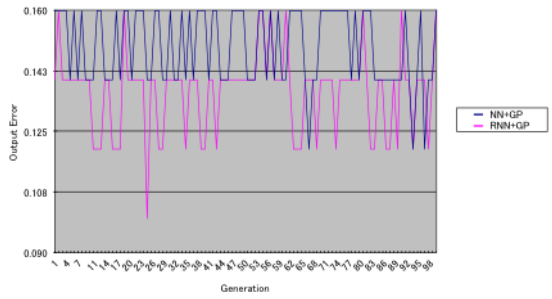

Figure 4: **The precision comparison in Genetic Programming Complex Agent Learner**

using genetic techniques. but, This Intelligent Agent considers revising Learner good parameter of output data. So, Intelligent agent duplicated on these good parameters Learner into this output data. Duplicated Intelligent Agent cross learner supported by genetic techniques. In this case, Intelligent Agent Learner used Neural Network and Rough Neural Network. Because, Genetic techniques consider combined in a Learner method only. This point join to that used to neural network wait link. New Intelligent Agent have make in this hybrid learner. Hybrid Learner is Neural Network or Rough Neural Network and genetic techniques. Genetic Techniques consider with many method support of algorithm into this data. This case used to parameter based on network wait and neuron input data and learning wait after output data. So, This control wait of neuron support Genetic Programming using tree stricture model based on graphical techniques.

Figure 4 shows the change in output error for the untrained dataset of the proposed neural network or Rough Neural Network combined Genetic programming.

Table 1 shows the Agent between learners in other learning method. This Learner has made be able to smaller than network size and output error count.

Table 1: The precision comparison in various networks

Agent Learner	Output Error	Error Countes
NN	0.14	7 / 50
NN + GP	0.12	6 / 50
RNN	0.12	6 / 50
RNN + GP	0.10	5 / 50

6 Conclusion

In this research we have applied best choice of genetic programming complex system buildings. We have been able to searching wide and complex solution space. We have created agent learner in compact network system.

For future works, we will consider methods quick running of genetic programming in learning techniques and noise input data. We try to delete noisy filter on input data. We consider that we delete noisy filter on input data.

Future versions of this model will aim to show how the system in communication response in a more natural, unscripted scenario, involving multiple parts in addition to other forms of process and contingency.

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