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Fuzzy Relational Clustering Algorithm Based Multi-Agent Systems

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ABSTRACT: A multi-agent system (MAS) is a distributed system which is composed of multiple interacting intelligent agents or entities. These agents are used to solve complex functions and operations which are all difficult to solve by human. This paper mainly concentrates on agent fitness and the growth of an agent population. Here we evaluate each and every entity based on agent fitness. The agents are arranged depends on fitness value. It transforms a set (information) of mathematical objects (typically fixed-length binary disposition strings), each with an corresponding fitness value, into a new set of information classified into objects using the clustering principle of natural selection and using operations that are patterned after naturally occurring fuzzy logic operations, such as crossover and mutation. Evaluated agents are used to extract the data from relational database.

KEYWORDS: Crossover, Fitness, Fuzzy logic, Intelligent Agent, Multi-Agent System, Mutation.

I. INTRODUCTION

Most of the complex real world problems are solved using distributed environments. Currently, there is tremendous pressure to design and develop systems in a short period of time. For example, a growing number of e-commerce applications are being deployed on a daily basis and this situation is only going to get worse with the incredible growth of the Internet and web-based applications. One approach commonly used to accelerate distributed systems development is to reuse previously developed components with similar functionalities. A large distributed system could be developed through identifying reusable software components, customizing them to meet the new requirements and integrating them with newly developed software. To address the issues of complex systems development in distributed environments, research on multi-agent systems (MAS) and their application is on the rise. A multi-agent system tries to solve complex problems with entities called agents, using their collaborative and autonomous properties. However, the effort in designing multi-agent systems suffers from lack of systematic approach that is grounded in software development methodologies. In order to develop MAS in a systematic way, we need to analyse the system in terms of its ultimate goals and design the system both in the abstract as well as concrete by mapping the goals and the sub goals to software agents. The implementation of a MAS is only as good as its design; hence, it is critical that correct design decisions are made. Every system has its own framework and the right establishment of this framework can lead to the right system and even right analysis and design for extending the system in future. Furthermore, this is an efficient way to improve the system's reliability and performance. Consequently, it is imperative that a systematic analysis and architecture development process be undertaken and results formalized in order to generate the right system.

Data mining strategies can be assembled as follows*:*

A. *Classification* - Here the given data instance has to be classified into one of the target classes which are already known or defined. One of the examples can be whether a customer has to be classified as a trustworthy customer or a defaulter in a credit card transaction data base, given his various demographic and previous purchase characteristics.
B. *Estimation* - Like categorization, the suggestion of an evaluation model is to determine a value for an unknown output element. After all, unlike categorization, the output elements for an evaluation difficulty are numeric rather than categorical.
C. *Prediction*- It is not easy to differentiate prediction from categorization or evaluation. The only variation is that rather than determining the current behaviour, the predictive model predicts a future outcome. The output attribute can be categorical or numeric. An example can be "Predict next week's closing price for the Dow Jones commercial median". Explains the assembly of a decision tree and its predictive applications.

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D. *Association rule mining* - Here interesting hidden rules called association rules in a large transactional data base is mined out.

E. *Clustering* - Clustering is a special type of classification in which the target ratings are concealed. For example given 100 customers they have to be classified based on certain similarity criteria and it is not preconceived which are those classes to which the customers should finally be grouped into.

It is done by selecting required attributes from the database by performing a query. Data transformation or data expression is the process of converting the raw data into required format which is acceptable by data mining system. For e.g., Symbolic data types are converted into numerical form or categorical form. Data modelling involves building the models like decision tree, neural network etc from above pre-processed data.

II. RELATED WORK

The study proposes an agent based computing based data mining platform to share different levels of clinical data and to extract knowledge from a huge number of raw data in various locations. Typically, the platform can be appealed to different hospitals, organizations as well as companies. More primarily, to our understanding, there are not many existing models that have been specifically focused on health informatics studies. The objectives of the study are:

- Survey the problem associated with embrace agent based computing in all kinds of research.
- Explore solution to conquer the barriers of implementing agent based computing for data sharing among different geographic information.
- Outline a verification-of-concept agent based computing architecture for geographically distributed data mining research.

The main operations in greedy k-nearest neighbor are to find the mean of points in a cluster region and to compute the distortion. While simply initially computing and storing the sum of all the points in a node can get the mean, Distortion can be decided by two ways. They are,

A. Computing Distortion for the current set of agent based centers

For all points X that is part of a specific center ϕ(x) the contribution to the total distortion is:

$$\text{distortion}_{\varphi} = \frac{1}{N}\sum_{x}\left|x \quad \varphi(x)\right|^{2}$$

$$= \frac{1}{N}\left(\sum_{x}|x|^{2} - 2\phi^{T}(x)\sum_{x}x + N\,|\phi(x)|^{2}\right) \qquad (1)$$

Where N is the number of points, The above equation can directly used to compute the distortion for the current set of count if one has stored the statistics of the sum of squared pattern of the count, the sum of the count which is belong to a single cluster and the number of count in each cluster.

B. Computing the distortion for the updated list of centers

The same statistics can be used to compute the distortion with the updated agent based centroids. This is a new method of computing the distortion devised by us. Let ϕ'(x) be the new agent based centroids. ϕ'(x) is computed as the mean of the sum of count in each field. Thus

$$\varphi'(x) = \frac{1}{N}\sum_{x} x \qquad (2)$$

Substituting the same in the equation (2), we get the following

$$\sum_{x}\left|x \quad \varphi'(x)\right|^{2} = \sum_{x}|x|^{2} \quad 2\varphi^{T'}(x)(N\varphi'(x)) + N\,|\varphi'(x)|^{2} \qquad (3)$$

The statistics that need to be stored in either of these is the selfsame way. That is sum of close pattern of all the pinpoints in a node. After all, based on the rule that is used, we efficacy either obtain the distortion for the old set of centers or the one-step renovated centers. After that when we use the second formula for obtaining the distortion for the new cluster centers.

III. BRIEF EXPLANATION FOR EARLIEST TECHNIQUES

A. Formation Stability

Formation stability is a formation control framework for multiple agents with intermittent information exchange between the agents. In the case where the number of communication channels that can be used at each time instant is limited. Formation stability provide stability based on two condition, one is agent wise limited information. In an environment only one channel allowed for each agent at every instant and it does not allowed per agent. Second one is system wise limited information used to allowed only a limited number of channels which are not sufficient to produce a connected network topology.

B. Time-dependent communication links

The weak assumption on the communication topology, we allow for nonbidirectional and time dependent transmission ornament. Oneway transmission is essential in practical applications and can easily be included, for example, via broadcasting. Agents are processed based on some instant of time, the current processing agent update their state based on the information received from neighbouring agents according to a simple condition. Gathering information is not a trusted one. This means we allow for time dependent communication patterns which are important if we want to take into account link failure and link creation, reconfigurable networks and nearest neighbour coupling.

C. Discrete Time with Time-Varying delay

Time-Varying delay provide a class of consensus protocols, which are built on repeatedly using the same state information at two time steps. We establish that consensus problems are solvable under the same topology conditions as the typical ones and without the requirement that agents always ret their own instantaneous state information. Agents are sepearted to "points in time", that is agents are move from one to next state at the same time the time period ia also moved to next state. The number of agents are finite and countable; in this the next state depends only on the current processing state. The current state losses its communication lines, the next state can not able to process further.

IV. OUR CONTRIBUTION IN PROPOSED SYSTEM

The proposed system uses fuzzy clustering algorithm to evaluate stability of multi-agent system at the time of increasing agent population. The fuzzy clustering algorithm is a probabilistic search algorithm that iteratively transforms a set (information) of mathematical objects (typically fixed-length binary character strings), all with an related fitness worth, into a new set of information classified into objects using the clustering principle of natural selection and using operations that are patterned after naturally occurring fuzzy logic operations, such as crossover and mutation.

A. *Initialize population:* Initial population contains set of sentence values and pre-processing sentence to evaluate behind into clustering process. It provides original data set to duplicate data set this duplicate data set to cluster after set goals for the further process.
B. *Cross over mutation:* It classified root goal into system sub-goals this is called as "system exterior goal". After user re-congestion level classification performed here this set goals called as "user goal".
C. *Agent classification:* Agent classifications contain set of Agent list and divide into sub-goal sets. Sub-goal sets are countable for calculate number of goals occurrence in the system performance time period.
D. *Fitness evolution:* Each user and system goals are calculate by the fitness (cost & Purity Value) calculation. It contain size of the agent cluster values and number of sub-set goals fitness also ingrate with is process.
E. *Performance analysis:* Performance analysis consists of the existing and proposed system clustering technique performance calculation and comparison. It provides chart based analysis and clear performance knowledge provide to the user.

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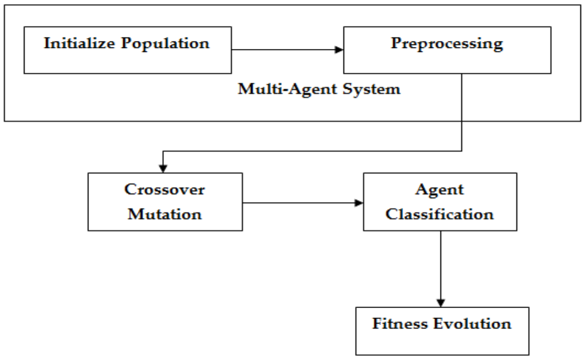

Fig.1 Architecture of Overall Design

The fuzzy clustering algorithms represent the data in form of graph by its Expectation-Maximization framework. This algorithm capable to find the overlapping clusters it mean produce related sentence. Fuzzy relationship algorithm used for variety of text mining process. This method also used in several domains for further classification. The fuzzy clustering provides the cluster evaluation from sentence. It gives the famous sentence from the relational data.

V. CONCLUSION

The fitness result is to provide a greater understanding of strength in multi-agent systems that make use of evolutionary computing, i.e., evolving agent populations. As one would have expected, an extremely high mutation rate had a destabilizing effect on the stability of evolving agent populations. Also, as expected, the crossover rate had only a minimal effect, because variation from crossover was limited once the population matured, consisting of agents identical or very similar to one another. It should also be noted that the stability of the system is different to its performance at developing, because at the period of showing no instability with mutation rates below 60% (inclusive), with at least one individual with a fitness. For example, one wanted to avoid a number of bad states. If the probability of being in those states kept revising with time, it would be strenuous to implement a strategy to avoid these states. However, if the probability converges in time, while one could not guarantee to avoid those states, one could at least calculate the awaited destruction, i.e., the expectation of being in a state times by the penalty for being in it, summed over all the states one wishes to avoid with a range of different fitness landscapes, including flat ones (from the neutral theory of molecular evolution) and ones with multiple global optima.

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