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Real Time Automated Task Scheduling

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***Abstract*: The use of bio-inspired knowledge gaining for Fuzzy Systems founded on Swarm Intelligence-Particle Swarm Optimization (SI-PSO). Swarm-based models consider knowledge entities as particles that move in the space to reach the higher quality. Fuzzy Systems following SI-PSO for knowledge acquisition are categorized in this work as Swarm Fuzzy Systems (SFSs). Specifically, two learning methodologies, KASIA (using rule bases as particles in PSO) and KARP (using rules as particles in PSO) are introduced. SFSs performance is studied in a problem of practical importance nowadays with data sets, the learning of fuzzy meta-schedulers in computational grids. Fuzzy meta-schedulers are Fuzzy Systems doing intelligent allocation of jobs to improve the performance of the grid, such as the reduction of the execution time of workload. The scheduling decisions are taken based on the knowledge of the Fuzzy System and in this way, the relevance of their learning process are critical. In this work, compared results of the performance of the different SFSs and a comparison between SFSs and Genetic Fuzzy Systems are presented. Simulations results show that SFSs can achieve a faster convergence and higher quality with a reduced number of control parameters what makes them a good alternative to Genetic Fuzzy Systems.**

***Keywords*: Parallel processing schedule and fuzzy rules**

1. Introduction

The most important areas for the application of Fuzzy Set Theory is Fuzzy Rule-Based Systems (FRBSs). These kinds of systems constitute an extension of classical Rule Based Systems, because they deal with fuzzy rules instead of classical logic rules. An important application of FRBSs is Linguistic Modeling, which in this field may be considered as an approach used to model a system making use of a descriptive language based on Fuzzy Logic with fuzzy predicates, where the interpretability of the obtained model is the main requirement. Thus, the linguistic model consists of a set of linguistic descriptions regarding the behavior of the system being modeled. In this approach, fuzzy linguistic IF-THEN rules are formulated and a process of fuzzification, inference, and defuzzification leads to the final decision of the system. Although sometimes the fuzzy rules can be directly derived from expert knowledge, different efforts have been made to obtain an improvement on system performance by incorporating learning mechanisms guided by numerical information to define the fuzzy rules.

This issue, known as fuzzy rule learning (FRL), is considered a hard problem and a large number of methods have been proposed to automatically generate fuzzy rules from numerical Data making use of different techniques such as ad hoc data-driven methods, neural networks, genetic algorithms, fuzzy clustering, etc. It proposes a novel way of facing the FRL problem making use of Ant Colony Optimization (ACO) algorithms. To do so, the FRL problem will be formulated as an optimization problem and the features related to these kinds of algorithms such as heuristic information, pheromone initialization, fitness function, solution construction, and pheromone update—will be introduced. An FRBS presents two main components:

- The Knowledge Base (KB), representing the knowledge about the problem being solved in the form of fuzzy linguistic IF-THEN rules,
- The Inference Engine, which puts into effect the fuzzy inference process needed to obtain an output from the FRBS when an input is specified.
- The KB is composed of the Rule Base (RB), constituted by the collection of linguistic rules themselves joined by means of the connective also, and of the Data Base (DB), containing the term sets and the membership functions defining their semantics. The fuzzy linguistic rule structure considered in linguistic FRBSs is the following: Ri: IF X1 is Ai1 and ... and Xn is Ain THEN Y is Bj , with X1, . . , Xn and Y being the input and output linguistic variables, respectively, and Ai1, . . . , Ain and Bj being linguistic labels, each one of them having associated a
- Fuzzy set defining its meaning. To apply ACO algorithms to a specific problem, the following steps have to be performed:
- Obtain a problem representation as a graph or a similar structure easily covered by ants.
- Define the way of assigning a heuristic preference to each choice that the ant has to take in each step to generate the solution.
- Establish an appropriate way of initializing the pheromone.
- Define a fitness function to be optimized.
- Select an ACO algorithm and apply it to the problem.

In the following subsections, these steps will be introduced to solve the FRL problem. This study introduces a new method for the fuzzy-rule evolution that forms expert system knowledge: the knowledge acquisition with a swarm-

intelligence approach (KASIA). Specifically, this strategy is based on the use of particle-swarm optimization (PSO) to obtain the antecedents, consequences, and connectives of the rules. To test the feasibility of the suggested method, the inverted-pendulum problem is studied, and results are compared for two of the most extensively used methodologies in machine learning: the genetic-based Pittsburgh approach and the Q-learning-based strategy Knowledge representation is enhanced with the use of linguistic variables and their linguistic values that are defined by context-dependent fuzzy sets whose meanings are specified by graded membership functions. On the other hand, inference methods such as generalized modus ponens, tollens, etc., which are based on Fuzzy Logic, form the basis of Approximate Reasoning with pattern matching scores of similarities. The Fuzzy Logic provides a unique computational framework for inference in Rule-Based Systems. Unlike traditional logical systems, Fuzzy Logic is aimed at providing modes of reasoning which are approximate and analog rather than exact.

2. Scope

The main goal of this project is intelligent allocation of jobs to improve the performance of the grid, such as reduction of the execution time of work load. The learning of a fuzzy rule-based scheduler is a relevant process for the whole system performance. The fuzzy scheduler bases its strategy on the application of expert knowledge to the current state of the system and thus, the accuracy of this knowledge can determine the quality of the scheduler decisions greatly. There exist diverse strategies for knowledge acquisition for these schedulers. Particularly, the role of GAs is to be highlighted. Genetic strategies have shown their effectiveness for the evolution of rules in FRBSs and they are founded in the application of natural law in evolution processes. The individuals to be evolved are encoded as chromosomes that are subject to competitive stages in order to be selected to be included in the next generation and that take part in the generation of new individuals. Michigan approach proposes the encoding of every rule within a RB as a chromosome or individual of the population whereas Pittsburgh approach suggests the consideration of whole RBs as individuals that are subject to genetic processes. Furthermore, new bio-inspired learning approaches for learning in FRBSs have been proposed founded on existing optimization algorithms. A recent proposal is Knowledge Acquisition with a Swarm Intelligence Approach (KASIA) and Knowledge Acquisition with Rules as Particles (KARP) which is a PSO –based strategy. In this approach, according to the original algorithm, individuals made up whole RBs, so-called particles that move in the search space with the aim of finding optimal locations. An optimal location may refer to a greater accuracy in terms of diverse criteria in an independent or simultaneous way. Thereby, considering the high dependence of the fuzzy rule-based scheduler's performance with the quality of their knowledge bases and in this regard, with the knowledge acquisition processes, it can be of interest to analyze the diverse learning strategies.

3. System analysis

A. *Existing system*

The development of a methodology to automatically generate scheduling strategies for Massively Parallel Processing systems that consider the providers preferences.

- The online job scheduling on MPP is usually non-clairvoyant as the processing time p of job j is not available at release date.
- The individual preferences of the machine providers are expressed using a complex objective function that is generated by combining well known simple basic object.
- The scheduling problem includes independent parallel jobs and multiple identical machines.
- Scheduling strategies again on real workload data in comparison to a probability-based scheduling strategy and the EASY standard scheduling algorithm.
- Genetic algorithms are probabilistic search technique that emulate the mechanics of evolution.
- They are capable of globally exploring a solution space, pursuing potentially fruitful paths while also examining random points to reduce the likelihood of settling for a local optimum.
- The system being evolved is encoded into a long bit string called a chromosome.
- Mutations include inversion of the copied bit, and the addition or deletion of an entire rule.
- The cycle of evaluation and reproduction continues for a predetermined number of generations, or until an acceptable performance level is achieved.

B. *Limitations*

- Thrusters are not linear controllers because their output is fixed. Therefore, the moment generated by thrusters depends on its starting period.
- Thrusters can only generate moment in one direction. Thus, another thruster is needed to generate moment in the opposite direction.
- The difference is that the range of membership function changes was modified in this work to analyze the limit cycle.
- Minimizing the time required for the system to reach the steady state is an important point in fuzzy controller design.

C. *Proposed system*

- Main goal of the proposed system is intelligent allocation of job to improve the performance of the grid, such as reduction of the execution time of work load.

- KASIA is a SI-based strategy for the gaining of fuzzy rule based inspired by the stochastic evolutionary algorithm PSO based social behavior.
- KARP approach is proposed for the evolutions of rules as individuals for FCS through the application of SI in the learning of classifier discovery system.
- Genetic individual encodes a whole rule based and a population of RB is evolved through the application of genetic operation.
- PSO learning process, each state of particle presents a position and velocity, which is initialized with a population generation by a random process, and then positions and velocities are adjusted by corresponding best evaluated information from iteration to iteration.
- The conceptual partitions developed for the input and output dimensions are used to create a fuzzy rule set which determines the behavior of the fuzzy system being constructed.
- Fuzzy-based algorithm for scheduling soft real-time tasks on uniform multiprocessors is presented.
- Fuzzy rules are experiences oriented and membership functions are selected by trial-and-error procedure.
- A Fuzzy Set is any set that allows its members to have different grades of membership in the interval.
- FLC can be considered as approximated version of already defined controllers or as a combination of a number of operating strategies or controller.

D. Advantages

- Flexible, intuitive knowledge base design.
- Control and Supervision speak the same language.
- Convenient user interface. Easier end-user in perpetration when the final user is not a control engineer.
- Easy computation. Widely available toolboxes and dedicated integrated circuits.
- Validation, Consistency, redundancy and completeness can be checked in rule bases.
- That could speed up automated learning and improve user interpretability.
- Ambiguousness fuzzy logic is a “natural” way of expressing uncertain information.
- KASIA, KARP algorithm and logic reasoning, allowing for integrated control schemas.
- FLC can incorporate a conventional design and fine-tune it to certain plant nonlinearities due to universal approximation capabilities.

4. System design

A. Architecture

The admin allows user to craft custom requests. You can either create a new request manually, or you can drag and drop a session. Reaction to an event, occurrence, or situation, aimed at its containment or control. Any behavior that results from a stimulus. It sends a finished request from customer send from the customer to admin. The share ideas by reducing the physical, political and technical barriers to communication. The module collects ideas in a central repository that can be analyzed by anyone with the appropriate access credentials.

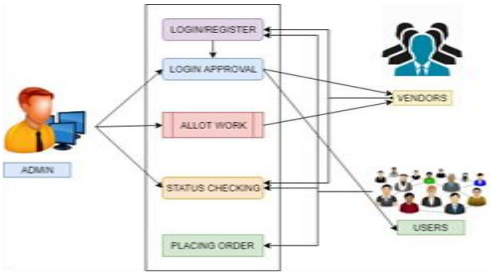

Fig. 1. Architecture

5. Implementation

A module is a bounded contiguous group of statements having a single name and that can be treated as a unit. In other words, a single block in a pile of blocks.

A. Guidelines for modularity

- Make sure modules perform a single task, have a single entry point, and have a single exit point.
- Isolate input-output (I-O) routines into a small number of standard modules that can be shared system-wide.
- Isolate system-dependent functions (e.g., getting date or time) in the application to ease possible future conversions to other computer platforms or to accommodate future operating system revisions.

B. Compose request

The Composer allows you to craft custom requests to send to a admin. You can either create a new request manually, or you can drag and drop a session. The development of a methodology to automatically generate scheduling strategies for Massively Parallel Processing systems that consider the providers references. The KB is composed of the Rule Base (RB), constituted by the collection of linguistic rules themselves joined by means of the connective also, and of the Data Base (DB), containing the term sets and the membership functions defining their semantics.

C. Response details

This module is act of responding. Reaction to an event, occurrence, or situation, aimed at its containment or control. Any behavior that results from a stimulus. The Inference Engine, which puts into effect the fuzzy inference process needed to obtain an output from the FRBS when an input is specified.

D. Allocate request

This module process of adding and assigning request and sub-request, and, unlike much other online project

management, allows you to assign tasks to several people instead of just one. The ACO algorithms to a specific problem, the following steps have to be performed to obtain a problem representation as a graph or a similar structure easily covered by ants. Define the way of assigning a heuristic preference to each choice that the ant has to take in each step to generate the solution. Establish an appropriate way of initializing the pheromone. Define a fitness function to be optimized. Select an ACO algorithm and apply it to the problem.

E. Ant colony optimization algorithm

ACO algorithm, the shortest path in a graph, between two points A and B, is built from a combination of several paths. It is not easy to give a precise definition of what algorithm is or is not an ant colony, because the definition may vary according to the uses. Ant colony algorithms are regarded as populated metaheuristics with each solution represented by an ant moving in the search space. Ants mark the best solutions and take account of previous markings to optimize their search. They can be seen as probabilistic multi-agent algorithms using a probability distribution to make the transition between each iteration. In their versions for combinatorial problems, they use an iterative construction of solutions. The thing which distinguishes ACO algorithms from other relatives (such as algorithms to estimate the distribution or particle swarm optimization) is precisely their constructive aspect. In combinatorial problems, it is possible that the best solution eventually be found, even though no ant would prove effective. Thus, in the example of the Travelling salesman problem, it is not necessary that an ant actually travels the shortest route: the shortest route can be built from the strongest segments of the best solutions. However, this definition can be problematic in the case of problems in real variables, where no structure of 'neighbors' exists. The collective behavior of social insects remains a source of inspiration for researchers. The wide variety of algorithms (for optimization or not) seeking self-organization in biological systems has led to the concept of "swarm intelligence", which is a very general framework in which ant colony algorithms fit.

F. Manager response

Manager response module is providing a comprehensive information sharing, alerting, and notification solution. Considering the high dependence of the fuzzy rule-based scheduler's performance with the quality of their knowledge bases and in this regard, with the knowledge acquisition processes, it can be of interest to analyze the diverse learning strategies.

G. Send user response

This module is a send a finished request from customer send from the customer to admin. The method form takes parameters send immediately defaults to true, which causes a basic or bearer authentication header to be sent. If send immediately is false, then request will retry with a proper authentication header after receiving a 401 response from the server.

6. Testing

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. In fact, testing is the one step in the software engineering process that could be viewed as destructive rather than constructive. A strategy for software testing integrates software test case design methods into a well-planned series of steps that result in the successful construction of software. Testing is the set of activities that can be planned in advance and conducted systematically. The underlying motivation of program testing is to affirm software quality with methods that can economically and effectively apply to both strategic to both large and small-scale systems.

7. Conclusion

Two machine learning techniques based on SI for RB and rule discovery in fuzzy systems have been introduced, resulting in SFSs. These techniques take advantage of the properties of the PSO to obtain higher quality for RBs in a shorter time and with a simply setup. Specifically, it has been analyzed that these strategies are able to improve both accuracy and convergence features, with the same computational cost, of genetic-based machine learning approaches in a problem of practical importance, the design of fuzzy meta-schedulers for Grid Computing. It has been shown that the swarm models for RB discovery and rule discovery, KASIA and KARP, respectively, provide higher quality RBs and rules in terms of accuracy and improved convergence behavior in comparison to classical strategies involving the same computational effort step by step in the whole learning process. Anomaly based intrusion detection systems are provided in order to protect computer networks against novel attacks and improve network security. These systems perform intrusion detection by comparing current network traffic with a behavioral model of normal network activity. The pattern of network traffic changes over time, static models are not appropriate to monitor malicious activities. As the static models could be tuned with respect to changes in traffic pattern, adaptive models are used in this manner. It presented a PSO based Fuzzy for anomaly detection in intrusion detection system. A whole new membership function successfully adjusted from standard fuzzy membership function. It could be done with representation of fuzzy membership function value as particles. The particle represent will be changes to reach the optimal value for each iteration using optimization method. The fuzzy membership function will be shrinks, move or expand through the changes of each value. Based on result experiment, the PSO+ Fuzzy has adjusted fuzzy membership function and improved the performance result in term accurately to destination and faster in speed of convergence. PSO+ Fuzzy rule-based modeling is used to create the detection model.

8. Future work

In addition, prediction results are delivered to system user for verification. Fuzzy controller module uses verified results in order to tune the detection model. To improve the accuracy for detect the anomaly in the intrusion detection system to extend our work with Genetic algorithm

References

[1] Muhammad Bilal Qureshi, Mohammed Abdulrahman Alqahtani, and Nasro min-Allah, "Grid Resource Allocation for Real-Time Data-Intensive Tasks," IEEE Trans. Softw. Eng., vol. 5, no. 1, pp. 101-160, Nov. 2017.

[2] L. Kontothanassis and D. Goddeau, "Profile driven scheduling for a Heterogeneous server cluster," in Proc. 34th Int. Conf. Parallel Process. Workshops, 2005, pp. 336–345.

[3] E. Caron, P. K. Chouhan, and F. Desprez, "Deadline scheduling with priority for client-server systems on the grid," in Proc. 5th IEEE/ACM Int. Workshop Grid Comput., Nov. 2004, pp. 410–414.

[4] K. Ranganathan and I. Foster, "Decoupling computation and data scheduling in Distributed data-intensive applications," in Proc. 11th IEEE Symp. High Perform. Distrib. Comput. (HPDC), Edinburg, TX, USA, Jul. 2002, pp. 352–361.

[5] J. Xu and D. L. Parnas, "Scheduling processes with release times, deadlines, precedence and exclusion relations," IEEE Trans. Softw. Eng., vol. 16, no. 3, pp. 360–369, Mar. 1990.

[6] J. P. Lehoczky, L. Sha, and Y. Ding, "The rate monotonic scheduling algorithm: Exact characterization and average case behavior," in Proc. IEEE Real-Time Syst. Symp., Jun. 1989, pp. 166–171.