



A Hybrid Algorithm Based on Artificial Fish Swarm and Particle Swarm for Effective Job Allocation in Cloud Data Centre

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Abstract — Effective allocation of job is one of the main challenges of cloud computing. The technical objective is to minimize the makespan and reduce the operational cost. AFSPSO algorithm is a hybrid algorithm of AFS algorithm and PSO algorithm. This hybrid algorithm helps to allocate the job to the VM within less time when compared to the PSO algorithm. AFSPSO is a hybrid algorithm which carries out the allocation of jobs to the best VM effectively. So that the total execution time of job can be reduced. The operational cost can also be minimized. The results shows that AFSPSO algorithm allocate the job to the VM within less time and less operational cost than the existing methods.

Keywords- AFS, Cloud Computing, Data Centre Job Allocation, PSO, VM

I. INTRODUCTION

Cloud computing is a computing model that provides services to users on the basis of pay per usage model. Based on SLA (Service Level Agreement) the resources are given to the cloud users. Artificial Fish Swarm (AFS) is an optimization algorithm. This algorithm deals with the movement of fish and its various behaviors. AFS algorithm has many advantages such as high convergence rate, not get trapped in local optimal value, high accuracy, error tolerance. AFS algorithm having applications in wireless sensor networks, image processing, neural network. Particle Swarm Optimization (PSO) is a population based iterative method. PSO is designed by Kennedy and Eberhart. The concept of PSO is taken from the behavior of bird movement for searching their food. AFSPSO is efficient when compared with the existing methods. Genetic algorithm is complex in nature when compared with AFSPSO. In first come first serve algorithm, the jobs are assigned to the VM in the way the jobs are coming. This makes the VM to get load easily and the VM may get fail. This algorithm has taken more execution time when compared with AFSPSO algorithm. The hybrid AFSPSO algorithm that helps in the effective scheduling of task with less time and less cost. Makespan is the completion time of all the jobs. The results shows that AFSPSO is an efficient algorithm that takes less time for finding out the virtual machine (VM) for each job. AFSPSO algorithm helps to reduce the overall makespan of jobs and reduce the operational cost than the PSO algorithm. The proposed algorithm optimized the use of resources in order to gain maximum profit. Task scheduling is a challenging issue in cloud computing. The execution of AFSPSO is modeled in cloudsims simulator. CloudSim provides a simulation environment that is useful for modeling and simulation of cloud based components. Data centre, cloudlet, VM can be created in cloudsims.

II. LITERATURE REVIEW

Ali al maamari et.al, explained about a dynamic adaptive particle swarm optimization (DAPSO) that is used to solve the PSO affinity problem in inertia weight where great inertia weight facilitates a global search while a little inertia weight facilitates a local search [1]. Poola, D et.al, proposed a scheduling algorithm that schedules tasks on Cloud resources using two different pricing models to reduce the cost of execution. The two pricing models are spot and on-demand instances. The proposed algorithm is fault tolerant against the premature termination of spot instances and also robust against performance variations of cloud resources [2]. Ramesh kumar et.al, proposed cost-aware service brokering and load aware over cost brokering in the cloud. Cost aware brokering always selects the VM with the lowest cost. If a

request is received from a user by the broker, the broker retrieves the region of the sender. It then sends queries to determine which data centers are located in the same region [3]. Aarati Singh et.al, analyzed the role of a service provider. The main role of service provider is to effectively distribute and share the resources [4]. Ghobaei-Arani et.al, his works commonly focused on to maximise the revenue that is subject to capacity and virtual machine migration constraints. Near Optimal (NOPT) based on hill climbing algorithm is used. This NOPT provides a 45% improvement in average revenue when compared with best fit [5]. De Falco et.al, implemented two new fast heuristics for mapping parallel applications on cloud computing. They are min-min-c and max-min-c. Advantage is takes less time for executing the tasks. Disadvantage is communication speed is less [6]. Oshin Sharma et.al, proposed a median based threshold approach for VM consolidation in cloud. Main advantage is the better optimization of resources. High energy consumption is the disadvantage [7]. Tanggong Chen et.al proposed explained about Artificial Searching Swarm Algorithm (ASSA) is a new optimization algorithm. This algorithm is used for solving optimization problems [8]. Ying Wu et.al, explained about a knowledge-based Artificial Fish-Swarm (AFA) optimization algorithm with crossover, CAFAC, is proposed to enhance the optimization efficiency and combat the blindness of the search of the AFA [9]. Javier Bajo et.al, explained about the virtualization technology that allows allocation of resources in low level. It is also possible to modify the resources in the low level. Agent theory allowing decentralized resource allocation. This innovative approach has great benefits such as equal distribution of load and less computation time [10].

III.METHODOLOGY

3.1AFSPSO (ARTIFICIAL FISH SWARM and PARTICLE SWARM OPTIMIZATION ALGORITHM)

The advantages of PSO algorithm are there is no overlapping and mutation calculation. The search is carried out by the speed of the particle. The calculation in PSO is simple. The advantages of AFS algorithm is high convergence speed, flexibility, high accuracy, good robustness, have the ability to search the global optimum effectively. The artificial fish swarm algorithm (AFSA) is a heuristic global optimization technique based on population which is easy to understand, high convergence rate. It is possible to combine PSO with AFS to utilize the resources efficiently. AFSPSO is a hybrid algorithm which carries out the allocation of jobs to the best VM effectively. So that the total execution time of job can be reduced. The operational cost also can also be minimized. The completion time of job in each virtual machine is calculated and the virtual machine which takes less time for the job completion can be taken as the best virtual machine. AFS having high convergence rate. Main disadvantage of PSO is that it get fall in local minimal value. AFS speeds up the swarm to converge to the global optimum value.

AFS is faster than PSO, and faster in case of resource selection. AFS is used for finding out the global optimum solution. So combining the PSO with AFS will give the best solution in terms of makespan, cost and energy usage. AFSPSO will allocate jobs to the best virtual machine and having less makespan for the jobs and less cost. AFSPSO algorithm is efficient than the PSO, Simulated Annealing algorithms.

3.2 ARTIFICIAL FISH SWARM ALGORITHM (AFSA)

AFSA imitates the behaviour of fishes in nature and allows finding a global optimum. In water fishes can find the most nutritional area in two ways, first one is by themselves or by following other fishes. Thus, the area in the water with the highest number of fishes is in general the one with the highest amount of food. According to this behaviour, the

AFSA algorithm relies on the concept of Artificial Fish (AF), and uses several AFs behaviors and performs the search of a global optimal solution. Artificial fish having several behaviours such as searching, swarming, leaping behaviour.

Searching behavior- When the fish discovers a region with more food, then it will go directly to that region.

Swarming behavior- When swimming, fish join in groups in order to avoid danger.

Leaping behavior- When fish moves in a region, a leap is required to look for food in other regions.

Follow behavior- When a fish found the food, other fishes in the group follow that fish and reaches the destination.

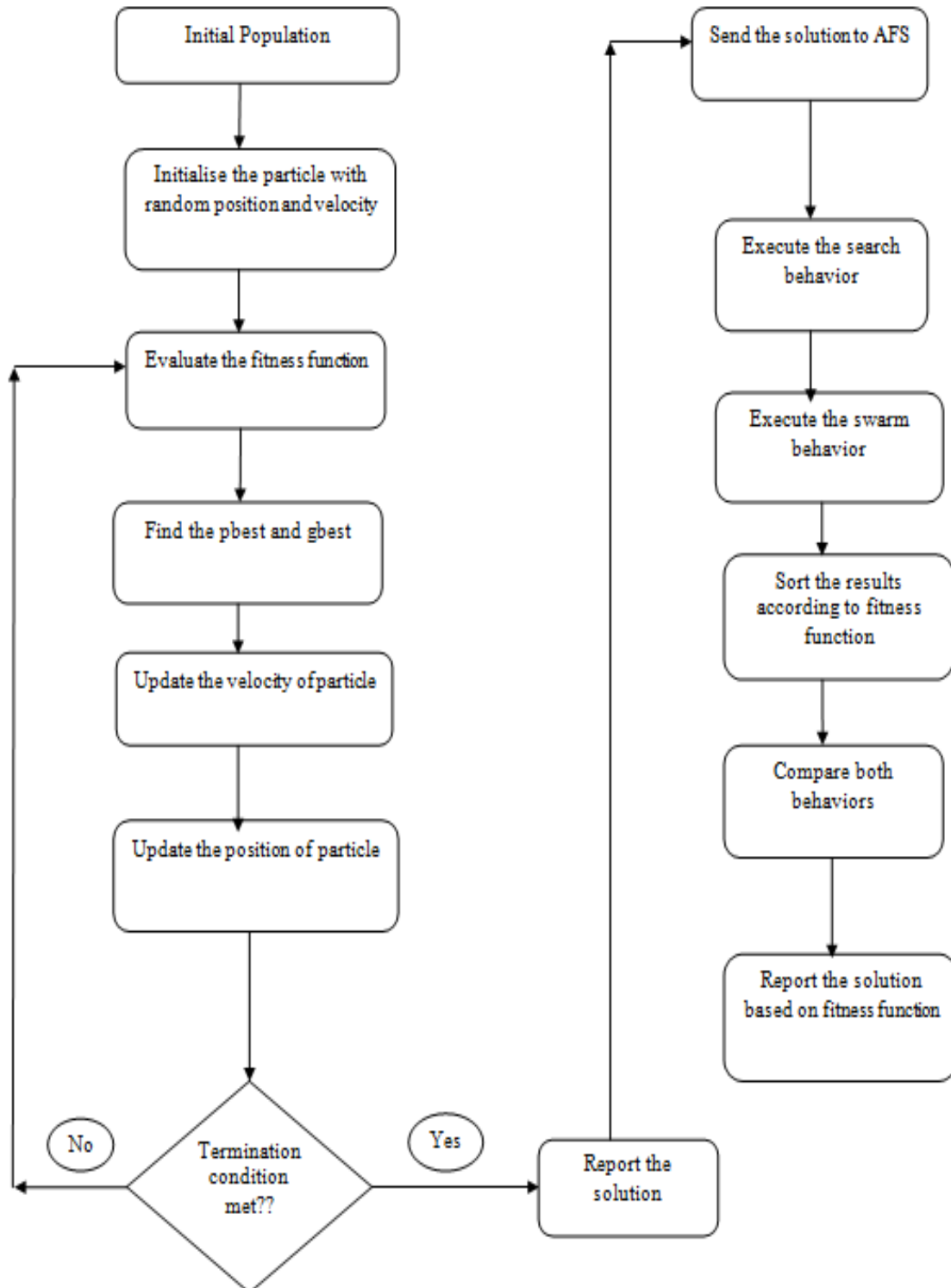


Figure 1.AFSPSO based framework

IV PERFORMANCE METRICS

The hybrid AFSPSO algorithm can reduce the makespan of jobs, operational cost and energy usage. The AFSPSO algorithm allocates the job to the suitable VM. So the energy utilized for the allocation of the job is less when compared with the PSO algorithm.

4.1 OPERATIONAL COST EVALUATION

Table 1. Comparison of operational cost of PSO and AFSPSO algorithm

Number of jobs	PSO Algorithm	AFSPSO Algorithm
5	55.58	36.34
10	66.27	47.25
15	70.42	58.36
20	80.31	68.73
25	95.36	79.43

Operational cost = (Cloudlet length*finish time)/capacity

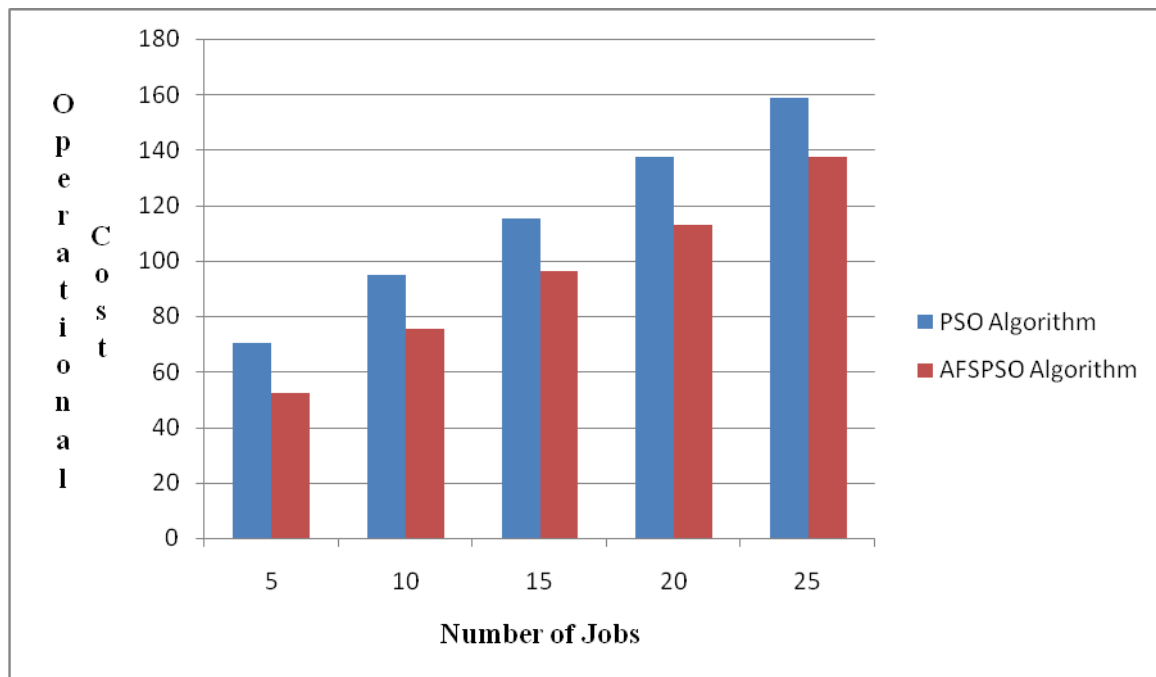


Figure 2. Comparison of operational cost of PSO algorithm and AFSPSO algorithm

V. CONCLUSION

The effective allocation of jobs to the VM is one of the core challenges of the cloud computing. By the use of hybrid algorithm, AFSPSO it is possible to allocate jobs to the suitable virtual machine and reduce the makespan of jobs, operational cost. The hybrid algorithm finds out the best resource within less time. In the case of AFSPSO hybrid algorithm, the particles are the virtual machine. Same job is given to different virtual machines. The completion time of job in each virtual machine is calculated. When jobs are coming and if randomly selecting the VM for each job, it will take more time and makespan of jobs are also high. By using AFSPSO the makespan of job is reduced, operational cost can be reduced and energy can be utilized efficiently. Effective loading of workloads in VM will improve the performance of VM. By combining both algorithms, the advantages of AFS and PSO can be used at the same time.

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