Review of Techniques Used To Enhance Performance of Job Allocation in Parallel System

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***Abstract*- This paper speaks to the parallel computing is a kind of working out through which numerous information or the execution associated with forms are done simultaneously and in addition scheduling alongside wellspring of data allowing so we can improve proficiency models inside multi-group heterogeneous circumstances is recognized for NP-difficult issues. Multi-group situations are ordinarily spoken to as a substitution to superior computing with respect to settling huge scale site improvement troubles. The survey has demonstrated the different meta heuristic procedures which has demonstrated their helpfulness to locate the ideal calendar around vast scale allotted conditions. It likewise demonstrates the examination of Meta heuristic systems which assesses the genuine workload follow and in addition demonstrates the favourable circumstances and hindrances with regards to other understood methodologies sketched out inside writing.**

***Index Terms*- Meta heuristic approach, job scheduling, parallel computing.**

I. INTRODUCTION

Various researchers have shown an intense interest in scheduling techniques. There are many algorithms for scheduling the jobs and then assigning those jobs to the resources or processors by using some criteria. Some algorithms are bi-objective and others are multi objectives. In early stages only one objective function is optimized whereas latter two or more than two objective functions are optimized concurrently. The basic aim of algorithm is optimization. In any problem optimization means finding an alternative method or is a process of modifying a system to make some features work more accurately under some given constraints, as feasible by maximizing required parameters and minimizing the parameters.[1]

Job scheduling is the way to allocate jobs to be executed by a single processor and even we can execute these tasks according to our choice. When tasks are scheduled on a multiprocessor system it is known to be NP-Complete problem. But the main issue behind this process is to minimize the execution time of a task. To achieve optimal result under different situations many heuristics have been developed. In our purposed paper we are using hybridization of bat and Cuckoo heuristic algorithms for taking better result and we also compare it with genetic algorithm. After comparison of make span and flow time we find that the make span of our hybridised algorithm is better than the genetic algorithm. [2]

Scheduling is a process which is used to schedule the tasks. These tasks can follow single cluster approach or multi cluster approach to achieve optimal result. In single cluster approach every job will be scheduled to execute on single cluster with similar types of serversBut in case of Multi cluster approach multiheuristic algorithms are used like ACO, BAT, Cuckoo and Firefly are used to execute the jobs.[3]

Proposed literature concentrate on Parallel jobs for resource allocation. In other words jobs are assigned to clusters with available resources. Problems start to appear in case as job requirements increases beyond the scope of current cluster. In that case jobs must wait. Starvation problem starts to appear. Genetic algorithm convergence is at stake while evaluating such jobs. Existing work in next section.[4]

II. BACKGROUND ANALYSIS

Scheduling is the most important issue which focuses on better performance and optimization is the basic parameter to achieve better performance. In scheduling every job get resources to achieve the objective or multiple objectives. In parallel

computing scheduling is considered to solve NP hard problems because it takes more time to find the optimal and best solution. Metaheuristic algorithm provides optimal solution in short span of time for certain kind of problems. These techniques can resolve large problems with more efficiency and effectiveness. The main aim to process the jobs parallel is to achieve better performance in less time as well as cost.[5]

Heuristic and metaheuristic approaches mimic their behaviour according to biological systems like in [6]swarm algorithm flocks of birds to solve problems such as effective foraging for food, prey evading, or colony re-location, [6]Ant Colony Algorithm with the behaviour as ants for finding food optimal path is achieved for certain problems, [5]BAT algorithm is inspired by the echolocation behaviour of bats to achieve global optimization, [7]Cuckoo algorithm inspired by the obligate brood parasitism of some cuckoo species by laying their eggs in the nests of other host birds, [4]Firefly algorithm was inspired by the behaviour of firefly to find optimal distance.

Meta heuristic algorithms provides mechanism to allocate jobs that exceed resources availability using pre-emption of resources on completion of existing jobs known as effective finish time.

A. GENETIC ALGORITHM

Genetic algorithm is one of the most commonly used Meta heuristic algorithms used to process complex jobs. Jobs processing under this algorithm have multiple objectives associated with it. Genetic algorithm has multiple phases associated with it. All of these phases are as explained below

Initialization[8][8](Solanki, no date)

Jobs and resources at first place required to be initialized. Jobs are known as chromosomes. These chromosomes are initially selected randomly for allocation. Generations, objective function, crossover and mutation probabilities are initialized in this phase. [9]

Selection

In genetic algorithm, Jobs are referred to as Chromosomes. Resources are required by chromosomes. Chromosomes are selected initially for resource allocation. This process is known as selection. In genetic algorithm, this selection is performed using variety of mechanism known as selection criteria's. Chromosomes are selected for later breeding using this phase. Steps in selection are listed as under

1) Fitness function is evaluated associated with each job. Fitness values are normalized by adding the fitness values and then dividing it with total number of jobs.
2) Population is sorted according to descending value of fitness values
3) Population with highest fitness value is selected for mating.

Crossover or Mating

Selected Chromosomes are then go through this phase in order to determine chromosomes which are to be mutated. Uniform crossover is preferred in proposed thesis.

Mutation

Chromosomes selected for mating in crossover are mutated to generate new chromosomes and then evaluated again.

After performing all the phases, fitness values are analysed again. This process continues until desired level of fitness values is achieved or generations terminates.

B. ANT COLONY OPTIMIZATION

This is another metaheuristic approach used to schedule resources among jobs. Ant colony optimization is an extension of Genetic algorithm used to handle more complex jobs as compared to Genetic approach. Resources may be located within same or distinct clusters and these jobs are handled using local and global solutions. Results obtained are compared against the previous solution to obtain optimal solution. Iterations terminates as optimal solution is reached or iterations expires against the specified value[10]. Ant Colony optimization follows the following steps

1) All the Ants must visit all the resources at least once
2) Distant resource is less likely to be visited due to visibility problem.
3) In case resource is fond by Ant, pheromone is laid down.
4) After previous iteration, Pheromone evaporated.
5) Process continues until optimal solution gbest and lbest is found out or generations terminates.

Convergence problem exists while using Ant colony Optimization.

C. BAT Algorithm

A nature inspired BAT algorithm was developed by Xin-She Yang. To detect their chase and obstacles microbats have special quality i.e. "sonar". In the dark nights they can also detect the cracks for their nest. Microbats hear the sound pulse and wait for reverberate of sound that comes back after striking the chase or obstacles.[11] Microbats usually use pulse rate i.e. 10-20 times per second and can also detect tiny obstacles like human hair. Time delay between emissions and reverberate of sound is used for navigation and can also detect distance, type of chase, its moving speed.[12] By variations of Doppler affect introduced by the wing flutter rates of the target insects they are able to differentiate targets. To easily detect the chase and its navigation they combine their all senses. Micro bats uses [0.7,17] mm range of wavelength or [20-500] kHz inbound frequencies. Algorithm is developed using three rules which are given below:

1). To sense the distance, hunt, food and obstacles echolocation is used.

2.) Bats usually used to fly randomly with some velocity at position Si with fixed frequency [feq max, feq min], varying wavelength ʎ, pulse rate r[0,1] and loudness A.

3.) Loudness varies from Amax to Amin. A[0,1].

Micro bats use varying loudness and frequency while their velocity, frequency and position remains fixed. Frequency can be varying corresponding to pulse rate and pulse emitted.

Movement of virtual bats:

For experiment, rules are updated with the frequency feq, position xi and velocity veli in d-dimensional search space. The corresponding updated solutions for SIt and velocity veli tat time step t are represented as:

feqi=feqmin+(feqmax-feqmin)U(0,1)

velit= velit-1+(xit-best)feqi

Sit= Sit-1+ velit

Distribution preferred is random indicated through U[0,1]. Best value availed from U[0,1] is used to find the location of resources used within the job allocation criteria. The following equation is used to calculate current best solution:

snew=sold+EAt

where E [-1,1] is a random number between -1 to 1, and At is used for average loudness of all the bats at time step t. Pseudo code is as under

Obtain Job Sequence(J1,J2,J3,-------,Jn)

Associate Objective Function with Each Job

F(y)={y_1,y_2,-----,y_n}

Define range of BAT in terms frequency(F) and Loudness(A)

Repeat following Steps until i< Max_Iterations

Generate Solutions by adjusting Existing frequency

Update location of BATS in case solution found

If (Optimal_Solution==True)

Select this solution and replace it with existing solution

End of if

Randomize the BATS flying and relocate the resources.

In case optimal solution is located increase pulse rate and decrease loudness(A).

Rank the BATS and sort the solution.

End of loop

5.Output Solution and job Ordering(J)

D. CUCKOO SEARCH ALGORITHM

This algorithm is also nature inspired optimization metaheuristic. It was introduced by Young and Deb in 2009. It gives guarantee for solving many hard real world optimization problems. The main attraction of the [13]cuckoos is reproduction strategy. It is a parasitism in which a cuckoo lays its eggs in the nest of host species. To increase the hatching probability of their own eggs some cuckoo species lay their eggs in other bird's nests and may remove the host bird's eggs.[14] As many host birds do not like intruders and conflict with them. However, the host bird will throw their eggs out or may simply abandon its nest and build a new nest at some other place. This algorithm is a population based global search stochastic[15]. Each egg retains possible solution in cuckoo search algorithm. Simplification of natural systems is required to successfully implement them by computer algorithms because natural systems are complex in nature. Three assumptions to simplify the cuckoo search algorithm is as follows:

1. At a time each cuckoo lays only one egg and can leave this egg in a randomly choosen nest.

2. To maintain the elitist property, the best nest with the highest quality of eggs will make it to the next generations. [16]

3. The number of available host nests to lay eggs is fixed in nature. It's egg can be identified by host bird with a probability paò[0, 1]. The host bird can either throw it away or the host may abandon its own nest and builds a new nest at some other location if they analyse it. [17]

1)Initialize Jobs(J) for Execution along with number of resources available(R), y=0

2)Input number of generations G.

3)Define Objective function F(x).

4)Define initial population in terms of nest

Solution is in terms of eggs which must be assigned with rank examined through fitness values

Repeat while stopping criteria is matched or y<G

Y=y+1

Produce new solution using levy flight of cuckoo

Calculate Fitness value

Select the nest randomly

If (Fi<Fi+1)

Replace current solution with the new solution z

End of if

Asses fitness and sort the solution with maximum fitness value.

End of loop

Produce result in terms of Job Ordering

Existing literature suggest problems of convergence in case job requirements exceeded the available resources. It is possible that convergence never occurs and algorithm terminates without optimal solution.

CONCLUSION

This paper analysis the accompanying issues for scheduling jobs in a parallel computing: 1) locality, 2) synchronization overhead and 3) reasonableness limitations. A few investigations taking care of these issues were presented. In our paper we contemplate diverse scheduling algorithms and furthermore appear there execution evaluation. From the literature clearly there are a few points of interest and confinements in particular requirements. In future work we will centre around having such algorithm that have every one of the benefits of these algorithms and endeavour to limit the confinement of that calculation.

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