Nature Inspired Based Meta-heuristic Techniques for Global Applications

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ABSTRACT

Meta-heuristic techniques are becoming popular tools in some of the recent years and are used and applied in many fields globally. The different algorithms of meta-heuristic are best for optimization and solving problems in very easy format in all the real-world, engineering, mathematics, data science, image processing like area. This paper is a simple review of various nature inspired meta-heuristic techniques in different fields for better optimization.

Keywords:Genetic Algorithm, Particle Swarm Optimization, Variable Neighbourhood Search, Nature Inspired Algorithms, Cloud Computing, Mobile Cloud Computing, Job Scheduling, Health Care System.

1. INTRODUCTION

Meta-heuristics approaches have grown immensely with fast speed in some of the past times as an optimized solution to the real-world in handling simple as well as complex problems [1]. These are capable for handling all the approaches in any typical situation. In other word it became the rocket for those positions where many optimisation mechanisms failed to get satisfactory outcomes [2]. For number of complex optimisation related problems wheather these are handlingdeterministic or nondeterministic polynomial or problems like any simple or complex problems, these becames the only and only one solution [3]. Note that meta-heuristic algorithms are able to handle worse situation and to generate better quality outputs in relatively very small time than some of the traditional optimisation approaches [4]. Meta Heuristics evoluatiobnary approaches are useful to catch all the applications in a global range of real world including planning, finance, scheduling, designing and implementation [5]. Here is a review of number of meta-heuristic techniques with recent approaches and applications applied globally.

Meta-heuristics approaches are also linked with parallel and distributed computing, cloud computing, mobile cloud computing, image processing, artificial intelligence related applications with extra and favourable in engineering, science, mathematics, health care system, mamagement, accounting system, solving real world applications, research area, teaching and learning system, operation research, statistical techniques, solving computer based optimization techniques and gave optimized results compared to previous approaches [6].Itis extensively known as an auspicious approach for the widespread solutions for the coming generations [7]. To solve anycomputing based services in any computing evolutionary approach showing the proper metaheuristics related applicationsas the various categories ofpopulation based meta-heuristicstechniques are categorized [8] and is as shown in figure 1. Here it produces data analysis solutions in various area of different population based metaheuritic techniques in a categorized manner. It become popular subject to the determinationstate of the services and applications that is helpful in any field on the whole globe having any small or big database storage and for the information to any person using this system with easy access in future [9]. This approach is the only possible by linking the

any persons'ssystem with wireless/distributed/cloud/mobile cloudenvironment and also by arranging the data having vital real time information or symptoms or signals having some physiologicalsigns with the assistance of public or private clouds/mobile-cloud data collection based approches through either smart or intelligent computing equipmentsor mobile phones [10].
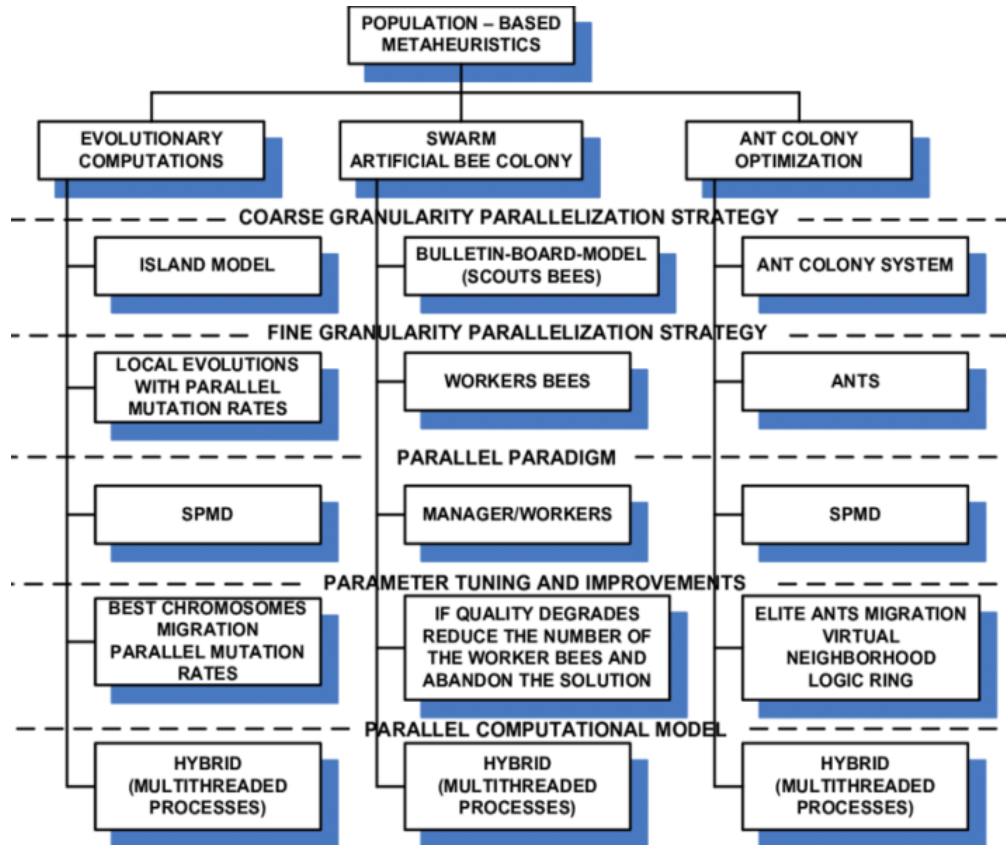

Figure 1.Meta-heuristic classifications globally

Scientists also debated and recognisedsome of smart job scheduling and computing system for solving number of health related, image obtaining, crops investigation like problems in simple format with meta-heuristic mechanisimin distributed, cloud and mobile cloud computing environment [11]. By doing so there is a big improvement in efficiency, computing power,and energy saving [12]. This will optimizes all the scheduling as well as other operations. Major objective of such well-designed schedulingand operating process is to get the timley and easy access for any system [13]. It diminishesworkflow time, waiting time, processing time, matching time extra between the demand and supply for all the resources connected with that particular system [14]. Also particle swarm optimization techniques are the major meta-heursitic technique for optimizing the solution and by doing so can compute the success rate of swarm-based nature-inspired mechanisms. These all problems are related with NP-Hard [15].The assistance of swarm-based algorithms have sharing of information betweennumber of agents to get high efficient solutions[16]. Actually,each swarm individual works and behaves in a combined approach for foraging, reproduction and tasks/resource distribution in simple way [17]. Number of emerging computational mechanismsprogrammed and analyzed the outcomes along with data mining, data warehousing, scheduling and by using internet of things approach that not only influenced the servicesrealted with meta-heuristic applications but they also optimize the problem globally [18]. Manyscholars have used different data mining techniques like SVM, VNS, RFapproachs with soft computing techniques like PSO, GA, ACO, Cuckoo, ABC to

handle and process problems and operations related with meta-heuristic approach globally for better outcomes [19].

2. REVIEW

Igoret et al. explained some of the metaheuristic techniques having aim for solving this type of optimization nonconvex problems by comparing these techniques to each other and as well as also to some of mostly used heuristictechniques like firefly algorithm, artificial bee colony algorithm. Obtained numerical outputs explain about themetaheuristic algorithms that can be applied to solve such problems successfully having 500 constraints maximum. From these algorithms, the modified version of ABC is most efficient with respect to robustness ,the quality of the solution, and the computational efficiency[20]. Manik et al. also discussed a comparision approach of nature inspired meta-heuristic techniques for feature selection in a well mannered way and mechanisms. That is the good explanation of applications of meta-heuristic algorithms [21]. Sharma et al. illustrated the future prospective of nature inspired soft computing in finding psychiatric disorder diagnosis disease in a well format pattern and showed a beautiful example of solving the problem with meta-heuristic methods [22]. Kaur et al.did a survey on some of the popular nature inspired computing techniques to find the fatal disease diagnosis in a systematic way and showed the proper explanation of use and applications of metaheuristic techniques [23]. Samriti et al. discussed a chaotic and stressed environment for COVID 19 showing suspected, infected and some of the people related with this crises in India by using these global occurring problem on a database analysis approach that is the proper use and explantion of meta-heursitic techniques in such cases [24]. Rajinderet al. also used the applications of soft computing in finding and explaining an advanced conceptual diagnostic healthcare framework for diabetes and cardiovascular disorders that shows the global applications of these approaches [25]. Prableen et al. analysied and reviewed the soft computing appplications with data miningapproaches in prospecting some of the diabetes disorder in human beings. This is another parameter for explaining the concept of meta-heuristic algorithms globally [26]. Gautam et al. showed the prevalence and diagnosis of neurological disorders using various metaheuristicdeep learning techniques that not only explained the concept of metaheuristic approaches but also show the use of these globally [27]. Singh et al. discussed some of the popular meta heuristic algorithm with hybrid approach using Genetic algorithm with Firefly algorithm to create a clinical decision support system for designing a good query optimizer which is the appropriate use of the meta-heuristic application in the global field [28]. Sharma et al. also analysied a decision support system with some queries and solve these queries in a well established way by using the popular meta-heuristic method naming genetic algorithm that is again the best example of the global utilization and applications of meta- heuristic approaches [29]. Singh et al. reviewed various cost-effective distributed some of the query optimizers that is the well explanation of the proper use of the metahuristic techniques in a simple format and is the best example for global utilization and applications of these approaches [30]. Sharma et al. well explained the working model and role of the Genetic Algorithm that is a famous meta-heuristic approach in the field of computer science that also explain the utilization of metaheuristic applications globally [31]. Singh and Singh et al. designed an ontology based framework having NLP approach with Genetic Algorithm for data mining online and is again a well formed explanation of metaheuristicbased applications on the globe [32]. Begur et al. developed a simple optimized Decision Support System to solve scheduling problems using meta-heuristics techniques that helps to physician for fulfillment of specified needs [33]. Thompson et al. designeda very efficient CBIP system for managing health services with the help of multi meta-heuristic approaches [34].

Fikar et al. studied an overview of routing and scheduling methods with the help of nature inspired evolutionary algorithms that is best optimized output [35]. Othman et al. desined and approved an optimized simple DSS for helping and managing all the physicians in healthcare services with soft computing approach for better job scheduling in dynamic multi-agent systems [36]. Barg-Walkow et al. designed a complex to simple model for handling the complex healthcare systems with meta heuristic approach that helps in decision making and controlling the system in awell mannered way [37]. Abdelaziz et al. discussed a particle swarm based optimized multi heuristic technique in the field of health care services with cloud computing environment that deals with the virtual machines for selections purposes and also make an improvementto get a better performance in all the health based services [38]. Abdelaziz et al. designed an intelligent and smart health care using evolutionary techniques having hybrid approaches with Genetic Algorith and Particle Swarm Optimization parallellyin a distributed cloud environment [39]. Islam et al. well explained an evolutionary nature-inspiredmechansism dealing with virtual computing machines for migration of data in heterogeneous cloud computing and mobile cloud computing environment to deal all the healthcare services smartly in various cities of the particular country [40]. Elhoseny et al. developed a novel optimized and systemized model using genetic algorithm for the approval and proper working of machines withPSO in cloud and IoT based system for efficiently handling and managingthe big data in the field of healthcare and its services [41]. Marynissen et al. reviewed a literature on multi-appointment health based services for the appropriate working of healthcare system and job scheduling ofdocters and patients using evolutionary algorithms [42]. Moreira et al. applied a Particle swarm optimization based approach for the inspiration of evolutrionary system for improving the computational cost with the help of ANN based electronic health care services [43]. Samantaet al. designed a new approved nature-inspired systematic evolutionary model in a simulation way to improve the biomedical services and maintain of doctors and patients records with the help of GA [44]. Zhang et al. studied and investigated the comprehensive PSO mechanism by comparing some of the traditional nature-inspired and soft corner evolutionary approaches to geta multi-objective model in various fields of research [45]. Liu et al. designed a new model with PSO approach for the improvement of traditional clusteringsystem and improving its efficiency in real time environment [46]. Gautam et al. discussed the uses and performance of ACO, ABC, GSO, FAand ALO techniques in finding different stages and typesof cancer and diabetes patients [47].

3. CONCLUSION

In this paper, all the nature inspired evolutionary meta heuristics methods are discussed for solving different applications in the real world and at global level to handle job/tasks scheduling in distributed computing, cloud and mobile cloud computing system. For handling number of problems related with the job scheduling, an analysis of all the soft computing systems wereevalulated using many nature-inspired evolutionary meta-heuristics mechanisms for optimized outcomes.

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