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Introduction to Hybrid algorithms

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Abstract: *Algorithms are the building blocks of the systems industry created by human civilization. From automation to a wide range of simple tasks to predicting values from existing databases visually patterns, algorithms are found almost everywhere. We have successfully created solutions to some of the most complex problems with using algorithms. However, there is still a category of problems that can be solved by the user information. Hybrid algorithms deal with certain types of problems. Hybrid algorithms play an important role in improving search engine algorithms. Consolidation aims to combine the benefits of each algorithm to build a hybrid algorithm, while at the same time trying minimize any major damage. In general, the effect of hybridization can often do something improvement depending on the speed of calculation or accuracy. This chapter considers the concepts, types, and motives behind the existence of a mixture algorithms. Types of integrated algorithms, description of each type, different categories as well segmentation algorithms are the main topics of discussion in this chapter.*

Keywords: Hybrid Algorithm

I. INTRODUCTION

Evolutionary statistics have become an important means of resolving problems among many researchers. The process of group learning, adaptability, and resilience are some of the key factors evolutionary algorithms when compared to other globalization strategies. Although evolution computer is widely accepted in solving a few key applications in engineering, business, commerce, etc., but in practice it sometimes brings only minimal performance. That's not right selection of various parameters, representation, etc. it is often blamed.

The behavior of the evolutionary algorithm is determined by the exploitation and experimental relationships maintained throughout to run. All of this clearly indicates the need for a mixed evolutionary approach to which the great work is to be done improve the performance of a straightforward evolutionary method. Hybrid algorithms have two or more algorithms run together to complement each other to form meaningful relationships in their integration.

1.1 What is Hybrid Algorithms?

Hybrid algorithms play a prominent role in improving the search capability of algorithms. Hybridization aims to combine the advantages of each algorithm to form a hybrid algorithm, while simultaneously trying to minimize any substantial disadvantage. In general, the outcome of hybridization can usually make some improvements in terms of either computational speed or accuracy. This chapter surveys recent advances in the area of hybridizing different algorithms. Based on this survey, some crucial recommendations are suggested for further development of hybrid algorithms.

A. The Past

Evolutionary algorithms (EAs) are robust global developers that mimic the theory of biological evolution. They are almost always algorithms based on the number of people who learned from previous searches through this group people or agents. These algorithms tend to have behaviors that are motivated by social or biological behaviour natural earth. Frankly speaking, there are three categories of EAs, namely

1 Evolutionary Programming (EP)
2 Evolutionary Strategies (ES)
3 Genetic Algorithms (GA)

These algorithms were among the first to offer great advantages in terms of locating the global optimality in vast and complex search spaces, especially when gradient information is unavailable. The implementation of the se algorithms are relatively straightforward and easy, based upon simple and easy to understand concepts . They are also reasonably flexible as parameters can be changed easily for better performance.

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There were many mixed or different algorithms about different evolutionary algorithms. However, Key problems such as a small reunion or premature reunion still exists. Moreover, these algorithms can be it is computer-generated and requires a lot of repetition for very complex problems.

B. The Present

Current developments usually provide some development based on the broader development of the past few for decades, and researchers are still actively developing new algorithms. For example, Rodriguez et al. developed a metaheuristic blend mixed with EA and Simulated Annealing (SA). In their review, they found that there were about 312 books identified by the ISI Web of Science using the EA and SA algorithms. Ngu by comparison, there were only 123 books including EA and other metaheuristics such as greedy search, repeated location searches, drop-down listings, and random search. However, a study by Rodriguez et al was limited EA and South African methods.

In current literature, hybrid algorithms appear to have been widely developed. Using Particle Swarm Development (PSO) for example, a combination of PSO and other search techniques helps to make it look like very effective in improving its performance. Genetic algorithm hybrids (or the use of other genes ways) are the most widely read. Genetic operators such as selection, crossover, and conversion are included in the PSO to produce better candidates. Unique evolution, ant colonial development and common the search strategies used to integrate with the PSO.

In addition, to avoid getting pre-discovered solutions, techniques such as deviation, drawing, retraction, sorting, and disposal methods have also been used in hybrid PSO algorithms. Some operators inspired by biology such as niche and specification were introduced to the PSO to prevent collisions. from overcrowding to getting as many good solutions as possible. A collection of cellular particles and performance, when the automated mobile device is integrated into the speed update for adjustment particle trajectories, proposed in.

The PSO is just one example, with other mixed algorithms regarding the emergence of differences and simulations. imitations are also widely studied. Current styles seem to be a combination of a new / well-established standard algorithms. For example, a new eagle strategy has been integrated with various variables and developed performance achieved.

C. The Future

Many new algorithms have been developed in recent years. For example, algorithms are bio-inspired as Artificial Bee Colony Algorithm (ABC), Bat Algorithm (BA), Cuckoo Search (CS), Fire fly Algorithm (FA), Flower Pollination Algorithm (FPA), Glowworm Swarm Algorithm (GlowSA), Hunting Search Algorithm (HSA), Eagle Strategy (ES), Roach Infestation Optimization (RIO), Gravitational Search Algorithm (GravSA), Artificial Fish School Algorithm (AFS), Bacterial Evolutionary Algorithm (BEA), Artificial Plant Development Algorithm (APO), Krill Herd Algorithm (KHA) and others.

The list is growing rapidly. These algorithms may have businesses and specific features of the novels mixing to be available in the near future. However, it is worth pointing out that it is easy, random mixing should not be encouraged.

Research efforts should focus on innovative, intelligent and effective new approaches. New strategies and methods should be based on mathematical theory and intelligent analysis of key processes in algorithms for innovation algorithms can really provide effective solutions to major problems - scale, real-world applications.

1.2. Why Hybrid Algorithms?

Improvements are needed in various fields of engineering in order to find the best solutions. Solving to do well problems with almost other functional, effective calculation algorithms are very important. The main purpose of the problem of efficiency to find a complete solution to a major problem. Development problem I clearly based on factors: first they address other goals of reduction and expansion, secondly, a set of unknown variables that are involved in objective activities and thirdly, a set of parameters that allow anonymity to take certain values but do not include others.

Choosing a method of improvement is very important as many performance issues may be more than that one local solution. The upgrade method should not be greedy and the search process will not be localized in place of the best solution as we may stick to a local solution and that will mislead the search process. The development algorithm should create a balance between land and local search. Problems with a large search area or complex complex by nature will be difficult to solve using standard techniques.

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II. A HEURISTIC METHOD

Heuristic, or heuristic technique, is any problem-solving technique that uses a practical or varied approach. shortcuts to produce solutions that may not be good but enough when given the time limit or deadline. It can be recognized as a solution, learning or problem solving using practical methods finally get results that are much closer than direct results. Heuristics can lead to bad decisions based on a set of limited data, but the speed of decisions can sometimes fix bad things. Heuristics can be defined as problem-based algorithms, i.e. are developed or familiar with the details of a particular performance problem or problem model.

2.1 Popular Heuristic Algorithm

Optimization heuristics can be divided into two broad categories depending on the nature of the solution edited:

A. Construction Methods

The greedy algorithm works in stages, where the algorithm makes the right choice for each step as it tries to find the perfect way to solve every problem. It is a method used to solve the famous "traveling merchant problem "when the following is:" For each step of the trip, visit a nearby place an uninhabited city.
Example: - Scheduling Problems

B. Local Search Methods

Local Search method follows the recurring method where we start with the first solution, check location of the current solution, and instead of the current solution with a better solution. In this way, the "mobile Merchant problem "will follow heuristic when the solution is a cycle that contains all graph nodes and policy to reduce the length of the cycle.
In general, heuristics conducts systematic testing, although it uses stochastic features. Use of Heuristics this goal is to provide faster, not more accurate (i.e., not the best) number development solutions problems. In addition, heuristics is often greedy to offer quick fixes but to cling to local beauty and failures to get the best in the world.

C. Genetic Algorithms

The term Genetic Algorithm was first used by John Holland. They are designed to mimic Darwin's theory of evolution, which means that living things evolved to produce complex organisms and adapt to life on Earth. Genetic algorithms work on character structures, such as biological structures, that change over time according to the survival plan of the most powerful through informal but systematic information exchange. Therefore, for all generations, a new set of strings was built, using parts of the strong members of the old set. The algorithm is terminated when a satisfactory qualification level is reached for more or less people generation reached.

2.2 A Meta Heuristic Method

Meta heuristics can be defined as problem-independent, general-purpose optimization algorithms. They apply to a wide range of problems and problem instances. The term meta describes the higher-level general methodology, which is utilized to guide the underlying heuristic strategy.
The meta heuristic method is a repetitive production process for resolving low heuristic combinations different concepts of ingenuity to explore and apply the search space, learning strategies are used in it edit the information to find the nearest and correct solutions.
Therefore, they do not use any problem specification and, therefore, can be used as black boxes. Generally, they are not greedy. In fact, they may even accept a temporary setback in solution allows them to explore the solution space and thus find a better solution hopefully.

2.3 A Hyper Heuristic Method

Hyper-heuristics represents a novel search method inspired by the principle of automation process to select or integrate simple heuristics to solve complex search problems. Extension of the first hyper-heuristic idea to produce new heuristic ones not yet known. These methods work in the search field for heuristics rather than directly in the search engine solution

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the basic problem which is with the extensive use of meta-heuristics. We use hyper-heuristics, trying to find the right approach or sequence of heuristics in a particular situation. rather than trying to solve the problem directly. Indeed, we use hyper-heuristic methods, seeking a standard method that works instead of solving a single problem. Hyper-heuristic methods are intended be standard methods, which should produce acceptable quality solutions for a set of problems.

A. Classification of Approaches

Hyper-heuristic methods to date can be divided into two main categories. In the first class, taken by the phrase heuristics to choose heuristics. The hyper-heuristic framework is provided by a set of pre-existents, a well-known heuristic to solve a specific problem. The task is to find a good sequence of applications of these heuristics to effectively solve the problem. At each stage of the decision, heuristic is selected by a component called the selection method and applied to the existing solution. The solution generated from the selected heuristic application is accepted / rejected on the basis of another component called condition of acceptance. Rejecting a solution means that we are discarded as soon as the acceptance of ads in replacement of existing solution.

In the second class, heuristics is to produce heuristics, the main idea is to "transform new heuristics through of parts of known heuristics. "The process requires, as in the first class of hyper-heuristics, selecting the appropriate set of heuristics that is known to be helpful in solving a specific problem. However, instead to provide these directly to the framework, heuristics began to decompose into its basic components.

The two main types can be classified according to whether they are constructive or not disturbing search. Additional orthogonal classification of hyper-heuristics takes into account the source provided feedback during the learning process, which can be a single example (online learning) or multiple scenarios root learning problem (offline reading).

B. Methodologies to Choose Heuristics

Discover good combinations of fixed, human-designed, well-known low-level heuristics.

- Based on constructive heuristics.
- Based on peturbative heuristics.

Methodologies to generate heuristics generate new heuristic methods using basic components of previously existing heuristic methods.

- Based on basic component of constriuctive heuristics.
- Based on basic component of peturbative heuristics.

C. On-line Learning Hyper Heuristics

Learning occurs when the algorithm solves the occurrence of a problem, therefore, a work-based environment buildings can be used as a high level strategy to determine the appropriate heuristic low level to be used. Examples of online learning strategies within hyper-heuristics are: the use of reinforcement learning in heuristic selection, and often the use of metaheuristics as a top search strategy in the field of heuristics.

D. Off-line Learning Hyper Heuristic

The idea is to gather information in the form of rules or programs, from a set of training conditions, that may be possible hopefully they will get used to the process of resolving unseen situations. Examples of offline learning methods within hyper-heuristics are: classification system systems, basic thinking and genetic systems.

III. MOTIVATIONS FOR HYBRIDIZATION

In a hybrid algorithm, two or more algorithms work together to solve a problem that has been described. other hybrids, one algorithm may be included as a sub-algorithm to obtain parallel parameters algorithm, while in some cases, different components of such conversion and crossover algorithms are used to develop another algorithm in a mixed structure. In this case, hybrid algorithms can be freely divided into two categories:

1 Unified purpose hybrids Under this section, all sub-algorithms are used to solve the same problem directly; as well as various algorithms used in non-target search categories. The mixture metaheuristic algorithms with local

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search are rare examples. Global search checks the search space, while local search is used to filter sites that may contain the best content in the world.

2 Multiple purpose hybrids One main algorithm is used to solve the problem, while a sub-algorithm is used to define the parameters of the main algorithm. For example, the PSO can be used to determine the total conversion rate of GAs. With this, the PSO does not solve the problem, but helps to find better solutions by searching for the right parameter for better performance. Hyper-heuristic algorithms can be considered as a form of mixed methods. In hyper-heuristic methods, parameters are selected (with the algorithm below or in the study mode)

IV. TAXONOMY OF HYBRID ALGORITHMS

The principle of general taxonomy is to provide a way to allow comparisons of algorithms integrated into a quality method. It is hoped that the categories and their relationships with each other are carefully selected enough to indicate areas that require future work and to help classify future work. Among the existing taxonomy in some domains, one can find examples of flat and sequential separation systems. taxonomy can be used to advantage to distinguish any hybrid efficiency algorithm. Metaheuristics is a conventional heuristics applies to major development problems.
Generally speaking, hybrid algorithms can be grouped into two categories.

4.1 Collaborative Hybrids

This involves a combination of two or more algorithms that work in sequence or in sequence. The contributing weight of each participating algorithm can be taken as a fraction and a half in the simplest case.

A. Multi-Stage

There are two categories involved in this case. The first algorithm works as a global optimizer while the second algorithm performs a local search. The first algorithm is able to test the search a place in the world to find a promising meeting place. Then the second algorithm will do the depth local searches such as hill climbs and easy descent routes. A challenging problem with such use the system is to know when to switch to the second algorithm. Measures such as diversity should be included to assist in the issue of change. The latter applies to the Genetic Algorithm used as a global algorithm (first algorithm), with Particle Swarm Optimization (PSO) as local detector (second algorithm).

B. Sequential

In this structure, both algorithms are used separately until one integration process is met. For convenience, both algorithms will be used with the same number of repetitions before moving on to the next algorithm.

C. Parallel

Two algorithms are used simultaneously, using the same number of people. One of the algorithms may be applied to the previously specified percentage of the algorithm.

4.2 Interactive Hybrid

In this feature, a single algorithm is considered to be subordinate, embedded in the master metaheuristic. At this stage, the contributing weight of the second algorithm is estimated at 10-20%. This involves the installation of a deceptive user from the second algorithm to the main algorithm. For example, many algorithms have used a variable operator from GA to PSO, which has resulted in what is called Genetic PSO or Mutated PSO. Some may include gradient techniques such as hill climbs, steep descents, and Newton -Raphson in the main algorithm. There are two possible approaches :

1 Full Manipulation: All demographics are used regularly .This function can be combined with existing source code, usually as subroutine / sub function.

2 Partial Manipulation: In this deception, only a fraction of the total population is accelerated using local search methods such as gradient methods. Choosing the right component and the right candidate to accelerate poses a major challenge in ensuring the success of this hybrid structure.

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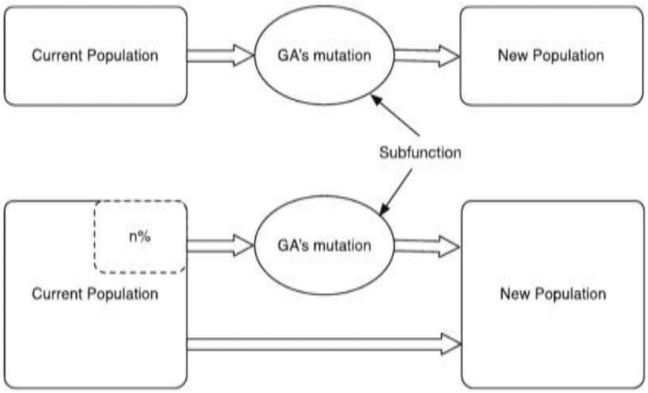

4.2 Disadvantage of Hybrid Algorithms

Although hybrid algorithms offers great advantage of increasing the diversity in a population and hence enhancing the search capability of the developed hybrid algorithm, some drawbacks do exist, which will be discussed in the following subsections.

A. Naming Convention

The inclusion of another algorithm often leads to naming problems. Some researchers accept a very different approach names from their integrated algorithms. For example, the GAAPI algorithm is a summary of Hybrid Ant Colony-Genetic Algorithm, which confuses some researchers. A hybrid name like HPSO-BFGS appears to be a stressful summary, hard to read. The interoperable nature of the hybrid algorithm seems to create complexity words. For example, it may be interesting to compare the terms Hybrid GA-PSO (co-operative) with Mutated PSO (integrated), although two hybrids combining GA and PSO.

B. Complexity of Hybrid Algorithms

Depending on the structure of the algorithm, the hybridization process often creates additional components throughout hybrid algorithm architecture .This increases the complexity of the hybrid algorithm .Because of the complexity structure, algorithms are complex combinations that must be accepted by researchers. In the books, two popular hybrid algorithms are the Hybrid Taguchi-Genetic Algorithm and the Hybrid Genetic Algorithm, both were published in 2004. From the quote, it seems to have been well received. It is interesting to note that both algorithms fall into a combination of mixed algorithms, with simple taxonomy / structures.

C. Computational Speed

In many systems, hybrid algorithms appear to improve results in terms of compliance speed and completeness. accuracy. However, these aggregation graphs are usually sorted according to the degree of multiplication. This means that rapid mixing does not mean the actual level of mixing because the mixture usually uses a high amount of multiplication(internal or vague). For example, in a combination (sequential) a mixed algorithm such as GA -PSO, cycle, or single duplicates include GA and PSO. For good comparison, this should be considered two cycles instead of one on the merge graph. To avoid this problem, final performance should be used as a metaphor by comparing mixed algorithms with non-hybrid algorithms. Besides, due to the very complex structures in Hybrid algorithms, overhead appear close to its weight, often unavoidable.

This affects the overall performance and thus reduces its durability. The time spent with overheads should be taken into account for proper comparison. Also, this is possible by recording the actual number of repetitions taken to achieve the predetermined direction, although the complexity of time must be compared again.

There are other problems associated with hybrid algorithms. For example, many hybrid algorithms will add the number of parameters in the algorithms, making it difficult to adjust their parameters. In addition, the the complex structure of the hybrid often makes it difficult to analyze, and thus we gain little understanding of reasons why such hybrids work. In

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addition, hybrid algorithms are very difficult to perform, and thus very prone in errors. Therefore, caution should be exercised when interpreting results from integrated algorithms.

V. RECOMMENDATIONS FOR FUTURE DEVLOPMENTS

Based on the above analysis and observations we can highlight some insights for future developments:

1. Simpler Algorithms are preferred than more complex algorithms. Algorithms should be made as simple as possible. People tend to use a robust algorithm that has simple architecture for the ease of implementation and is yet efficiemt to be useful to real world applications.
2. Shorter names are much preferred in the scientific community.
3. New hybrids should have a clear structure that is easy to use. Any combination should they are based on clear thinking, novel feature and clever methods that can produce better hybrids over time.

VI. CONCLUSION

In this chapter, we review various algorithms and investigate the causes of their development. We and categorized these algorithms, based on hybridization techniques. In addition, some barriers to hybridization has been discussed. The latest examples of hybrid algorithm from the literature are presented, in brief a summary of some of the remaining applications. Finally, some suggestions were suggested that it could be is useful for future development of integrated algorithms.

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