International Academic Institute for Science and Technology

International Academic Journal of Science and Engineering
Vol. 4, No. 1, 2017, pp.190-195.
ISSN 2454-3896

International Academic Journal of Science and Engineering

www.iaiest.com

Review local search algorithms in artificial intelligence

Mansour Jouya [a], Seyran Khayati [b]

[a] *Computer Engineering Department, Urmia University, Urmia, Iran.*

[b] *Computer Engineering Department, Urmia University, Sanandaj, Iran.*

Abstract

Find the best path for solving problems that can be very useful Effective decision-making is very important. That's why many long research on optimization Using different algorithms, artificial intelligence has taken place. This paper introduces a variety of local search algorithms Artificial intelligence is part of that discussion, we have discussed.

Keywords: local search, problem solving, artificial intelligence, optimization, solve problems

Introduction:

In computer science, a routine computational algorithms are well defined, a series of amounts received as input After the calculation, The input to the output. An algorithm for solving computational problems are defined [1] [2][3]. Local search algorithms belonging to the late 20th century in the former Soviet Union. They were the pioneers of this process And the theory of algebraic algorithms has raised local. in West, Studies first conducted mainly salesman problem and then these ideas to the problems of accommodation, Networking and Other issues have emerged. They are making the best sequence of local algorithms, Random search and Local optimization and Find a randomized controlled have provided [4]. Local Search A meta-heuristic method of computing for solving hard optimization problems Things that can the solution for maximizing a criterion Among a number Solutions are used. Local search algorithms from one solution to another solution in the space ahead of solutions (the search space) With limited changes move Until a satisfactory solution is found or a time elapse [5]. These algorithms on issues that independent the cost of the course is appropriate. What is important, Mode is the solution. Family of local

search algorithms Includes methods are the statistical physics (gradual cooling) And evolutionary biology (genetic algorithms, etc.) Inspiring them [6].

Local search algorithm:

Local search algorithms are generally only Moved and neighboring states Based on a single mode Instead of several track actions. For example, local search algorithms are not a system but uses very little memory and Rational responses in large state spaces found that Usually the space algorithms are implemented. Local search algorithms for optimization problems appropriately .To Local search algorithms better understand the Consider the spatial vision. As shown in (Figure 1) a landscape that Both the location and Too tall to be included. If the volume-related Costs, the goal is to find the lowest valley and If the volume-related the objective function is the goal, find the highest point. Local search algorithms to find this landscape [7].

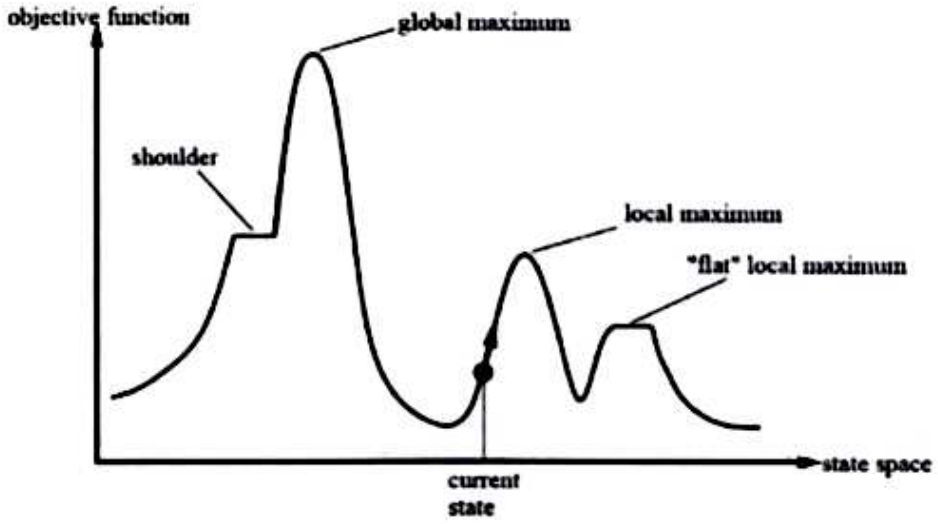


Figure 1. The spatial vision of the local search algorithm

The hill-climbing algorithm

Hill-climbing algorithm is a method of local search algorithms. Hill-climbing algorithm for Find the most appropriate and the best answer for It will be used. [7] in the hill-climbing algorithm is that the answer to Randomly for It is produced and Then, in a loop until Stop condition is not established algorithm to Repeatedly for a number of neighbor the current state of production [8]. Among neighboring states to select their best Will replace the current mode. The disadvantage of this method is stopped after reaching the ring the first large amount of local. Hill-climbing algorithm in Figure 2 can be seen. Examples that for hill-climbing algorithm can be expressed, the 8 minister Is a traveling salesman [9].

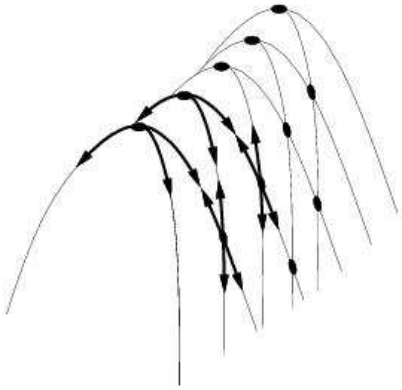


Figure 2. hill-climbing algorithm

Local beam search algorithm

Local beam search algorithm based on searching for hill climbing is another way in solving the problems of power a lot more than Find hill climbing is great. In contrast hill climbing answer to the first k It's produced [10]. Then Each of the K state has produced its neighbors and of all the neighbor's K to choose the best neighbors we the process to achieve Stop condition continues. Even though Local beam search algorithm is more efficient compared with hill-climbing algorithm, however both of these methods are not immune from exposure to the local optimality [11].

Heat-simulation algorithm

The thermal simulation algorithm first start of an answer and Then, in a loop Moves neighbor answers, and if a neighbor is better than the current answer, it's algorithm Current answer puts as otherwise, the answer to the algorithm Accepts the current answer. Thermal simulation algorithm for solving a meta-heuristic algorithm is simple. The origin of these algorithms work by Patrick Kearney and Colleagues [12].

Genetic Algorithm

When other local search algorithms are a genetic algorithm, genetic algorithm As a random optimization method known This discovery is sometimes called met heuristic. In general, the genetic algorithm for Production of useful solutions for Optimization Find the used stuff. This algorithm is inspired by nature, such as inheritance, mutation, selection and ... The basic idea of genetic algorithms inherited by genes such as human transmission characteristics (as in Figure 3) By chromosomes him the next generation will be moved. Each gene on this chromosome is a property representative. If the chromosome All the next generation will transfer all features of the next generation like Properties will be the last generation [13].

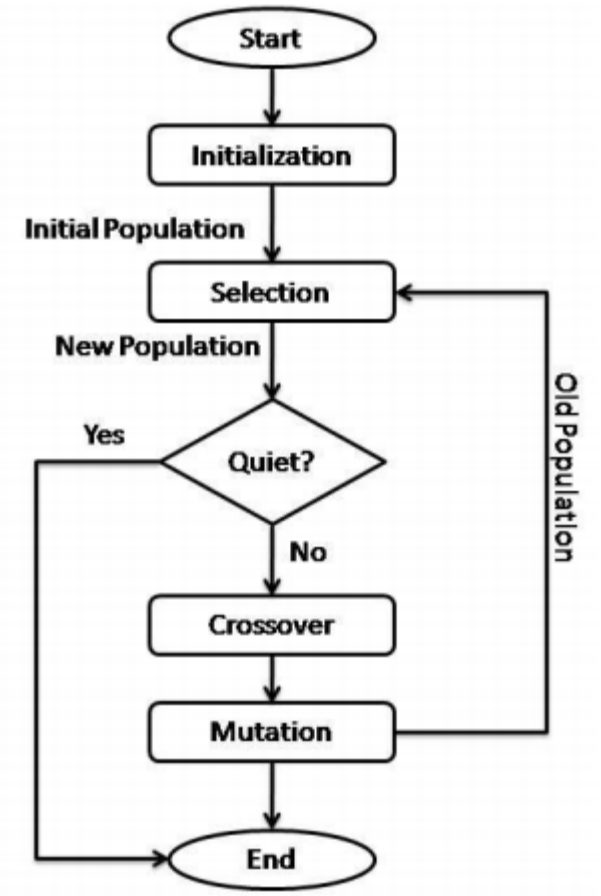


Figure 3 - Block diagram of the implementation of Genetic Algorithm

Discussion and Conclusion

Ant Colony Algorithm

Another local search algorithm ant algorithm, this algorithm derived from nature Live ants. Using this algorithm finds the optimal path between the source and Flights from using the principle of consensus and Possibility [14]. ants walking from the trace of chemical pheromones to Leave that It rejected as ants on the ground in the short term remains [15]. When choosing between two paths they choose that path as possibilities in other words, more ants have more chemicals or have already crossed it [16].

Compare algorithms

Algorithms	Advantage	Flaw
Hill-climbing	It is suitable for small algorithms.	After reaching the stop ring the first large

algorithm		amount of local.
Local beam search algorithm	More power than Find hill climbing is great.	Find consumes too much memory space in linseed may be before the answer is to be filled memory.
Heat-simulation algorithm	Very low memory consumption and it is easier to implement and usually find acceptable solutions and also because of the random process guided its ability to transition from local optimum.	Highly dependent on the initial value of the parameter and If you select the wrong amount for the initial temperature parameter, the Most likely stuck in local optima.
Genetic Algorithm	Answers are always more acceptable than to find other algorithms.	High memory usage.
Ant Colony Algorithm	Probability Event Ants may find the shortest route as well as high speed.	High memory usage.

References:

1. Weatherwax, John L. "Solution Manual for: Introduction to ALGORITHMS by T. Cormen, C. Leiserson, and R. Rivest." (2016).
2. Mehdi Mafi, “Integration of Mesh WLAN and WiMAX Networks Applied in Telemedicine services to Transfer Fixed and Mobile User`s Data,” *Second Conference on Telemedicine, Tehran*, Iran, Jun. 2014.
3. Mehdi Mafi, Habib Azizi, Hamidreza Yazdizadeh Alborz, “A new Model of Free Global Positioning System using Triple DME,” *International Research Journal of Engineering and Technology*, vol. 4, issue 8, Aug. 2017.
4. Brunato, Mauro, and Roberto Battiti. "Corso (collaborative reactive search optimization): Blending combinatorial and continuous local search." *Informatica* 27.2 (2016): 299-322.
5. Mengshoel, Ole J., Youssef Ahres, and Tong Yu. "Markov Chain Analysis of Noise and Restart in Stochastic Local Search." *Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence (IJCAI-16)*. 2016.
6. Jones, M. Tim. *Artificial Intelligence: A Systems Approach: A Systems Approach*. Jones & Bartlett Learning, 2015.
7. Russell, Stuart, and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Pearson Higher Ed, 2016.
8. Mehdi Mafi, Harold Martin, Malek Adjouadi, “HIGH IMPULSE NOISE INTENSITY REMOVAL IN MRI IMAGES”, *IEEE Signal Processing in Medicine and Biology Symposium (SPMB17),*” Philadelphia, USA, Dec. 2017.

9. Burke, Edmund K., and Yuri Bykov. "The late acceptance Hill-Climbing heuristic." *European Journal of Operational Research* 258.1 (2017): 70-78.
10. Reza Sarraf Shirazi, Mehdi Mafi, Habib Azizi, "A Low Noise PLL Frequency Synthesizer in 2.4 GHz with 1MHz Frequency Step," *International Organization of Scientific Research Journal of Engineering*, vol. 2, issue 8, 2012, pp. 196-200.
11. Zor, Cemre, et al. "BeamECOC: a local search for the optimization of the ECOC matrix." ICPR, 2016.
12. Chiou, Hong-Wen, and Yu-Min Lee. "Thermal Simulation for Two-Phase Liquid Cooling 3D-ICs." *Journal of Computer and Communications* 4.15 (2016): 33.
13. Maheshwari, Ankit, Richa Garg, and Er Naveen Sharma. "A Review Paper on Brief Introduction of Genetic Algorithm." (2016).
14. Rao, Divyanshu, and Sapna Rai. "Ant Colony Optimization Algorithm for Improving Efficiency of Canny Edge Detection Technique for Images." (2016).
15. Mehdi Mafi, "Integration of Mobile Ad hoc and WIMAX Networks with Approach of Admission Control and Hand off Combination Applied in Telemedicine Services," *American Journal of Scientific Research*, vol. 83, 2012, pp. 14-24.
16. Karakida, Ryo, Masato Okada, and Shun-ichi Amari. "Adaptive Natural Gradient Learning Algorithms for Unnormalized Statistical Models." *International Conference on Artificial Neural Networks*. Springer International Publishing, 2016.