Parallel Metaheuristic
Towards Balancing Intensification and Diversification

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Abstract: With the development of complex, high dimensional and highly constrained optimization problems mainly arising from real applications the use of metaheuristic algorithms become popular. Metaheuristic algorithm is can be defined as a procedure that uses the structure of the considered problem in the best way possible in order to find a solution of reasonably good quality in a reasonable computing time as possible. The algorithms usually start with random or pseudo-random solutions which will be updated through iteration using different updating mechanisms. The two basic search components of the search are exploration, also called diversification, and exploitation also called intensification or local search. Diversification is a search mechanism of searching unexplored area whereas intensification is a neighbourhood search in the neighbourhood of the already explored promising area. The performance of a metaheuristic algorithms depends on how these search behaviours are balanced. The diversification is very important to escape from local solution, however, extreme diversification may result in a bad approximate solution. Intensification is a search mechanism which tries to improve the solution found by searching its neighbourhood. This search mechanism is very important to archive a good approximation of the solution but high focus on intensification may result in the solution to be trapped in a local solution. Hence, a good balance between the two search mechanism needs to be archived. The intensification and diversification of a metaheuristic algorithm basically done in the following two ways in addition to increasing the number of initial solutions: 1) using different operators, this is when the algorithm has an exploration and exploitation operator. In this case by increasing the operators' execution of a particular search behaviour the balance of the two search mechanisms can be tuned. 2) by using algorithm parameters. This is when by adjusting the parameters the degree of exploration and exploitation can be adjusted. For either case, a parallel implementation or model can be introduced where different processors use a specific balance of the two search mechanisms. Hence, in this presentation, a parallel model of metaheuristic algorithms towards adjusting the search behaviour will be presented along with a case study on selected metaheuristic algorithms.

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