

2.3.3 Abilities and limitation of ABC

The abilities of ABC algorithm may possibly include the following (Rao et al, 2008; Karaboga N., 2009; Benala et al, 2009; Akay and Karaboga, 2010; Karaboga D. and Akay, 2009; Rao and Pawar, 2010; Akay and Karaboga, 2009):

- i. ABC algorithm does not need external parameters such as cross over rate and mutation rate as in GA and DE.
- ii. ABC algorithm introduces neighbourhood source production mechanism which is the same as mutation process.
- iii. ABC algorithm has less computation time required and offered optimal solution due to its excellent global and local search capability.
- iv. the probability of falling into the local optimum is low in ABC algorithm because of the combination of local and global search.
- v. ABC algorithm only employs fewer control parameters.
- vi. the convergence rate of ABC algorithm is very high and only requires a little iteration for convergence to the optimal solution.
- vii. ABC algorithm combines both stochastic selection scheme and greedy selection scheme.
- viii. ABC algorithm does not need big number of colony size to solve optimization problems with high dimensions.

The limitations of ABC may perhaps include the following (Kurban and Besdok, 2009; Pei et al, 2009; Saeedi et al, 2009):

- i. slow convergence rate.
- ii. the artificial bee, can only move straight to one of the nectar sources of those are discovered by the employed bees.
- iii. the number of tunable parameters it employs.

2.4 Previous research on ABC algorithm in various domain

ABC is a recent swarm based intelligent algorithm that has been applied in various applications to solve numerous problems and the performance of ABC proved that it is an excellent algorithm. This is confirmed by a number of researches that has successfully implemented ABC in different domain and problems.

In the domain of electrical and network-based, ABC algorithm has been used to solve network configuration problem in distribution system (Rao et al, 2008). The experiments results obtained showed that ABC outperforms the GA, differential evolution (DE) and SA in terms of quality of the solution and computation effectiveness. The authors stated that the advantages of ABC are it does not need external parameters such as cross over rate and mutation rate as in GA and DE. Moreover, ABC algorithm introduces neighborhood source production mechanism which is the same as mutation process. In a research by Karaboga et al. (2010), ABC has been proposed as a hierarchical clustering approach for wireless sensor networks to maintain energy reduction of the network in lowest amount. From the results, it showed that ABC algorithm outperformed over direct transmission and LEACH algorithm. Also, ABC algorithm seems to be a promising solution for successful operations in cluster based. In the research of Abu-Mouti and El-Hawary (2009), the authors positive that ABC algorithm has excellent solution quality and convergence characteristics. In the experiments, ABC has been used to minimize total system real power loss for determining the optimal size, location and power factor for a distributed generation (DG). The efficiency of ABC algorithm is confirmed where the standard deviation of the attained results for 30 independent runs at every test case is practically equivalent to zero.

In the domain of signal processing, ABC algorithm was implemented for designing digital IIR filters and its performance is compared with conventional optimization algorithm (LSQ-nonlin) and PSO (Karaboga, 2009). ABC algorithm shows a less computation time required and offered optimal solution compared to