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1. The ABC algorithm uses a population of food source positions. Each food source is an alternative solution to the optimization problem, and the nectar amount of a food source is the fitness of the solution. The algorithm tries to find an optimum solution (the most profitable source) by using some local and global search mechanisms in addition to various selection mechanisms performed by bees. Bees are classified into three groups based on their food source selection type. These classes correspond to the phases of the algorithm. Main steps of the algorithm are given below:

- Initialization
- **Repeat**
  - Employed Bees' Phase
  - Onlooker Bees' Phase
  - Memorize the best solution achieved so far
  - Scout Bee Phase
- **Until** Termination criteria is satisfied.

In the initialization phase of the algorithm, a food source population is generated randomly by equation

$$x_{ij} = x_j^{min} + rand(0,1)(x_j^{max} - x_j^{min})$$

where i = 1 ... SN, j = 1 ... D, SN is the number of food sources, D is the number of design parameters, x_j^{min} and x_j^{max} are lower and upper boundary of jth dimension, respectively.

The initial population is improved through a foraging cycle of employed, onlooker and scout bees' phases. The foraging cycle is iterated until a termination criterion is satisfied. The termination criterion may be either reaching a maximum evaluation number or finding an acceptable function value. In the employed bees' phase, the food source exploitation in real foraging behaviour is simulated by a local search in the neighbourhood of the sources. The local search of the basic ABC algorithm is defined by equation:

$$v_{ij} = x_{ij} + \varphi_{ij}(x_{ij} - x_{kj})$$

where i is the current solution, k is a neighbour solution chosen randomly and φ_{ij} is a real random number within the range [−1, 1] coming from uniform distribution. In the local search defined by Eq. 2, only one randomly chosen dimension of the current solution (parameter j) is changed. After the local search, a greedy selection between the current solution and its mutant is carried out to select the better one to survive. The better solution is retained in the population and the other one is discarded. The local search and the greedy selection are applied to each food source in the population.

Once the employed bees' phase is completed, onlooker bees' phase is performed. In the onlooker bees' phase, the neighbourhood of the food sources is searched to find better solutions like in the employed bees' phase. Unlike the employed bees' phase, the search is not conducted in the vicinity of each solution one by one. Instead, the solutions that will be included in the search are selected stochastically depending on their fitness values, that is, high quality solutions are more likely to be selected. This is the positive feedback property of the ABC algorithm. Each solution is assigned a probability proportional to its fitness value.

$$p_i = \frac{fitness_i}{\sum_{i=1}^{SN} fitness_i}$$

After calculating the probability values, a fitness-based selection scheme is employed to give higher chance to better solutions. The selection scheme may be roulette wheel, ranking based, stochastic universal sampling, tournament selection, or another selection scheme. In the basic ABC, roulette wheel selection scheme is used.

Once SN solutions are selected probabilistically and local searches are conducted in the vicinity of these solutions and then, the greedy search is applied to select better solutions as in the employed bee phase. In both the employed bees' and onlooker bees' phases, if a solution cannot be improved by the local search, its counter is incremented by one. This counter holds how many times the solution is exploited and retained in the population. The counters are used to determine exploitation sufficiency and exhaustion. If a counter exceeds a limit, the solution associated with the counter is assumed to be exhausted and is replaced with a new solution produced randomly. Checking the counters and if required, producing a random solution operation comprise the scout bee phase. Regarding all the phases, the algorithm has three control parameters: the number of food sources, the maximum number of cycles, and the limit used to determine the exhausted sources.

2. This algorithm is normally used for optimising numerical problems. Since its inception, the ABC algorithm has been used in a vast pool of applications, such as neural network training, cluster analysis, protein structure prediction, and stock market forecasting. Recent numerical studies have unveiled the ABC's distinguished capability, to excel other comparable meta-heuristic algorithms, in continuous optimization problems.

3. Onlooker bees' search the neighbourhood of the food sources to find better solutions just like the employed bees. But unlike the employed bees, they do not conduct the search in the vicinity of each solution one by one. Instead, the solutions that will be included in the search are selected stochastically depending on their fitness values, that is, high quality solutions are more likely to be selected. Each solution is assigned a probability proportional to its fitness value.

4. Artificial Bee Colony (ABC) algorithm is a swarm intelligence algorithm motivated by foraging behaviour of honey bees. A bee swarm has many intelligent behaviour patterns such as task division in the nest, mating, navigation, nest site selection, and foraging. The foraging task is carried out by bees very efficiently by exhibiting all characteristics of self-organization and division of labour. The bees assigned to foraging task are divided into three categories: employed bees, onlooker bees and scout bees, which corresponds to the division of labour in the foraging task. The employed bees are responsible for exploiting the food sources and recruiting the other bees by dancing. The onlooker bees wait in the hive and choose a food source by watching the dances of the employed bees. The scout bees search for new unexplored sources. A food source exhausted by the exploitation is abandoned by its employed bee and the employed bee becomes a scout bee. Recruitment of the bees to profitable sources is a positive feedback phenomenon while the abandonment of the exhausted sources is a negative feedback phenomenon. Searching the undiscovered sources carried out by the scout bees isa fluctuation effect which brings innovation to available food sources. The bees' communication through the dancing includes information about the location and the quality of the sources, and this is the multiple interaction property of the self-organization.