

Research Article

Optimized Evaluation System to Athletic Food Safety

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Abstract: This study presented a new method of optimizing evaluation function in athletic food safety information programming by particle swarm optimization. The process of food information evaluation function is to automatically adjust these parameters in the evaluation function by self-optimizing method accomplished through competition, which is a food information system plays against itself with different evaluation functions. The results show that the particle swarm optimization is successfully applied to optimize the evaluation function in athletic food safety and the performance of the presented program is effectively improved after many experiences.

Keywords: Athletic food safety, optimized evaluation system, optimizing evaluation function

INTRODUCTION

With the economic development, food safety incidents occur frequently in domestic and foreign. Facing the serious food security situation, how to effectively control food quality and safety is actively exploring practical solutions of countries around the world. Artificial intelligence is a method of studying intelligent computer, which makes the machine have abilities of human thinking and judgment. Various searching algorithms, pattern recognition and intelligent methods came from machine game research are widely applied to many fields and improved the development of these fields. Likewise the advance of these fields greatly promoted the development of artificial intelligence from the production, circulation to consumption, from farm to table, the whole chain of food safety regulatory responsibilities is involved with many departments. Therefore, food safety information management must be effective with overall planning, coordination and collaboration between departments, so as to ensure the departments and local areas can share information and resources together (Zhou, 2007).

Food safety information evaluation is in order to realize the records of the market access for food and the records of food production operating body as well as the records of the historic food detection information, warning the unqualified food and its processing, distribution enterprises, so as to force the unqualified food market to be exited and so on, which regards providing public services as the basic goal; trying to improve and perfect the safety supervision management of the food production and the circulation field, strengthening the accessing behavior of the market main body, food producing and operating behavior, as well as the market withdrawal behavior, taking the whole supervision on them as the foundation; the food quality supervision and inspection information of all

departments, as well as the relevant laws, regulations, policies and other information are released through a unified platform to the society, the relevant departments should pass the food safety information management by the unified and comprehensive service system software that will be associated with the quality and safety of food hygiene information with its collection, collation, analysis, delivery timely to the community.

MATERIALS AND METHODS

The food safety supervision and management can provide food safety information with network service platform according to the requirements that is established for the society, the purpose is to set up a platform with unified food safety information network, which can be combined food information with agriculture, food, industrial and commercial joint announcement, health, quality supervision, environmental protection and other relevant departments, so as to provide a window for the consumers to understand the food safety knowledge and information. On this network platform, it mainly releases information including supervision and inspection of food safety information, quality of food, information about the food safety events and other information on food safety supervision, etc. At the same time, realizing to prepare the records of accessing to the food market and the records of food production and operation of the main market, achieving the data exchange, collaborative management among the various departments in the internal business, dealing with the emergency, which can improve work efficiency (Chen and Shahandashti, 2009).

The system structure of food safety information platform: The Platform system is consisted of food

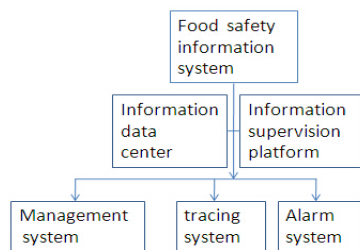


Fig. 1: Platform system

safety information data center, food safety information supervision platform, the application system of food safety information. The system structure adopts the engineering standard component and the platform with modular idea to have functional design for the platform, which is beneficial to the scalability and openness of the system in the future. It is as shown in Fig. 1.

The optimization of the evaluation function: Particle Swarm Optimization (PSO) is proposed by doctor Kennedy and Eberhart, it realized the analogues of bird flocks searching for corns to produce computational intelligence (Li and Tang, 2009). The advantages of the PSO are a simple realization, a small number of the parameters and higher speed. The results of the PSO have applied into more and more fields in science. The PSO has been received more attention and became a new hotspot in optimization algorithms after GA, ACS, etc.

Particle swarm optimization: In PSO each particle includes the location information and the velocity information are respectively presented by N dimension and $V_i = (v_{i1}, v_{i2}, \dots, v_{ij}, \dots, v_{in})$. The location information indicates these optimized parameters that are feasible solutions in solution space and the velocity information for each particle is the optimized speed dynamically regulated by studying the surrounding environments. Each particle is moved through the search space by combing some information of the history of its own current and best location with those of one or more members of the swarm, with some velocity information and random perturbation. The next iteration occurs after all members in swarm have been moved. Each particle was programmed to update its velocity and velocity information in terms of the Eq. (1) and:

$$V_i = (v_{i1}, v_{i2}, \dots, v_{ij}, \dots, v_{in})$$

where, w is termed the “inertia weight” and is set a dynamic number from a relatively high value, to a much lower value. The parameter w with a high value (e.g., 0.9) means that particles take place global search, but when w is given a low value (e.g., 0.4) the particles in swarm assemble toward local optima. The updating formula of the parameter w is the following:

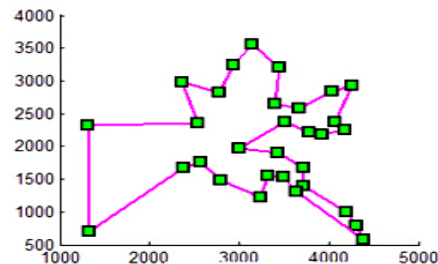


Fig. 2: Improved path

$$v_{id}^{k+1} = wv_{id}^k + c_1r_1 (pbest - x_i^k d) + c_2r_2 (gbest - x_{id}^k)$$

$$x_{id}^{k+1} = x_{id}^k + v_{id}^{k+1}$$

where, Tmax is the maximum iteration, wini and wmax is, respectively the initial value and the maximum value of the parameter w. The parameters C₁ and C₂ in (1) are often called acceleration coefficients and determine the magnitude of the random forces in the direction of local optimum (called LBest) and global optimum (called GBest). The parameter rand is a random number from 0 to 1. The value C₁ = C₂ = 2, almost ubiquitously adopted in PSO research.

Algorithm process:

- Step 1:** Initialize the population size such as particle position vector and the velocity vector, calculating the fitness of particles.
- Step 2:** Update the Pbest and Gbest of the particle according to formula (2) and (3).
- Step 3:** If stopping condition is met, the algorithms return to step 10, otherwise return to step 5.
- Step 4:** After Bmax generation in continuous evolution, population variation mechanism according to the speed variation if it's no improvement.
- Step 5:** Calculate the average speed of all particle and the adaptive value of particle swarm according to Formula (8). Set P_{best} of the particle as current optimal position for the individual, the g_{best} is set to best position of entire particle population in initial population; If the particle fitness is better than individual extremum, then individual extreme P_{best} is set to new position, if the particle fitness is better than global extremum, the global extremum g_{best} is set to the new location.
- Step 6:** Computing community fitness variance σ^2 according to formula (6).
- Step 7:** Generate a random number r ∈ [0, 1], if r < pm, algorithm will Perform mutation; Otherwise return to step 5.
- Step 8:** According to the type (4) with type (5) update the particle's speed and position.
- Step 9:** The number of iterations adds 1 and algorithm return to step 4.
- Step 10:** Output g_{best}, End of the algorithm.

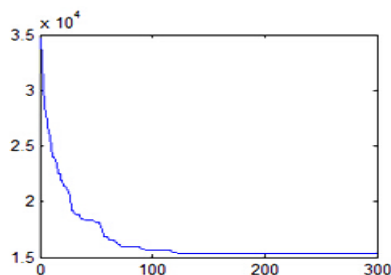


Fig. 3: Optimal path and convergence curve

The improved path is as shown in Fig. 2.

RESULTS AND DISCUSSION

The analysis of experimental results: Using MATLAB 7.0 software to make the six examples in international standard database TSPLIB simulation experiments, as shown in Fig. 3, the number of particles group: $N = 100$; maximum inertia coefficient $W_{max} = 0.99$, the minimum inertia coefficient $W_{min} = 0.09$, learning factor $c_1 = 2$, $c_2 = 1.5126$. The initial mutation probability $P_m = 0.05$. Taking Chn 31, Oliver 30 for example, Fig. 1 is mutation Particle Swarm Optimization (GBPSO) to find Chn31 optimal path and convergence curve.

CONCLUSION

This study puts forward an intellectualized method that is able to strengthen the evaluation function in

athletic food without manual intervention (Wei and Zhao, 2005). The method is carried out by optimizing the evaluation function with the particle swarm optimization. The experiment shows that the power of athletic food has been clearly advanced using the method presented in the study. The optimized athletic food can easily overcome the former one. However, the optimizing method only applied to a class of athletic food. We have been carrying on our research on the influences of reducing the parameters in the evaluation function and transforming the construction method of the local optimum in particle swarm optimization.

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