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Research on the Optimum Layout Technology Based on Computing Intelligent

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Abstract: Computational intelligent algorithm in modern life, more and more extensive application in engineering practice, is mainly used to solve the automatic layout optimization problems, the research on it has important significance. This study mainly studies intelligent computing algorithm in automatic layout optimization problem in the application, intelligent computation algorithm contains more categories, such as genetic algorithm, ant colony algorithm, simulated annealing algorithm, the algorithm in solving automatic optimum layout problem, have its distinctive place. This study, firstly research on genetic algorithms by solving automatic optimum layout example function, crossover heavy group solve tour business problems as well as through dualistic coding knapsack problem application, followed by study of ant colony algorithm function extreme value problem the ant system and local search method of combining the two distribution, through the improvement of ant colony algorithm technology cogeneration economic scheduling problem, make full use of the ant colony advantage, use of pheromone solving automatic optimum layout problem.

Key words: Genetic algorithm, ant colony algorithm, genetic operator, order crossover, automatic packing optimization problem

INTRODUCTION

In modern life, engineering practice, often encounter some new algorithms or theory, such as genetic algorithm, tabu search, neural network and so on. In modern life, often encounter a variety of problems and these problems, often cannot get very good settlement, if the need to solve these problems, need to adopt special algorithm which can be used in intelligent computing algorithm. In real life, automatic layout optimization problem can be addressed by computational intelligent algorithm, calculation of profit and loss, minimum material consumption, high efficiency and other issues has been a very good solution. Through intelligent computing algorithms, it is more convenient, more quickly solve some complex mathematical problem.

COMPUTATIONAL INTELLIGENT ALGORITHM OVERVIEW

Intelligent algorithm summary and characteristic: The traditional mainly has the following types of automatic optimum layout method: Enumeration method, the search algorithm and heuristic algorithm.

- Enumeration algorithm will be feasible solution set of the full range of feasible solution one listed and then work out the accurate solutions

The search algorithm to search a algorithm, this algorithm is in part or all of the possible problems solution space for the search operation, in order to find the optimal solution

- heuristic algorithm to seek a feasible solution by heuristic rules, thereby generating, eventually obtaining the optimal plan.
- solutions, ultimately selected by the user to determine

As the problem of different kinds of problems and the expansion of the scale, is seeking a can with limited cost to solve search and automatic optimum layout method for general computational intelligent algorithm, provides us with an effective way, it is different from the traditional search and automatic optimum layout method.

- Computational intelligent algorithm is commonly known as " soft computing ", it is the simulation of nature's principle, according to which the enlightenment, solving problem algorithm. Simulation nature structure, through which gained enlightenment, were invented and created, intelligent calculation of a feature is the use of bionic principle to design (Jin *et al.*, 2008). An important feature of the algorithm is
- Self-organizing, adaptive and self-learning

- Intelligent algorithm parallelism
- Intelligent computing algorithm does not require the derivation or other auxiliary knowledge, while requiring only affect the search direction of the objective function and corresponding fitness function
- Computational intelligent algorithm can more directly
- Computational intelligent algorithm for a given problem, can produce a lot of potential solutions, ultimately selected by the user to determine

Computational intelligent algorithm classification

Genetic Algorithm, GA: Genetic algorithms: genetic algorithm by the United States J. professor Holland in 1975 in his monograph " adaptation in natural and artificial system " first proposed, it is according to the nature of its own characteristics, through the simulation of natural selection, to solve practical problems of a random search algorithm

Ant Colony Optimization, ACO: Ant colony algorithm (Ant Colony Optimization, ACO) by Colorni, Dorigo and Maniezzo is proposed, according to imitate nature ant community find food and came up with a bionic automatic nesting algorithm. Ant colony searching for food in nature, they would send a group of ants, then split up around search, if one ants find food, it will return to the nest and then tell the other ants and on the way back, leaving the "information" (pheromone) as is the troop of ants to need food where the marking pheromone will gradually volatile, if three ant the same time find the same food and take a different route back to the nest, so in a more roundabout path pheromone smell will be relatively light, it will likely along another relatively near the line to the food 's location.

Simulated annealing, SA: Metropolis is proposed for the simulated annealing algorithm. Based on solid facts and annealing process with ordinary automatic optimum layout problem, seek the similarity between them as their starting point. The simulated annealing method is a commonly used automatic nesting algorithm, such as this has been widely applied to engineering.

Simulated annealing algorithm for solving the problem of the basic process:

- For a certain initial temperature and the initial point, the calculation of this point of the function values
- The calculation of the function of the difference between $\Delta f = f(x') - f(x)$

If $\Delta f = 0$, Then a simulation of initial point with the new point to replace

If $\Delta f > 0$, we calculate the new acceptance probability:

$$p(\Delta f) = \exp\left(-\frac{\Delta f}{k \cdot T}\right)$$

Produce $[0, 1]$ Interval uniformly distributed pseudo random number $r, r \in [0, 1]$, If $p(\Delta f) \geq r$, To accept the new point as a simulated initial point; if not, then drop the new point, continue to choose a point before the next time as simulated initial point.

GENETIC ALGORITHM IN AUTOMATIC LAYOUT OPTIMIZATION PROBLEMS IN THE APPLICATION OF

The principle of genetic algorithms: The principle of genetic algorithms genetic algorithms: genetic algorithm by the United States Holland (1975) in his monograph " adaptation in natural and artificial system " (Schafer *et al.*, 2001) first proposed, it is according to the nature of its own characteristics, through the simulation of natural selection, to solve practical problems of a random search algorithm.

Basic genetic algorithm is a kind of relatively simple to understand, operation of the genetic evolutionary process of relatively easy for a most basic genetic algorithm. The basic genetic algorithm is composed of several components:

Generation groups, initial and coding: Set up a range of parameter values, can use the length of K binary coded symbols to represent the parameters, it generates different coding, can make the coding parameters of the corresponding relations for:

$$\begin{aligned} 000000\dots0000 &= 0 \rightarrow U_1 \\ 000000\dots0001 &= 1 \rightarrow U_1 + \delta \\ 000000\dots0010 &= 2 \rightarrow U_1 + 2\delta \\ &\vdots \\ &\vdots \\ &\vdots \\ 111111\dots1111 &= 2^k - 1 \rightarrow U_2 \end{aligned}$$

In which:

$$\delta = \frac{U_2 - U_1}{2^k - 1} \tag{1}$$

- As the driving genetic algorithm process fitness function

- Containing a selection operator, crossover operator mutation operator of genetic operator

The purpose is to make the choice of genetic algorithm to search the solution space toward the promising regional mobile. Fitness high individual is selected, they and their children have a greater chance of survival to the next generation. As the population number is M, the fitness of individuals, then to select individual probability.

$$P_i = f_i / \sum_{k=1}^M f_k \quad (2)$$

In the biology of the normal evolution of mating of homologous chromosomes, two, after the reorganization, do not have the same chromosome, then, new species arising therefrom. According to such process, a new individual through the use of cross operator in the genetic algorithm to generate. The cross operation generally use the single point crossover operator.

Variation is also a standard genetic algorithm. The genetic and biological normal evolution in the process of cell division, its replication link is possible because of some accidental factors and produce some replication errors, for some biological gene these errors will cause some variation, neonatal chromosome therefrom.

For an individual, through binary coded representation of the chromosome, is one changes from 0 to 1, or from 1 to 0 as shown in Fig. 1:

- For a particular parameter operation

Basic genetic algorithm can be expressed as:

$$SGA = (C, E, P_0, M, \Phi, \Gamma, \Psi, T) \quad (3)$$

In the (1) type corresponding to the symbol meaning as follows:

Figure 2 is the basic genetic algorithm flow chart:

Genetic algorithm is essentially a selection operator, so that the next generation can accept the quality pattern of population, crossover operator based on the reorganization, the mutation operator to use, makes the model. This mutation operation, mode evolution direction will be more and more good, then the resulting optimal solution.

Genetic algorithm function of automatic optimum layout example: Web Services provides completely independent programming language, independent of hardware or software platform to promote loose coupling between

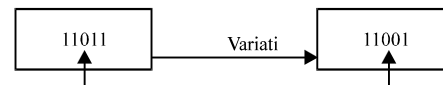


Fig. 1: Mutation operator description

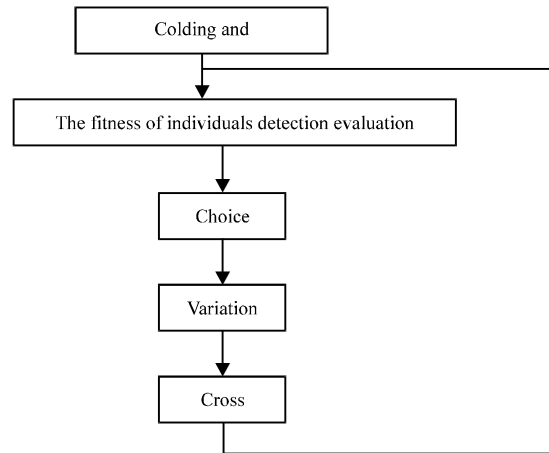


Fig. 2: Genetic algorithm basic flow chart

(Vilhjalmsjon and Kopp, 2013) system services. As a caveat, Web Services is not equal to Webservice, the former is used for overall technical framework of the latter and the latter is the application example using the technology and created, they are a kind of the relationship between containing and being contained.

The ultimate goal of MOODEL on-line testing is the operating system, programming language and hardware platform to integrate application system. However, acollection of MOODEL on-line test and not for any particular technology, but merely conceptual architecture, if you want to use in the application, it is necessary to adopt the concrete realization technology. XML technology based on Web services is the best choice to realize MOODEL online test. Implementation of Web services is based on the technology of the following public:

- The extensible markup language XML

XML (eXtensibleMarkupLanguage) extensible marplanguage, is a cross-platform Internet environment, dependent on the content of technology, is a powerful tool in the structured document information processing. The system provides management function module should only be maintained by the system administrator unit, through the function modules of LAN maintenance in normal operation of the MOODEL system basic information needs.

The function module provides the function: organization management, operation management, authority, various data information maintenance, process management and system log management.

Organizational management: Management by departments of the functions of the units, departments subordinate relationship with tree structure, can maintain department related properties, such as: The name of the Department, department leader, telephone etc., The system administrator can add, modify the function module, delete the units of the department (Li *et al.*, 2008). The user management system management system by use of the personnel information processing, including: Name, username, password, photos, links, mobile phone, post title, ID number and so on, the property can be according to the characteristics of large enterprise LAN production quality Bureau added or deleted. The user management, data management and personnel staff the information to achieve the data sharing.

Authority management through the rights management module, system administrator permissions assigned to each user according to the duties of the internal unit staff department. Permissions include: Function module, each person can use to undertake the function, use in the production of quality management in the project transfer process in task and so on in the function module. Permissions can be assigned directly to people; you can also define roles, as the assigning authority role, then the personnel and the role of the association, between roles and staff is a one-to-many relationship, this can reduce the workload of permission assignment operation, makes more flexible allocation of rights. Roles can be defined according to the characteristics of the unit.

Dictionary maintenance: The system provides a standard dictionary database, the administrator can to some commonly used data set, including: automatic numbering, production quality management project template, production quality management project to the word, classification, production quality management project type, dispatch mode, production quality management project urgency degree, job title, title name and so on production quality management project (Zhu *et al.*, 2011) automatic numbering: definition of the receipt, issued after the serial number, serial number can be generated automatically according to a defined format. production quality management project template: can often use the file format prior to the definition of production quality management project, when using this format can be called directly.

Process management: "flow" is the core of MOODEL system in LAN, in the system all the processes, the process definition and process the operations were performed by the senior administrator, so the administrator can according to provincial large enterprise production quality Bureau of internal management requirements, define the flow of each kind of complex in different degree, for the circulation of use. The user can view the transfer process tracking.

Using the penalty function method for continuous variable constraint automatic optimum layout problem into unconstrained continuous variable automatic packing optimization problem and then using the genetic algorithm to solve the constraint automatic optimum layout of mathematical model:

$$\text{Min } F(x) \quad x = [x_1, x_2, \dots, x_n] \tag{4}$$

$$\text{S.T } g_j(x) \leq 0 \quad (j=1, 2, \dots, n_c) \quad a_i \leq x_i \leq b_i \quad (i=1, 2, \dots, n) \tag{5}$$

Type: fFor the upper and lower limit; constraint function; as the number of constraint functions. By using penalty function method for the constrained automatic layout optimization model into unconstrained automatic optimum layout model, there are:

$$\text{Min } F'(x) = F(x) + \sum_{j=1}^{n_c} \Phi_j \quad \Phi_j = r_j [g'_j(x)]^2 \tag{6}$$

$$g'_j(x) = \begin{cases} g_j(x) & (g_j(x) > \epsilon_j) \\ 0 & (g_j(x) \leq \epsilon_j) \end{cases} \quad (j=1, 2, \dots, n_c) \tag{7}$$

Of which: is the constraint of the penalty factor of penalty; is bound accuracy.

Definition of fitness function:

$$f = F_{\max} - F'(x) \tag{8}$$

To be greater than the generation of the individual maximum fitness value, in order to ensure constant greater than 0 through fitness function, the automatic layout optimization problem is transformed into genetic algorithm evolution problems.

Support vector machine (Support Vector Machines, SVM) Support vector machine classification in a short text method research process is divided into two main categories, support vector machine is needed for the analysis of VC dimension vector in statistical learning

theory support and can control the risk in the structural mode. The sample information required to set up information model in the treatment process, analyze its complexity, the need for specific training precision measurement, identification of learning ability, basic ability without error identification of samples.

Analysis from the perspective of geometry, the support vector machine can find a decision surface in R-dimensional space range, decision surface can be positive and negative on the text to distinguish, the establishment of a relationship between the proportion of data information, the classification of space between the positive and negative maximum. SVM in the process of design of the positive and negative linear analysis, nonlinear problem, need to put it into high dimensional linear problem, so as to obtain the optimal classification face in space in the process of change (Mishin, 2005).

The naive Bias algorithm (Naive Bayes, NB) Mainly is carries on the webpage classification from the angle of probability, the formation probability algorithm. Algorithm design process need to classify webpage of pretreatment, the formation of a hypothetical relationship. Stochastic model of a hypothetical, for model evaluation according to the training, design the corresponding parameter, according to the Bias rule on the training model for classification, based on the "simple Bias" hypothesis, need to analyze the probability of the training sample.

K nearest neighbor classifier (KNN) In the short text intelligent computing process, need to control K nearest neighbor classifier, ensure the neural network for data classification. In the specific implementation process needs to be tested on the text, to ensure that the system needs to control the text information in the training process, carries on the analysis to the Knearest neighbors of different nodes, ensure that the weight can meet the requirements of data optimization.

In consideration of the maximum value of automatic nesting problem.

In order to prove the algorithm is improved, introduced the function of one variable:

$$f(x) = x \cdot \sin(10 \cdot x), x \in [-1, 2] \tag{9}$$

Knowledge can be obtained by mathematical analysis, in the interval [-1,2] is differentiable.

Through the new my1-fun.m file:

$$\text{function} = \text{my1-fun}(x) \tag{10}$$

$$z = x \cdot \sin(10 \cdot \pi \cdot x) + 2.0 \tag{11}$$

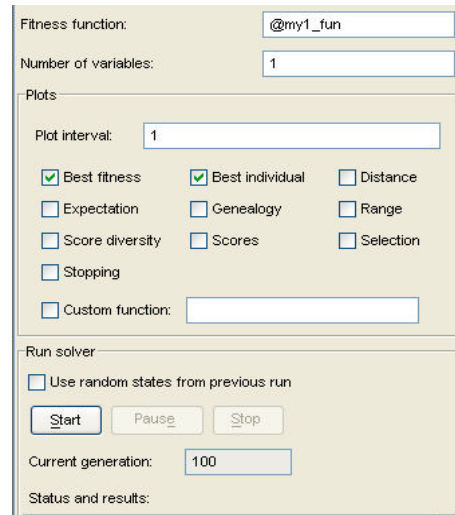


Fig. 3: Genetic algorithm toolbox parameter setting

Save it to a work working directory, in Fig. 3 enter the following parameters. At present, there are two methods to extract the text structure, the first method is based on the method of obtaining pixel character contour, this method does not consider the global information and structure information, such as edges and intersections existing problems of deformation and the results. Therefore, the researchers proposed some other feature extraction methods, but this makes the character recognition based on pixel is more complex and unstable. The second method is to use a set of line segments and the relationship between them to describe the character and recognition, but these methods many steps, calculation of complex, difficult to achieve, but susceptible to boundary noise and intersection.

Unconstrained handwritten Chinese characters, complicated structure, large number of similar characters and the irregular deformation is serious, so the various font handwritten Chinese characters recognition character recognition is a very difficult problem, is considered the most challenging research topic in this field and the highest goal of the existing methods. Handwritten numeral recognition, only some relatively simple, although it can be a little recognition of handwritten Chinese characters, but they are not fundamentally overcome the error recognition rate this problem. Pattern recognition classifier and other traditional Bias because of the lack of prior knowledge and can not achieve the desired results, a new identification method of grammatical inference method and relay method and difficult to realize because of complex coding process, large amount of calculation or identifiable text a limited number of reasons (Song, 2010).

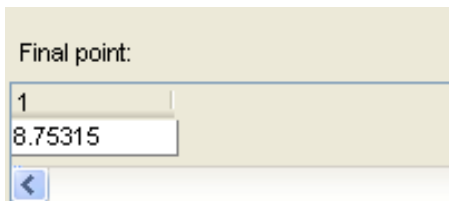
Neural network has the ability and the classification ability to obtain the very strong knowledge, has the very high fault tolerance and robustness, can form arbitrarily complex decision regions in the feature space, since the constraint conditions, the self-learning function greatly relaxed the traditional pattern recognition method by its, provides a new powerful tool as the Chinese characters recognition.

Chinese short text (text, HTML) mining key technology of the success or failure of the word segmentation of text is short of success. Because of the complexity and particularity of the Chinese language, Chinese word segmentation has become a difficult problem, if we do not take word processing is carried out, a lot of research can not be carried out. SOUP (Service-Oriented Unified Process, unified service oriented process) is a software method using a part of the best RUP and XP to build and manage the MOODEL on-line test project (Breese *et al.*, 1998). Adjust the existing network structure. Configure the high security gateway, the network is divided into several regions, respectively, to limit the external users internal users, directly affiliated institutions and large enterprise production and quality department user access.

The transformation of existing network cabling. At present each office at least point of information more than 2, due to the increase of the client device of existing information on the Internet is not enough, will select 2 information in the room side a and external government network interconnection, an internal office network; office end respectively increase the desktop type small exchange office, the client device are respectively connected with the Bureau, to achieve user access to e-government extranet and internal office network entirely separate.

Fitness function: @ myl_fun (x)
 Number of Variables: 1
 The hereditary algebra set to: 100
 The operation process and the results of Fig. 3, 4:

Test result:



GA running.
 GA terminated.
 Fitness function value: -8.871263290096495
 Optimization terminated: maximum number of

generations exceeded.

 Options have changed.

 GA running.
 GA terminated.
 Fitness function value: -3.9596737331551664
 Optimization terminated: stop requested.

 GA running.
 GA terminated.
 Fitness function value: -6.710204408553752

Optimization terminated: maximum number of generations exceeded.

GA is currently mainly in the statistical methods have been applied, the method and decision tree, LLSF neural network, the classification design. Specific process is as follows: a short text for testing, system needs to find focus in the text in the training process, find K nearest neighbors, then the K neighbor weight analysis, each neighbor short text and test the short text comparison, the similarity degree is used as a weight, from the characteristics of several neighbors look, if has the similarity, it will produce the corresponding weight, if the weight of several neighbor is a class, so all the weight sum, the weight sum as the myopic degree of short text test. In order to express more convenient, take the cosine values to represent the vector similarity, measurement of similarity. The disadvantage of this method is K value definition is difficult, generally use the different K values for a series of tests to decide which is better value.

The probability of short text D belongs to the C class for short text:

$$P(c/d) = \frac{\sum_{i=1}^K \text{sim}(d, d_i) p(c / d_i)}{\sum_j \sum_{i=1}^K \text{sim}(d, d_i) p(c_j / d_i)} \quad (12)$$

There is, because the Internet access of cheap and popular, the distribution of Web short text is very extensive, diverse user groups, demand diversity and fuzzy information. Understanding of the Web data mining users often only to mining theme has a shallow based on, no clear goals, often can't get the desired knowledge, or because they have too long to wait for useful knowledge is mined. This requires data mining system has certain intelligence and learning mechanisms, continue to track the user's interest, the mining results clearly. A part of the information on the Web has little to be relevant or useful. According to statistics, 99% of the Web information is

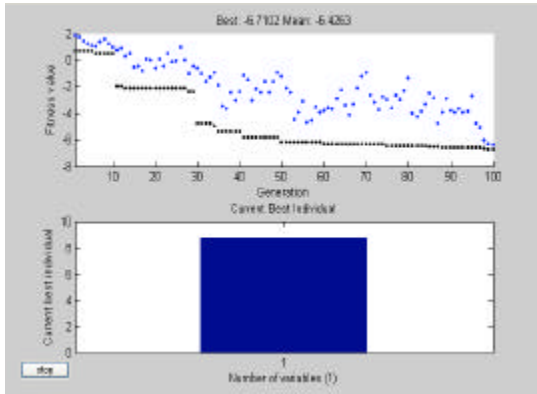


Fig. 4: My1_fun analog test charts

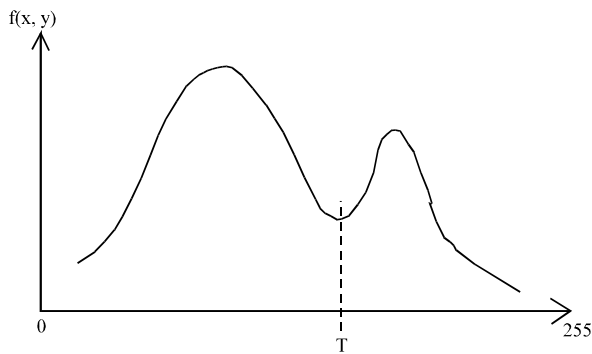


Fig. 5: Shuangfeng value curve

useless for 99% users, the useless information will overwhelm the user want results.

Then through the research and analysis of continuous, summed up a new formula, to a user ontology model can be abstractly defined as a structure:

$$\Theta = (C, R, \sigma, \theta, \vec{c}_u, w_u) \tag{13}$$

The segmentation method can not only greatly reduce the amount of data, but also greatly simplifies the analysis and processing steps, the image histogram showed obvious Shuangfeng characteristics, can obtain good segmentation results. Threshold segmentation seemingly simple question, received extensive attention of scholars at home and abroad in the past forty years, have produced hundreds of threshold selection method, but it is a pity, as other image recognition algorithm, none of the existing methods on a variety of image can get satisfactory results, even there is not a theory to guide us to select the specific method to deal with the specific image. Valley point histogram threshold search method is determined by the analysis of the image based on

histogram. Hypothesis, a pair of images only the objects and the background of two parts, the grayscale histogram shows the Shuangfeng values, such as Fig. 5.

CONCLUSION

This study mainly significance: society 's many questions need reasonable automatic optimum layout can be solved effectively. In order to solve complicated problems in production, life, can use intelligent computation algorithm for automatic packing optimization problem solving. Intelligent computation algorithm can simulate the natural structure and the system which can solve the fuzzy, uncertain and complicated practical problems.

Computational intelligent algorithm in many areas and achieved fruitful results, with the computational intelligent algorithm theory of continuous study, will be in G fields to play its role.

This thesis mainly studies the following aspects: The first part of the study of intelligent computing algorithm and the principle of automatic packing optimization problem, genetic algorithm, ant colony algorithm, the simulated annealing method to explain the concept of intelligent computing algorithm and through automatic optimum layout of combination of intelligent algorithm in solving the problem of the characteristic.

On the second part of the genetic algorithm in automatic layout optimization problem in the application. Firstly studies the genetic algorithm function of automatic optimum layout example, followed by crossover recombination solve four business problems, finally through the dualistic coding genetic algorithm for knapsack problem is used.

The third part mainly studied the ant colony algorithm in automatic layout optimization problem in the application. Firstly on the ant colony algorithm in function extremum problems in application, followed by the ant system and local search method of combining the two distribution, through the improvement of ant colony algorithm technology cogeneration economic scheduling problem, make full use of the advantage of ant colony use of pheromone, solving automatic optimum layout problem.

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