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Weather Forecasting By Genetic Algorithm

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ABSTRACT
This paper is all about the genetics algorithms. And with the help of genetics our research is to predict the weather system in order to increase the possibility of physical parametrization layout and to enhance the result of weather forecast of two important atmospheric parameters temperature and relative humidity. Our research showed develop result in improving the quality of average prediction error in limited amount of emphasis and this could prove essential in base of GA enhance ensemble forecasts, especially when focusing on specific atmospheric parameters. The optimization process performed completely in finding optimal physical layout for humidity prediction and relative humidity.GA techniques for physical parametrization optimization.
Keyword: weather forecasting, GA, atmospheric parameters, prediction.

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I. INTRODUCTION

The weather prediction occurs from ancient time. They predict the weather by strong genes. Genetics is a part of biology uneasy with the study of genes, genetic variation, and heredity in organisms.

Gregor Mendel a scientist and Augustinian friar, discovered genetics in the late 19th century. The various designs have been used since last past decades for forecast and research atmospheric atmosphere, at Initial stage with many problems. With the development of technology and computer science models designs became more accessible to scientists. Prediction systems were developed, some open-source.

The advancement in technology is increase day by day with the help of technology like computer can help us to predict the weather forecast. To predict the weather 100% is not possible but so however near about 70to80 Percent is possible if we add artificial intelligent also In weather for casting it might be increase the percent At certain level[1]. Forecasting help the human to take Precaution from flood ,heavy rain fall etc.as we saw every year that due to heavy rain fall many people are died. And crops are also destruct and cause lack of food in the resource. Or block the sewar and surface of land is filled with water and provide the environment for insect to increase the population and cause a disease reduces a quantity of fresh water in the environment.[2,3]

Advantage
1) Help to take precaution from flood or destruction.

2) Save the human resource from destruction.
3) Change the life of people.
4) Reduce the dead of people which can occur due to
flood or water scarcity.
5) We can save the water for future use also.

Disadvantage
1) 100percent prediction is not possible.
2) Bugs may be present in genetic algorithms.
3) Testing cannot remove all bugs from software.
4) We just predict not sure about for casting but it Help at some instant.

II. GENETICALGORITMS

Genetic algorithms are search algorithms based on the Mechanics of natural selection and genetics. String structure with a structured yet randomized in formation. innovation flair of human search.[5]

- Optimize tradeoff between new points and information discovered so far.
- Randomized algorithm
- Operate on several solutions simultaneously.

Rainy and Precipitation occurrence are sought in relation to measure vertical velocity(mm s”1), Y, and the dew point mean depression(F),Z. [4]

Furthermore, there may be other however the parameters such as evaporation rates, humidity, temperature

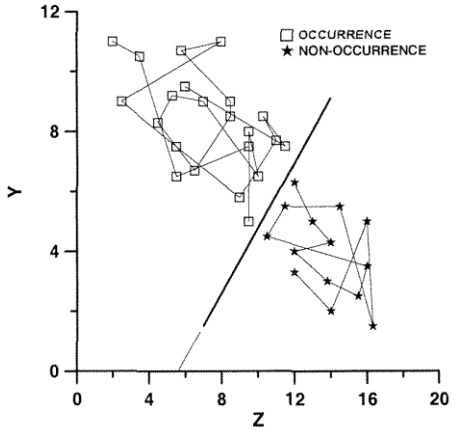

Fig:1

III. RESEARCH METHODS

Methods of optimization calculation

The process of searching for locations with a maximum or minimum physical quantity (objective function) is called optimization calculation. In order to obtain maximum positive values in optimization calculation,

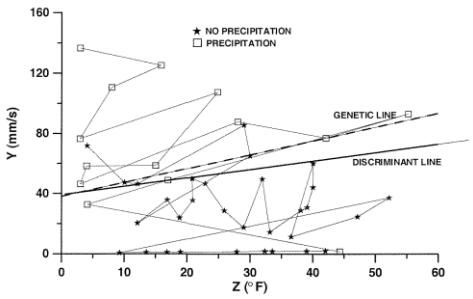

Fig:2

The objective function needs to be transformed into fitness Z (Park et al. 2006).

Optimization calculation includes three kinds of methods In the enumeration method, many points are selected and their fitness is calculated one by one. Then, the maximum value is determined.[6,7] Therefore, the method involves too much work, and the maximum value may not be found (Yang et al. 2008; Lavric et al. 2005). If we have a preliminary understanding of the fitness distribution, and there is an optimization method, the heuristic algorithm may be used.

If there is no prior knowledge, and a large sample is not considered, generally, the search algorithm may be adopted (Liu et al. 2009). There are many search algorithms. [8]

Such as the simplex method, gradient method, ant colony algorithm, and GA are the example. Among them, GA has experienced the most rapid development over

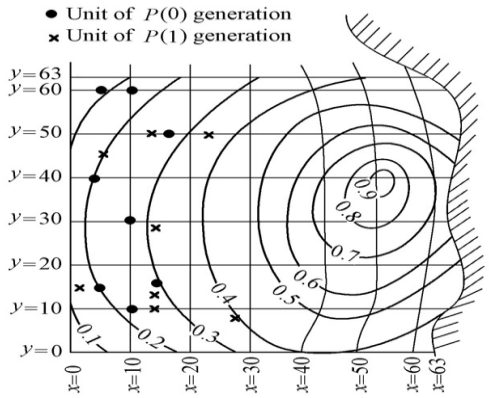

Fig:3

the past 20 years, and has been applied in many fields (Li and Peng 2000).

IV. LIMITATIONS OF GA IN APPLICATION

The selection operator can copy individuals of a current group to form a new group according to a probability in proportion with the adaptive value, and its effect is to improve the average applicable values of the group, but the diversity is lost. The crossover operator selects two parent strings from the mating pool according to the hybrid probability, and generates offspring strings according to single-point or multi-point hybrids, and its effect is to improve the convergence speed. The mutation operator randomly c h anges some points of chromosome strings, and its effect is to increase the population's diversity.

A necessary condition for the application of GA is that the function () ,Z f x y= is known.

No matter how difficult the calculation process is, with the powerful computational capability of computers, these calculations can be finished quickly. The guide function is slightly better than the diffusion function in the evolution progress towards the optimal solution, and gives each unit a considerable degree of diffusion freedom. Results and discussion 3.1 improved GA for searching for pollution source.[9,10]

As a global search optimization algorithm, GA does not have optimization function requirements, which does not have to be continuous or differentiable, and has been widely applied to parameter identification, robot control, neural network training, and fuzzy logic systems. [11]

The control parameters of GA are fewer than those of other optimization algorithms, but the effect of different combinations of parameters on the performance of GA is very complex. [12]Therefore, for a class of given optimization problems, how to set GA parameters is also an optimization problem. The early GA adopts fixed parameters, convergence is slow, premature phenomena or local extreme points can easily occur, and a global optimal solution cannot be ensured. A lot of experimental results and theoretical analysis indicate that it is very difficult to find a set of GA control parameters that are universally valid (Bazzazi et al. 2009). Therefore, many scholars have tried to relate GA control parameters to some indicators in the population evolution process, so that control parameters can be automatically adjusted in the process of evolution, in order to improve the overall search results. [13]As for the search for the pollution source, GA cannot be used directly. It requires improvement, and it is only used as a method of guiding searches.

V. SGA TECHNICAL SUMMARY TABLEAU

Representation	:	Binary string
Recombination	:	N-point or uniform
Mutation	:	Bitwise bit-flipping with fixed Probability
Parent selection	:	Fitness-proportionate
Survivor selection	:	All children replace parents
Speciality	:	Emphasis on crossover

VI. REPRESENTATION

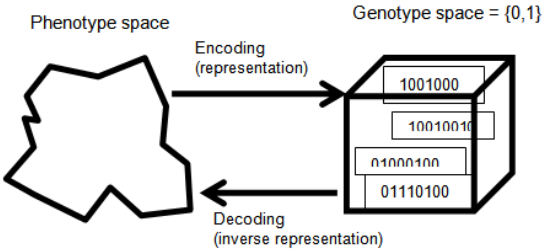

Fig:4

VII. ARTIFICIALLY SETTING INITIAL GENERATION OF UNITS AND ADVANCING FROM LIGHTLY POLLUTED TO AREAS HEAVILY POLLUTED AREAS

Taking lake water as an example, the distribution of polluted water can be estimated. In areas near the shore, heavy pollution occurs due to industrial wastewater, domestic sewage, pesticides, and fertilizers, and the quality of water far from the shore is better, so the overall strategy is to search from the middle of the lake to the shore. According to GA, the locations of initial generation of units are selected randomly. Using predetermined search directions and artificially setting the initial generation of units improves the search efficiency.

VIII. INTRODUCING INTERVENTION

measures to form competition between units

In GA, the survival of the fittest principle is introduced, but the implementation is flexible. The retention probability in selection of ii Z Z ¦ can be calculated with each unit's fitness iZ , and then the remaining units are determined after random roulette selection. Because of differences in frequency and probability, the unit with minimum probability may not necessarily be eliminated.[14]

It is specified here that the unit with large probability remains, and the unit with low probability is eliminated, which can allow realization of the shortened and reasonable process.

IX. ADDING GUIDE UNITS

When n units are eliminated, new n units need to be supplemented. Based on GA, the units that have been selected more than once are supplemented. If a unit is selected s times, it takes (sí1) vacancies. [15]The guide function of this method is weak, and the units move slowly. We proposed that the units are added artificially, and the positions of supplemented units are selected according to the direction of fitness increase.

X. A CALCULATION EXAMPLE

Assuming that the position of the most severely polluted water of a lake needs to belocated, the geographic map of the area is shown in Fig. 1.

Fig. 1 Geographic map of study area and evolution from (0) P to (1) P generations In Fig. 1, there are x contour lines, y contour lines, and a line for the comprehensive environmental quality evaluation index Z. The Z line exists objectively, and it is unknown in the process of search for pollution sources.[16]

The drawing of the Z line is meant to obtain the value of Z based on the values of x and y, and the results can be used instead of those from sampling analysis and environmental quality assessment. [8]The follows are specified in the optimization calculation: the population size m = 8; for the coded string, each chromosome has 6 binary codes, and each unit has a total of 12 genes; in the crossover calculation, for the

calculation of the three-angle intersection points, the positions of the points are between loci 3 and 4, loci 6 and 7, and loci 9 and 10, The migration from the () 0P generation to the () 1P generation is shown in Fig. 1. It can be seen from

the graph that the units of the () 1P generation are closer to the pollution source than those of the () 0P generation.

The evolution of the units of the () 0P and () 1P generations can be compared based on the number of units in different pollution zones, that from the () 0P generation to the () 1P generation, the number of units with serious pollution increases, and the number of units with light pollution decrease.[17]

The average values for the () 0P and () 1P generations can then be compared: For the () 0P generation, the average value of Z is ()1 0.160 0.292 0.228 0.205 0.210 0.090 0.290 0.298 0.222 8 Z = + + + + + + + + = (1) If the two units with the smallest values of Z are removed, then 0.254Z

XI. SGA REPRODUCTION CYCLE

1. Chose parents for the mating pool
2. Mix the mating pool
3. For all pair apply crossover with probability p_c , otherwise copy parents
4. For all chid apply mutation (bit-flip with probability p_m independently for each bit)
5. Change the whole population with the resulting child.[5]

XII. SGA OPERATORS: 1-POINT CROSSOVER

1. select an arbitrary point on the two parents
2. divide parents at this crossover point
3. build children by swap stalk
4. P_c frequently in range (0.6, 0.9)

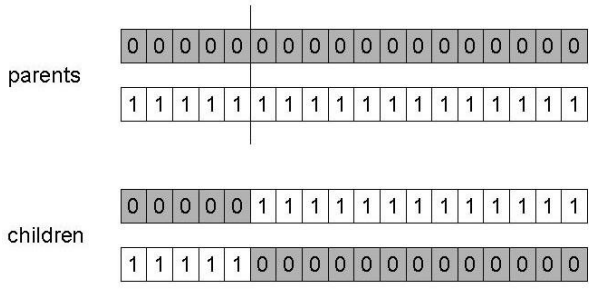

Fig:5

XIII. SGA OPERATORS: MUTATION

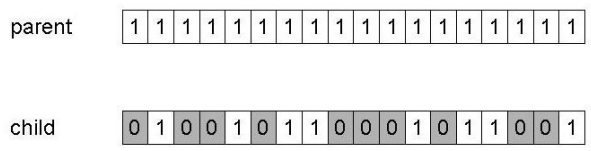

Fig:6

XIV. SGA OPERATORS: SELECTION

1. Optimize individuals get higher chance
2. Chances corresponding to fitness
3. Apply: roulette wheel approach
4. Twist the wheel n times to choose n existences

XV. CONCLUSIONS AND FUTURE SCOPE

Premature convergence usually appears in the search process of the traditional GA, and itslocal search ability is weak, so it is difficult to apply traditional GA in the search of pollution sources. The improved GA has self-adaptability; it improves the optimization performance of the traditional GA. The improved GA has two main characteristics: (1) it retains the basic idea and framework of GA, and (2) it accelerates the search process. Improving methods proposed in this study, except for the artificial addition of guide units, are possible realizations of GA.Through strengthening guidance, weakening diffusion, and necessary intervention measures, the number of evolving generations can be reduced significantly

This provides an obvious advantage in efficiency compared with the traditional GA. Finally, through a specific example,it is proven that the improved GA can not only provide satisfactory results in the search process, but also greatly reduces the quantity of calculations and significantly improves the searching speed of the algorithm.

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