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The study of SON network model which has the function of self-optimizing

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ABSTRACT

This paper firstly introduces the mode of transmission in free space. List the expression of transmission loss in the vacuum environment. The SON optimization modelings are introduced, and introduces the concrete optimization goal is the capacity and energy saving as well as their mutual self optimization. Then through the communication theory of electromagnetic wave in the private space, analyzed the influence factors of the network capacity, according them to establish the model of the network capacity. And analyze energy consumption when the transmission power of the base station is allocated to each user. Therefore, establish energy-saving model. Finally, we introduced the real-time traffic control variable; to analysis select target optimization under different scenarios, which established the final self-optimization model.

KEYWORDS

Network optimization;
Power control;
Multiple objectives programming;
Network capacity.

INTRODUCTION

In recent years, the rapid development of wireless communication network, wireless service demand also increases sharply, so people need to the network also more and more, there are increasingly high requirements[1-3]. To find out the influence factors of the quality of the self-organization network, establish a new optimization model to control user transmit power in the uplink to achieve energy and capacity optimization in the downlink and uplink[4-6]. So the cyber source to obtain the reasonable use, improve the quality of network, to ensure the needs of users, but also save maintenance cost for operators[7-9].

SON network optimization function refers to the network equipment, according to its own running status, adaptive adjust parameters, optimize network performance. Enable the network to achieve the best running status. Traditional network optimization can be divided into two aspects: one is the wireless parameter optimization, such as transmit power, switching threshold, cell individual offset; the second is mechanical and physical optimization, such as antenna and declination, antenna position, point supplement. Self-optimization can partly replace the traditional network optimization, including coverage and capacity optimization, energy saving, PCI configuration, mobility robust optimization, moving load balancing optimization, RACH optimization, automatic neighbor relation, coordinate the intercell interference[4,7].

The problem considered in this paper is to establish a downlink and uplink optimization model in the environment of traffic dynamic change, the objective of the optimization is to find an optimal mathematical model on network capacity and energy consumption, which makes the model to obtain the best performance of SON network. Including the network capacity, compromise between energy consumption and optimization of both, and study some properties of compromise performance.

BASIC PREPARATION

Free space propagation characteristics

Free space propagation refers to the dissemination in the ideal, homogeneous, isotropic medium, wave no refraction, diffraction, emission, scattering and absorption phenomena; there is only the energy of the electromagnetic wave propagation loss caused by diffusion. By electromagnetic field theory available: if the radiation power of isotropic antenna for PT, electric field intensity from the radiation source d m is as follows.

$$E_0 = \frac{\sqrt{30P_T}}{d} \quad (1)$$

Let H0be the effective value of the strength of the magnetic field, and the value:

$$H_0 = \frac{\sqrt{30P_T}}{120\pi d} \quad (2)$$

Wave power density S of per unit area:

$$S = \frac{P_T}{4\pi d^2} \quad (3)$$

If using the directional antenna of the antenna gains GT to instead of isotropic antenna, then the formula (1 to 3) should be written as:

$$E_0 = \frac{\sqrt{30P_T G_T}}{d} \quad (4)$$

$$H_0 = \frac{\sqrt{30P_T G_T}}{120\pi d} \quad (5)$$

$$S = \frac{P_T G_T}{4\pi d^2} \quad (6)$$

The effective area of the receiving antenna is multiplied by wave power density of the point is equal to the receiving wave power, i.e.

$$P_R = SA_R \quad (7)$$

In the formula, AR is the effective area of the receiving antenna; it has the following relationship with receiving antenna gain GR:

$$A_R = \frac{\lambda^2}{4\pi} G_R \quad (8)$$

$\lambda^2 / (4\pi)$ is effective area of isotropic antenna, λ is the wavelength. By formula (6) to (8) available:

$$P_R = P_T G_T G_R \left(\frac{\lambda}{4\pi d} \right)^2 \quad (9)$$

When receiving, transmitting antenna gain GT=GR=1, power of receiving antenna as follows:

$$P_R = P_T \left(\frac{\lambda}{4\pi d} \right)^2 \quad (10)$$

By formula (10) shows, the free space propagation loss L_{fs} can be defined as

$$L_{fs} = \frac{P_T}{P_R} = \left(\frac{\lambda}{4\pi d} \right)^2 \quad (11)$$

Calculated by dB

$$[L_{fs}](dB) = 10\lg\left(\frac{\lambda}{4\pi d} \right)^2 (dB) = 20\lg \frac{\lambda}{4\pi d}(dB) \quad (12)$$

Or

$$[L_{fs}](dB) = 32.44 + 20\lg d\,(km) + 20\lg f\,(MHz) \quad (13)$$

By (13) available, radio wave propagation loss in free space only has relationship with the propagation distance D and the working frequency F.

Two different power control algorithm

With the development of science and technology, the network scale is continually expanding; people's demand to the network increases, the current network performance deterioration, therefore, network optimization has become the hotspot of current research. Through the research on the performance of network analysis, network capacity and energy saving is the key of SON network.

The following were briefly introduced SON network capacity and energy saving. SON network deployment and planning purposes is to optimize the network based on coverage and capacity. The network capacity optimization is mainly reflected in the more rational allocation and use of cyber source, improves the utilization rate of cyber source, reduce congestion rate, equilibrium traffic rate, and enables the network to achieve the best running state. A traditional wireless network OPEX (operational expenditure) in energy consumption is 30%~40%, this is the largest overhead project. According to estimates, the energy consumption occurs in the network without data transmission state. Energy saving potential is big. In the wireless network equipment field, energy-saving can be from two aspects: energy-saving, first of all to optimize each user emission power, adjust the network state, so as to reduce the unnecessary energy consumption, and then develop more energy-efficient wireless equipment. Energy-saving SON network is mainly reflected in the rational use and allocation of cyber source, to avoid unnecessary overhead. Specifically, the main is to control the wireless resources according to the change of the network load of the opening and closing, to meet the needs of users at the same time as far as possible to avoid idling cyber source.

The self-organizing network optimization is designed from two aspects to consider. First, from the user's perspective, reflect the user satisfaction with the services in the SON network availability, stability, energy saving and voice quality; secondly, from the SON network operation point of view, do the system hardware and software and parameters of reasonable configuration, in order to maximize the use of wireless cyber source, improve the SON network economic benefits, to reduce the operation cost of SON network. Through continuous observation and monitoring of the entire SON network, and continuously to control each user uplink power to the optimized and adjustment downlink capacity, so as to ensure and improve the quality of service in SON networks. Main goal of network optimization is the user capacity and energy consumption of SON networks in this paper.

(1) The capacity maximization algorithm

N users access to the network, $P_1^{'}, P_2^{'}, \cdots P_N^{'}$ represent received power of each user in the downlink, the maximum transmission power of users is $P_{\max}$. σ represent background noise of each user, $N_i(i=1,2\cdots N)$ is the interference power of user i propagation by other N-1 users in free space, the system bandwidth is B, C is the network capacity, in multiple users algorithm, in the premise of users the minimum SNR to maximize network capacity system as the goal, this goal can be modeled as a constrained optimization problem, i.e.:

$$\max\ C = \sum_{i=1}^{N} C_i = \sum_{i=1}^{N} B\log_2(1+SNR_i) = \sum_{i=1}^{N} B\log_2\left(1+\frac{P_i^{'}}{N_i+\sigma}\right)$$

$$= \sum_{i=1}^{N} B\log_2\left(1+\frac{p_i^{'}}{\sum_{\substack{j=1\\ j\neq i}}^{N} P_j\left(\frac{\lambda}{4\pi d_{ij}^2}\right)+\sigma}\right) \quad (14)$$

$$\text{s.t.}\begin{cases} 0 \le P_1 \le P_{\max} \\ 0 \le P_2 \le P_{\max} \\ \vdots \\ 0 \le P_N \le P_{\max} \\ SNR_1 \ge Q \\ SNR_2 \ge Q \\ \vdots \\ SNR_N \ge Q \end{cases}$$

In the formula, P_i is sent power in the uplink interference of user i; $N_i = \sum_{\substack{j=1\\ j\neq i}}^{N} P_i\left(\frac{\lambda}{4\pi d_i^2}\right)$ is interference power of other N-1 users to user I in free space propagation, signal-to-noise ratio $SNR_i = \frac{P_i^{'}}{N_i+\sigma}$, λ represents the signal wavelength, d_{ij} is the distancsaid of user i to user j, Q is minimum signal-to-noise ratio that the user terminal recover the useful signal.

(2) The minimization energy consumption algorithm

N users access to the network, $P_1^{'}, P_2^{'}, \cdots P_N^{'}$ represent received power of each user in the downlink, the maximum transmission power of users is $P_{\max}$. σ represent background noise of each user, $N_i(i=1,2\cdots N)$ is the interference power of user i propagation by other N-1 users in free space, mathematical model based on the minimum energy as the goal of the network is shown as follows:

$$\min\ E = \sum_{i=1}^{N} p_i \quad (15)$$

$$\mathbf{s.t.}\begin{cases} \mathbf{0 \le P_1 \le P_{max}} \\ \mathbf{0 \le P_2 \le P_{max}} \\ \vdots \\ \mathbf{0 \le P_N \le P_{max}} \\ \mathbf{SNR_1 \ge Q} \\ \mathbf{SNR_2 \ge Q} \\ \vdots \\ \mathbf{SNR_N \ge Q} \end{cases}$$

In the formula, $SNR_i = \frac{P_i^{'}}{N_i + \sigma} \quad (i = 1,2,\cdots N)$. $P_1^{'}, P_2^{'}, \cdots P_N^{'}$ Represent received power of each user in the downlink.

THE SELF-OPTIMIZATION ALGORITHM DESIGN

Adaptive optimization mathematical model

Be able to design a self-optimization mathematical model with the dynamic change of network traffic and change its optimization object. The optimization model should have the following three advantages:

(1) When a parameter is very important, the optimization of other parameters will be weakened
(2) it has adaptive function for the busy degree of network
(3) it also take into account a number of optimization parameters

Self-optimization algorithm design

Because the number of network users is unceasing change, the network traffic is constantly changing, so the optimization object will also along with the network changes, so as to realize the optimization. Namely: we can from the size of the network business in real time to consider our main optimization. In the formula (15) the algorithm is to compute the consumption of power of all users in the minimize uplink, where we can change the way to find the maximum saving power value P_{save}, then:

$$\mathbf{max} \quad \mathbf{P_{save}} = \left(\mathbf{N \times P_{max}} - \sum_{\mathbf{i=1}}^{\mathbf{N}} \mathbf{P_i} \right) \tag{16}$$

In order to solve the above problem, puts forward the self-optimization mathematical model which has the self-adaptive network, suppose that control variables is $\alpha \in (0\,1)$, we can tradeoff capacity and energy consumption of optimization network, therefore, we can regain a effect function y form formula (14), (16) and traffic control variables, we can pursue their maximum values to achieve optimization. That is:

$$\max \quad y = \alpha C + (1-\alpha) P_{save} = \alpha \sum_{i=1}^{N} B\log_2\left(1 + \frac{P_1^{'}}{N_i + \sigma}\right) + \\ + (1-\alpha)\left(N \times P_{max} - \sum_{i=1}^{N} P_i\right) \tag{17}$$

$$= \alpha \sum_{i=1}^{N} B\log_2\left(1 + \frac{p_i^{'}}{\sum_{\substack{j=1 \\ j \ne i}}^{N} P_j \left(\frac{\lambda}{4\pi d_{ij}^2}\right) + \sigma}\right) + (1\text{-}\alpha)\left(N \times P_{max} \text{-} \sum_{i=1}^{N} P_i\right)$$

$$\mathbf{s.t.}\begin{cases} \mathbf{0 \le P_1 \le P_{max}} \\ \mathbf{0 \le P_2 \le P_{max}} \\ \vdots \\ \mathbf{0 \le P_N \le P_{max}} \\ \mathbf{SNR_1 \ge Q} \\ \mathbf{SNR_2 \ge Q} \\ \vdots \\ \mathbf{SNR_N \ge Q} \end{cases}$$

In the formula, P_i is sent power in the uplink interference of user i; $N_i = \sum_{\substack{j=1 \\ j \ne i}}^{N} P_i \left(\frac{\lambda}{4\pi d_i^2}\right)$ is interference power of other N-1 users to user I in free space propagation, signal-to-noise ratio $SNR_i = \frac{P_i^{'}}{N_i + \sigma}$, λ represents the signal wavelength, d_{ij} is the distancsaid of user i to user j, Q is minimum signal-to-noise ratio that the user terminal recover the useful signal.

The constraints condition $SNR_i \ge Q \; (i = 1,2,\cdots,N)$ to solve the effect function is more complex, so it can be converted into an unconstrained problem. Transform it into unconstrained problems to solve, an intuitive idea is: when in the downlink user received SNR does not satisfy the restriction condition, we can reduce the corresponding objective function value, the point can not be the optimal solution of corresponding optimum unconstrained problem. From the above idea, formula (17) can be converted into the objective function:

$$\max \quad y=\alpha C+(1-\alpha)P_{save}-K\sum_{i=1}^{N}\varepsilon(Q-SNR_i)=\alpha\sum_{i=1}^{N}B\log_2$$

$$\left(1+\frac{P_1^{'}}{N_i+\sigma}\right)+(1-\alpha)\left(N\times P_{max}-\sum_{i=1}^{N}P_i\right)-K\sum_{i=1}^{N}\varepsilon(Q-SNR_i) \qquad \textbf{(18)}$$

$$\text{s.t}\begin{cases}0\le P_1\le P_{max}\\0\le P_2\le P_{max}\\ \quad\vdots\\0\le P_N\le P_{max}\end{cases}$$

In the formula, $K\sum_{i=1}^{N}\varepsilon(Q-SNR_i)$ is converted from the constraint condition $SNR_i\ge Q\,(i=1,2,\cdots,N)$, the step function is $\varepsilon(t)=\begin{cases}1 & t>0\\0 & t\le 0\end{cases}$, K is a large number of previously selected. If $SNR_i<Q\,(i=1,2,\cdots,N)$, then the effect function value y is small, so the y will not be the largest, the user transmit power value is not the optimal value of the power allocation.

THE MATHEMATICAL MODEL OF MULTI-OBJECTIVE PROGRAMMING PROBLEM

General multi-objective programming problem

Similar to single objective programming, "maximization problem" can be converted into "minimization".

$$\max f(x)=\min(-f(x)) \qquad \textbf{(19)}$$

So the general form of multiobjective programming problems is:

$$\begin{aligned}&\min\ f_1(x_1,x_2,\cdots,x_n)\\&\min\ f_2(x_1,x_2,\cdots,x_n)\\&\qquad\vdots\\&\min\ f_p(x_1,x_2,\cdots,x_n)\end{aligned}$$

$$s.t.\begin{cases}g_i(x_1,x_2,\cdots,x_n)\le 0 & i=1,2,\cdots,m\\h_j(x_1,x_2,\cdots,x_n)=0 & j=1,2,\cdots,l\end{cases}$$

Denote $x=(x_1,x_2\cdots,x_n)^T$

$$f(x)=(f_1(x),f_2(x),\cdots,f_p(x))^T$$
$$g(x)=(g_1(x),g_2(x),\cdots,g_m(x))^T$$
$$h(x)=(h_1(x),h_2(x),\cdots,h_l(x))^T$$

$f(x),g(x),h(x)$ are the vector valued function; the multi-objective programming problem can be simplified as

$$\min \mathbf{f}(\mathbf{x})$$
$$\text{s.t.}\begin{cases}\mathbf{g}(\mathbf{x})\le 0\\\mathbf{h}(\mathbf{x})=0\end{cases} \qquad \textbf{(20)}$$

Denote the feasible regionthe of formula (20):

$$D=\left\{x\middle|\begin{matrix}g_i(x)\le 0, & i=1,2,\cdots,m\\h_j(x)=0, & i=1,2,\cdots,l\end{matrix}\right.\ x\in R^n$$

Also known as the multiobjective goal programming problem (17) as the vector mathematical programming. If all functions of formula (16) are linear function programming, so it is known as the multiple objective linear programming, i.e.

$$\min \mathbf{C_x}=\left(\mathbf{c_1^Tx},\mathbf{c_2^Tx},\cdots,\mathbf{c_p^Tx}\right)^{\mathbf{T}} \qquad \textbf{(21)}$$

$$s.t.\begin{cases}Ax\le b\\x\ge 0\end{cases}$$

$$C=\begin{cases}c_{11} & c_{12} & \cdots & c_{1n}\\c_{21} & c_{22} & \cdots & c_{2n}\\ & \vdots & & \\c_{p1} & c_{p2} & \cdots & c_{pn}\end{cases},\quad A=\begin{cases}a_{11} & a_{12} & \cdots & a_{1n}\\a_{21} & a_{22} & \cdots & a_{2n}\\ & \vdots & & \\a_{m1} & a_{m2} & \cdots & a_{mn}\end{cases}$$

$$c_i^T=(c_{i1},c_{i2},\cdots,c_{in}),\quad b=(b_1,b_2,\cdots,b_n)$$

Formula (21) also known as the vector linear programming.

(1) Stratified multiobjective programming

Stratified multiobjective programming is the value under the constraint condition; the objective function is not the same for optimization, but according to the intention of policy makers, different priority levels, successively layer optimization. According to the importance, P objective functions are divided into Q priority levels, then the P objective functions is expressed as:

The first layer: $f_1^{(1)}(x),f_2^{(1)}(x),\cdots,f_{p1}^{(1)}(x);$

The second layer: $f_1^{(2)}(x),f_2^{(2)}(x),\cdots,f_{p1}^{(2)}(x);$

$\vdots\ \vdots$

The *qth* layer: $f_1^{(q)}(x),f_2^{(q)}(x),\cdots,f_{p1}^{(q)}(x);$

Among them $p_1+p_2+\cdots+p_a=p$

Denoted by

$$F_1(x)=\left(f_1^{(1)}(x),f_2^{(1)}(x),\cdots,f_{p1}^{(1)}(x)\right)^T$$
$$F_2(x)=\left(f_1^{(2)}(x),f_2^{(2)}(x),\cdots,f_{p1}^{(2)}(x)\right)^T$$
$$\vdots$$
$$F_q(x)=\left(f_1^{(q)}(x),f_2^{(q)}(x),\cdots,f_{p1}^{(q)}(x)\right)^T$$

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The hierarchical multiobjective programming problem can be simplified as

$$\begin{array}{l} \min F_1(x) \\ \min F_2(x) \\ \vdots \\ \min F_q(x) \end{array} \qquad (22)$$

$s.t. \quad x \in D$

If $F_i(x) = f_i(x) \quad (i = 1, 2, \cdots, p)$, so it is called the complete stratified multiobjective programming.

(2) The goal programming

Characteristic of goal programming is: under the constraint condition it is not directly to minimize each objective function, but as far as possible so that each objective function approximation to a given target value.

Given p objective functions

$f(x) = (f_1(x), f_2(x), \cdots, f_p(x))^T$, decision makers hope they can reach their respective target values $\bar{f} = (\bar{f}_1, \bar{f}_2, \cdots, \bar{f}_p)^T$, policymakers hope that they can achieve their respective objectives:

$$f_i(x) \to \bar{f}_i \qquad i = 1, 2, \cdots, p \qquad (23)$$

$\|\bullet\|$ as a norm of a vector space R^p, then the target programming problem can be expressed as $\min_{x \in D} \| f(x) - \bar{f} \|$.

Solution of the multi-objective problem

Multiobjective programming in general form:

$$\min f(x) = (f_1(x), f_2(x), \cdots, f_p(x))^T \qquad (24)$$

$s.t. \quad x \in D$

Among them, the feasible region D:

$$D = \left\{ x \middle| \begin{array}{l} g(x) = (g_1(x), g_2(x), \cdots, g_m(x))^T \le 0 \\ h(x) = (h_1(x), h_2(x), \cdots, h_l(x))^T = 0 \end{array} \right\}, \quad x \in R^n$$

(1) Concept of solution

1 Definitions 1: absolute optimal solution

Set $x^* \in D$, if there are $f_i(x^*) \le f_i(x), \quad i = 1, 2, \cdots, p$ for $\forall x \in D$, so x^* is said to bathe the absolute optimal solution of formula (21), $f(x^*) = (f_1(x^*), f_2(x^*), \cdots, f_p(x^*))$ is the absolute optimal value of formula (24). All the absolute optimal solution in formula (24) consisting of a collection called the absolute optimal solution $z^*(f, D)$, as shown in Figure 1 (a), 1 (b), 1 (c) shows.

In the multi-objective programming problem, the optimal solution is the best solution, but the absolute optimal solution does not exist for the multi-objective programming problem most, in order to introduce other solution concepts, we first introduce the vector order.

Definition 2: sequence of vector. With two vectors: $a = (a_1, a_2, \cdots, a_p)^T, b = (b_1, b_2, \cdots, b_p)^T$

- if $a_i = b_i \ (i = 1, 2, \cdots, p)$, called vector a is equal to the vector b, denoted as a=b; if $a_i = b_i \ (i = 1, 2, \cdots, p)$, called vector a is equal to the vector b, denoted as a=b;
- if $a_i \le b_i \ (i = 1, 2, \cdots, p)$, called vector a is less than or equal to the vector b, denoted as $a \le b$;
- if $a_i \le b_i \ (i = 1, 2, \cdots, p)$ and at least there is a strict inequality establishment, called the vector a is less than the vector b, denoted as $a \lneqq b$;
- if $a_i < b_i \ (i = 1, 2, \cdots, p)$, called vector a is strictly less than the vector b, denoted as a<b, obviously $a \lneqq b$ must have $a \le b$,.

Definitions 3: efficient solution

Set $x^* \in D$, if there is no $x \in D$ for $f(x) \lneqq f(x^*)$,

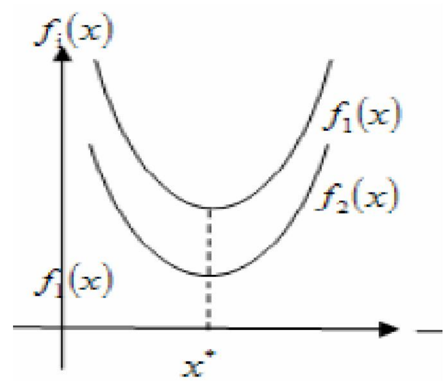

Figure 1a

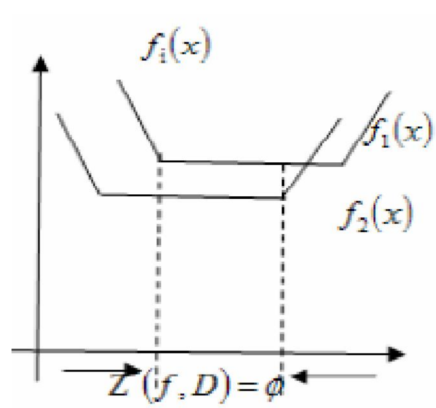

Figure 1b

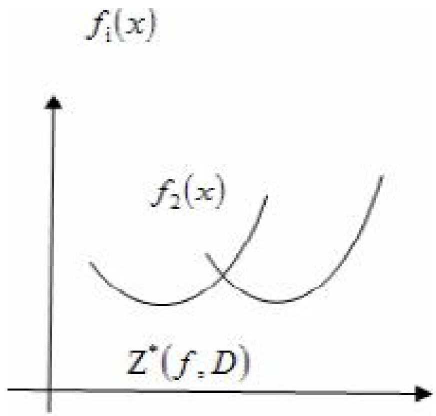

Figure 1c

x^* is the efficient solution of formula(24), also known as the Pareto efficient solution. All efficient solution set of formula (24)is called the efficient solution set, denoted as $P(f,D)$, as shown in Figure 2 (a).

According to the definition of absolute optimal solutions, efficient solutions in general are not "optimal", but we can say that it is "not bad", so often called effective solution for the non inferior solution, acceptable solution.

Definitions 4: weak efficient solution

Set $x^* \in D$, if there is no $x \in D$ for $f(x) < f(x^*)$, x^* is the efficient solution of formula(24), also known as the Pareto efficient solution. All the weak efficient solution consisting of a collection called weakly efficient solution sets, as $P_w(f,D)$, as shown in Figure 2 (b) shows.

(2) Limitations

In the general multi-objective programming prob-

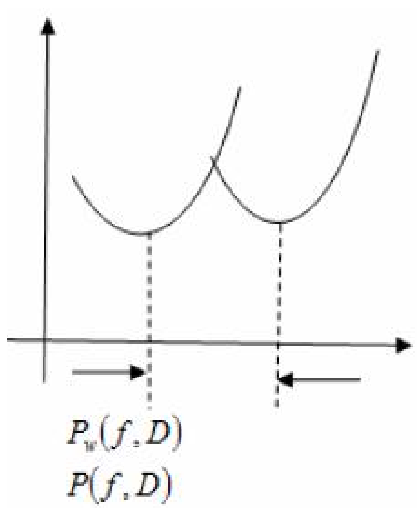

Figure 2a

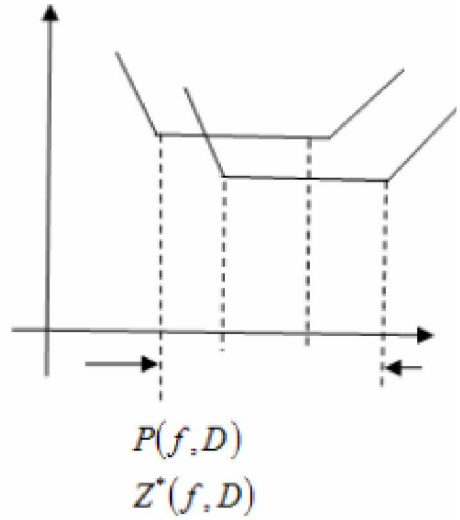

Figure 2b

lem, when we build the model, we will optimize target level, namely: the target according to the importance is turned into the first order, the second order. In the multi-objective programming problem, sometimes in solving their process will give different weights to each target, but in the actual problem, our optimization goal is likely to change over time and present a different importance, namely: with the change of time, established a mathematical model for the importance of the optimization object is not immutable and frozen. In general, because the network traffic is an uncertain value, resulting in our optimization will constantly change follow the changes of network traffic, so the above multi-objective programming in solving this problem shows a mechanical, this mechanical decided had the inevitable limitations in some sense.

Design of control parameters α

According to the above analysis, when the number of network users is larger, we should let the capacity became the main optimization in the objective function, thus the control parameters α should be close to 1 in this case. Similarly, when the network number of users is small, should let the energy consumption becomes the main optimization in the objective function, therefore the control parameters α should be close to 0 in this case. Through the number changes of network users to control the size, so as to realize the adaptive control of the objective function. When the number of users is relatively large, if the traffic demand of users continue to increase, the demand for network capacity will

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be greater, but now the network capacity increase is not simply a linear increase, because this time the congestion rate will increase very fast, so the control parameter α is proportional to the increase of inconsistent with the actual, so at this time the optimization problem of network capacity will become the most important solution to the problems in communications networks. When the number of users is relatively small, if the traffic demand of users continue to decrease, because the network capacity sufficient to meet the needs of these users, so we need not consider the network capacity issues, but considering the energy problem, this time clearly, then the energy consumption will decrease with the reduction of the number of users, but the energy consumption of the network. Reduce and increase is not simply linear, so the control parameter α is proportional to the increase of inconsistent with the actual, so the energy consumption of the network optimization problem will become the first to solve the problems in communications networks. When the number of users is neither too much nor too little case, the capacity optimization and energy consumption is necessary, so according to the analysis, the relationship function between control parameters α and the number of users N as follows:

$$\alpha = 0.5\left(\left(\frac{N-10}{10}\right)^3 + 1\right) \quad (25)$$

The graph of the control parameters α is shown as follows:

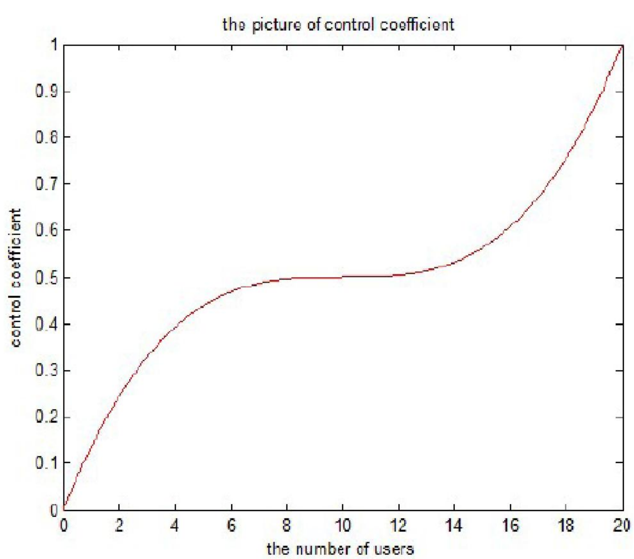

Figure 3 : Relationship between number of users and control coefficient

From the above figure, we can see the control coefficient increases with the number of users, but the control coefficient increased is not linear, because when the number of users rarely, if the user number continues to reduce, the network are considered in the optimization of energy problem, so this time control coefficient drops quickly, so that energy consumption to obtain rapid optimization. Similarly, when the number of users is larger, if the user number continues to increase, then the capacity of the network has become the main factor of restricting network, so we need to make the control coefficient fast rise, the network capacity can rapid optimization.

CONCLUSIONS

With the continuous development of science and technology, as well as the continuous evolution of the network technology, the network number of parameters more and more, different network need between the interoperability, and rapid configuration management increasing number of base station, the emergence of these problems, it needs to operators using better network management to reduce the operation and maintenance cost, so as to realize the intelligent network. Therefore, the long-term evolution of the 3 GPP has put forward the new operation and maintenance strategy, namely self-organizing network.

Through the wireless mobile network of research and analysis to know, in wireless mobile network field power control algorithm research has made a lot of achievements. But, these algorithms are all the same, it is the network of a parameter or several parameters as target optimization. And in fact, different network environment restrict network performance parameters is not the same, this needs power control technology according to the change of network state has the adaptive function. According to this problem, we use different power control algorithm has the same characteristics and of the feasible solution of the multi-objective programming mathematical foundation model, design a power control model. In the model, first of all, we to network state and optimize parameters between objects function relation analysis and design, secondly, through the change of network state influence each power control algorithm of weight. Finally achieve the goal function state changes with the network adaptive optimization.

Finally, the simulation results show that when the user usage, can optimize the network capacity, make its capacity to maximize; On the contrary, when the user use small, to optimize the energy consumption, make its consumption to minimize the power, so as to realize the self organization (SON) from the function of network optimization.

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