STUDY ON POLICY DECISION OF APPOINTED QUESTIONS UNDER FUZZY CONDITIONS AND THE COMPUTER MANAGEMENT SYSTEM

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Abstract: Starting from the classical appointed questions, this paper studies the appointed policy decision under fuzzy conditions, using the theory of fuzzy sets and the quantified approach for `soft' index, this paper tries to solve the problem of how to synthetically handle the fuzzy massages and then get to the best appointment policy decision by the way of classical approach. In this paper, the question of fuzzy appointment policy decision under the condition of single and several elements and the application of permutation in policy decision under the fuzzy conditions. this paper designs the related computer management system in Turbo C language. This system can be used in rapid general policy decision and solving the problem of policy decision with single or several elements under the fuzzy condition.

key words: Fuzzy condition, policy decision of appointment, permutation, management of computer

1 INTRODUCTION

We would ask n people to fulfill m tasks of work given. Having known the tested measure value of some term of every worker who would fulfill different tasks, we wish to get an appointment plan that can make work efficiency highest or get some other best result. Such kind of problem can be called as classical appointment. The asked tested measure value in the above appointment is clear while the implications shown by several data are agreeable. But the appointment in actual management work is often more complicated than this, especially in the one which deals with persons. It's very difficult for a policy decision to get the accurate tested data of every one in varies work, even if in dealing with the work tasks in the same kind. Or even it's impossible. In many cases we have to appoint several different tasks to some persons. The appointment problem like that is even tougher. On the other hand, seeing the test elements, even the tasks are same in nature, testing only one single element is not always enough. For instance, we have now two pieces of language materials, one in English and the other in French, to appoint to two persons to translate. Suppose we have known that A is better than B in translating English while B is better than A in translating French (The test standard is the numbers of characters' symbols correctly translated in a unit time.) But A intends to improve his French level through translating the materials in French while B doesn't want to translate the materials in English because of his own poor English. Thus, if we don't put the elements mentioned above into consideration, we will not be able to fulfill the task of translation. Dealing with m different work tasks; thinking of several elements at the same time; the tested data are not clear, in such a condition we can't fulfil the best appointment simply using the classical appointment theory.Such kind of problem is called a problem of appointment policy decision under fuzzy conditions.

2 THE APPOINTMENT POLICY DECISION UNDER FUZZY CONDITIONS

This section deals with seperatedly the fuzzy appointment policy deision in the conditions of both single and several elements.

2.1 The fuzzy appointment policy decision with single element

Suppose the massages waiting for test expressed by every worker are not clear when we consider of the appointable m workers $(R_1,R_2,\cdots,R_m)$ for the given n tashs $(r_1,r_2,\cdots,r_n)$(r1,r2,...,rn). we will not get clear related test data in such case using the classical approach. Then we can use the fuzzy massage composing method given in [3], to get R_i (i=1, 2, ..., m) and fulfil the fuzzy test data of r_j (J=1,2,...,n).According the routine standard, we take K "Level" fuzzy sets A_i (i=1,2,...,k) the discourse limit being [0,1],namely $A_1,A_2,\cdots,A_k$ is [0,1]→[0,1] used in describing the skillful level or satisfying level.The appointor (appointment decider) builds a cooresponding relationship between the test result and "level" set A_t (t=1,2,...,k) to get the matrix W_j called "impression matrix"

$$W_j=\begin{pmatrix} A_1r_j(R_1) & A_2r_j(R_1) & \cdots & A_kr_j(R_1) \\ A_1r_j(R_2) & A_2r_j(R_2) & \cdots & A_kr_j(R_2) \\ \cdots & \cdots & \cdots & \cdots \\ A_1r_j(R_m) & A_2r_j(R_m) & \cdots & A_kr_j(R_m) \end{pmatrix}$$

Among this matrix, $A_ir_j(R_s)$ indicates that the numerical value of the "level sets A_i" responding to the fulfilment of r_j (tasks) by R_s (people).i=1,2,...,k, s=1,2,...,m. Assuming j=1,2,...,n, we get n "impression matrixes $W_1^{\prime\prime},W_2,\cdots,W_n.W_j$ is a fuzzy informatin. in daily work ,it's difficult to say a policy maker can exactly grasp the very real condition. it's difficult to say that the informationsa decission maker knows are all true . There might be some false in the test data gotten even in the condition of distinguished factors given.But if we can anylize the connection of several informations in the view of system and entirety, we therefore can eliminate the false and retain the true.

For example,talking about the information of the workman R's working on the task Y,suppose the factor to be investigated was the working speed,because of the limit of the materials kept by policymaker,when R is first asked for the working speed of task Y ,maybe the policymaker answers "it's Ok ". But after a period of time, when the policymaker associates task Y with the other facts, his answer may become "it's not so good".(This is just the expression of shifting idea in management policy.) Obviously,these two answers are different,no one of them can be considered as the grounds of policy, so they should be considered comprehensively. K fuzzy sets in different degrees are taken. The number of K is decided by the actual situation.Along with the change of the fuzzy sets in different degrees,the policymaker's attention to certain skill of R_i (i=1,2,..,m) also changes. All the shfting possibilities should be considered comprehensively in order to get useful information. this is why K fuzzy sets are taken,but not one fuzzy sets taken simply.

The basic steps of dealing with the gettable fuzzy information metioned above are expressed in the following:

(1) if line S in W_j is taken as row i, i=1,2,...,n, the new matrix $\tilde{R}_j$ is to be got .It is called as $\tilde{R}_j$'s matrix of personal ability.

$$\tilde{R}_j=\begin{pmatrix} A_1r_1(R_j) & A_1r_2(R_j) & \cdots & A_1r_n(R_j) \\ A_2r_1(R_j) & A_2r_2(R_j) & \cdots & A_2r_n(R_j) \\ \cdots & \cdots & \cdots & \cdots \\ A_nr_1(R_j) & A_nr_2(R_j) & \cdots & A_nr_n(R_j) \end{pmatrix}$$

If i=1,2,...,m, is taken, m matrix of personal ability will be got: $\tilde{R}_1,\tilde{R}_2,\cdots,\tilde{R}_m$

(2) If $A_1, A_2, \cdots, A_k$ plus proportion, proportion matrix Q will be got . Q=$(q_1, q_2, \cdots, q_k)$, to meet the need of $q \in [0,1]$, $\sum_{i=1}^{k} q_i = 1$ the rules for plus proportion are in the following,the larger proportion is given to A_i which is helpful to finish the task,the smaller proportion or zero is given to the opposite side.

(3) To calculate $Q \cdot \tilde{R}_s$, s=1,2,...,m, the commmon multiplication of matrix is taken here. $Q \cdot R_s$ is considered as the satisfied show of finishing all kinds of tasks: $B = (Q \cdot R_1 \ \ Q \cdot R_2 \ \cdots \ Q \cdot R_m)^T$

(4) When the classical designating method is used, B is worked out. By this way the superior designating could be got out.

Example 1 There are three workmen $R_1\ R_2\ R_3$, and three kinds of the work $r_1\ r_2\ r_3$. To certain target, the fuzzy sets degree: A_1(good), A_2(just so so), A_3(not so good). Having already known the policymaker can work out the practical problem:

$$W_1 = \begin{bmatrix} 0.7 & 0.4 & 0.3 \\ 0.6 & 0.2 & 0.1 \\ 0.3 & 0.6 & 0.4 \end{bmatrix} \quad W_2 = \begin{bmatrix} 0.1 & 0.6 & 0.4 \\ 0.9 & 0.0 & 0.2 \\ 0.3 & 0.7 & 0.2 \end{bmatrix} \quad W_3 = \begin{bmatrix} 0.1 & 0.2 & 0.8 \\ 0.9 & 0.1 & 0.0 \\ 0.6 & 0.4 & 0.1 \end{bmatrix}$$

So the ability matrix of $R_1\ R_2\ R_3$ is expressed in the following :

$$\tilde{R}_1 = \begin{bmatrix} 0.7 & 0.1 & 0.1 \\ 0.4 & 0.6 & 0.2 \\ 0.3 & 0.4 & 0.8 \end{bmatrix} \quad \tilde{R}_2 = \begin{bmatrix} 0.6 & 0.9 & 0.9 \\ 0.2 & 0.0 & 0.1 \\ 0.1 & 0.2 & 0.0 \end{bmatrix} \quad \tilde{R}_3 = \begin{bmatrix} 0.3 & 0.3 & 0.6 \\ 0.6 & 0.7 & 0.4 \\ 0.4 & 0.2 & 0.1 \end{bmatrix}$$

Take $Q = (0.6\ \ 0.3\ \ 0.1)$ as proportion matrix . Then

$$Q \cdot \tilde{R}_1 = (0.6\ \ 0.3\ \ 0.1) \begin{pmatrix} 0.7 & 0.1 & 0.1 \\ 0.4 & 0.6 & 0.2 \\ 0.3 & 0.4 & 0.8 \end{pmatrix} = (0.57\ \ 0.28\ \ 0.20) \quad Q \cdot \tilde{R}_2 = (0.6\ \ 0.3\ \ 0.1) \begin{pmatrix} 0.6 & 0.9 & 0.9 \\ 0.2 & 0.0 & 0.1 \\ 0.1 & 0.2 & 0.0 \end{pmatrix} = (0.43\ \ 0.56\ \ 0.57)$$

$$Q \cdot \tilde{R}_3 = (0.6\ \ 0.3\ \ 0.1) \begin{pmatrix} 0.3 & 0.3 & 0.6 \\ 0.6 & 0.7 & 0.4 \\ 0.4 & 0.2 & 0.1 \end{pmatrix} = (0.40\ \ 0.41\ \ 0.49) \qquad \text{Then:} \quad B = \begin{bmatrix} Q \cdot \tilde{R}_1 \\ Q \cdot \tilde{R}_2 \\ Q \cdot \tilde{R}_3 \end{bmatrix} = \begin{bmatrix} 0.57 & 0.28 & 0.20 \\ 0.43 & 0.56 & 0.57 \\ 0.40 & 0.41 & 0.49 \end{bmatrix}$$

Now using the classical designating method can work out B and get the superior designating $R_1 \to r_1$, $R_2 \to r_2$, $R_3 \to r_3$

2.2 The fuzzy designating policy of many factors

Suppose there L factors $F_1, F_2, \cdots, F_L$ to F_i (i=1,2,...,l),making use of the method in "2.1" canwork out the personal ability matrix $F_1R_j\ \ F_2R_j\ \cdots\ F_lR_j$ of R_j (j=1,2,...,m), and find out $Q_1 \cdot F_1R_j$, $Q_2 \cdot F_2R_j, \cdots, Q_L \cdot R_j$ .Q_i (i=1,2,...,l) is considered as proportion matrix of the different fuzzy sete to factor F_i. In the respect F_1, $F_2, \cdots, F_L$, it is taking propertion matrix $(f_1\ \ f_2\ \cdots\ f_L)$.Its principle is that larger proportion is given to the beneficial factors, and meet the need of $f_i \in [0,1]$, $\sum_{i=1}^{L} f_i = 1$ calculate:

$$(f_1\ f_2\ \cdots\ f_L)\cdot\begin{pmatrix} Q_1\cdot F_1R_j \\ Q_2\cdot F_2R_j \\ \vdots \\ Q_L\cdot F_LR_j \end{pmatrix}=WR_j$$

It is called as the personal ability matrix of R_j for the factor of $F_1,F_2,\cdots F_L$ Taking j=1,2,...,m can get

$B=(WR_1\ WR_2\ \cdots\ WR_m)^T$.Then using classical designating method again.

Example 2 Now there are three university graduates $R_1\ R_2\ R_3$ who want to be sent to do the following jobs r_1 (department secretary); r_2 (teaching); r_3 (scientific research).Having known the following cases about them: their average marks of the main causes are 84, 75, 92. Their political conditions R_1 and R_2 are communist party member, R_3 is the superior student in the respects of quality ,inteligence and health in all previous years. Their speaking abilities R_1 is good, R_2 and R_3 are just so so . Their personal aspiration: R_1 (1 doing scientific reseach, 2 teaching, 3 administration); R_2 (1 doing scientific research, 2 administration, 3 teaching) R_3 (1 scientific research, 2 teaching, 3 administration). Now two factors should be checked, F_1 (about their basic condition), F_2 (their personal aspiration).To F_2, the fuzzy sets of different degrees are as the following: A_1 (suitable for doing the job), A_2 (not suitable for doing the job).Suppose having got the following corresponding relation:

$$W_1=\begin{pmatrix} R_1 & 0.7 & 0.2 \\ R_2 & 0.8 & 0.2 \\ R_3 & 0.5 & 0.5 \end{pmatrix}\quad W_2=\begin{pmatrix} R_1 & 0.8 & 0.1 \\ R_2 & 0.6 & 0.4 \\ R_3 & 0.7 & 0.3 \end{pmatrix}\quad W_3=\begin{pmatrix} R_1 & 0.7 & 0.2 \\ R_2 & 0.5 & 0.5 \\ R_3 & 0.9 & 0.0 \end{pmatrix}$$

Then:

$$F_2R_1=\begin{pmatrix} r_1 & r_2 & r_3 \\ 0.7 & 0.8 & 0.7 \\ 0.2 & 0.1 & 0.2 \end{pmatrix}\quad F_2R_2=\begin{pmatrix} r_1 & r_2 & r_3 \\ 0.8 & 0.6 & 0.5 \\ 0.2 & 0.4 & 0.5 \end{pmatrix}\quad F_2R_3=\begin{pmatrix} r_1 & r_2 & r_3 \\ 0.5 & 0.7 & 0.9 \\ 0.5 & 0.3 & 0.0 \end{pmatrix}$$

To $A_1\ A_2$,taking proportion matrix $Q_2=(1\ 0)$ so:

$Q_2\cdot F_2R_1=(0.7\ 0.8\ 0.7)$ $Q_2\cdot F_2R_2=(0.8\ 0.6\ 0.5)$ $Q_2F_2R_3=(0.5\ 0.7\ 0.9)$

To factor F_1, taking fuzzy sets of different degrees: A_1 (very suitable), A_2 (suitable), A_3 (not suitable). Suppose having got the following corresponding relation:

$$W_1=\begin{bmatrix} 0.0 & 0.1 & 1.0 \\ 0.1 & 0.3 & 0.7 \\ 0.0 & 0.1 & 0.1 \end{bmatrix}\quad W_2=\begin{bmatrix} 0.1 & 0.3 & 0.7 \\ 0.0 & 0.1 & 1.0 \\ 0.1 & 0.3 & 0.7 \end{bmatrix}\quad W_3=\begin{bmatrix} 1.0 & 0.7 & 0.0 \\ 1.0 & 0.7 & 0.0 \\ 1.0 & 0.7 & 0.3 \end{bmatrix}$$

Then

$$F_1R_1=\begin{bmatrix} 0.0 & 1.0 & 0.1 \\ 0.1 & 0.3 & 0.7 \\ 1.0 & 0.7 & 0.0 \end{bmatrix}\quad F_1R_2=\begin{bmatrix} 0.1 & 0.0 & 1.0 \\ 0.3 & 0.1 & 0.7 \\ 0.7 & 1.0 & 0.0 \end{bmatrix}\quad F_1R_3=\begin{bmatrix} 0.0 & 0.1 & 1.0 \\ 0.1 & 0.3 & 0.7 \\ 1.0 & 0.7 & 0.0 \end{bmatrix}$$

To $A_1\ A_2\ A_3$, taking $Q_1=(0.6\ 0.4\ 0.0)$ Then: $Q_1\cdot F_1R_1=(0.04\ 0.18\ 0.88)$ $Q_1\cdot F_1R_2=(0.18\ 0.04\ 0.88)$ $Q_1\cdot F_1R_3=(0.04\ 0.18\ 0.88)$.To $F_1\ F_2$, taking $Q=(0.6\ 0.4)$ will get the following:

$$WR_1=(0.6\ 0.4)\cdot\begin{bmatrix} Q_1\cdot F_1R_1 \\ Q_2\cdot F_2R_1 \end{bmatrix}=(0.30\ 0.43\ 0.81)\quad WR_2=(0.6\ 0.4)\cdot\begin{bmatrix} Q_1\cdot F_1R_2 \\ Q_2\cdot F_2R_2 \end{bmatrix}=(0.43\ 0.26\ 0.73)$$

$$WR_3 = (0.6\ 0.4)\cdot\begin{bmatrix} Q_1 \cdot F_1R_3 \\ Q_2 \cdot F_2R_3 \end{bmatrix} = (0.22\ 0.39\ 0.89) \quad \text{Then}: B = \begin{bmatrix} 0.30 & 0.43 & 0.81 \\ 0.43 & 0.26 & 0.73 \\ 0.22 & 0.39 & 0.89 \end{bmatrix}$$

Using classical designating method can work out and get the superior designating $R_1 \to r_2$, $R_2 \to r_1$, $R_3 \to r_3$

3 THE APPLYING OF ARRANGING THE ORDER IN DESIGNTING POLICY UNDER THE FUZZY CONDITION

Having already known that n. kinds of work will be assigned to n workmen. Suppose the information structure gained by policymakers was as the following: each one's degree of his skill for work task decided r_i (i=1,2,...,n), or the satisfied degree for the finished task forms a chain W from the front to the back. And to R_j workmen decided, the satisfied degree of finishing each kind of task also forms a chain M_j from the front to the back. Under this condition, to realize the best designating based on this order, one must consider the relation of the two orders. That is to put the satisfied degree for finish r_i by R_j in the fmt position of the middle part. Use $f(R_j\ r_i)$ expresses the satisfied degree for fimshing r_i by R_j .Then $f(R_j\ r_i)$'s position in each chain shows the satisfied degree for finishing r_i by R_j Taking the amount of the position number of the sequence of $f(R_j\ r_i)$ in the two chains as f_{ji}, which can be used as the datums for Rj finishing ri. This forms the table 1 . According to the classical destinating method ,it can be solved as the following .

	r_1	r_2	$\cdots$	r_n
R_1	f_{11}	f_{12}	$\cdots$	f_{1n}
R_2	f_{21}	f_{22}	$\cdots$	f_{2n}
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
R_n	f_{n1}	f_{n2}	$\cdots$	f_{nn}

(1)

	r_1	r_2	r_3	r_4
R_1	5	6	3	5
R_2	2	3	8	6
R_3	4	8	5	3
R_4	5	5	4	8

(2)

For example 3 Taking n=4 as the known condition,

$$\}W\begin{cases} To\ r_1, W_1\ is: f(R_2\ r_1) \geq f(R_3\ r_1) \geq (R_4\ r_1) \geq f(R_1\ r_1) \\ To\ r_2, W_2\ is: f(R_2\ r_2) \geq f(R_4\ r_2) \geq f(R_1\ r_2) f(R_3\ r_2) \\ To\ r_3, W_3\ is: f(R_1\ r_3) \geq f(R_3\ r_3) \geq f(R_4\ r_3) \geq f(R_2\ r_3) \\ To\ r_4, W_4\ is: f(R_1\ r_4) \geq f(R_3\ r_4) \geq f(R_4\ r_4) \geq f(R_2\ r_4) \end{cases}$$

$$M\begin{cases} To\ R_1, M_1\ is: f(R_1\ r_1) \geq f(R_1\ r_3) \geq f(R_1\ r_2) \geq f(R_1\ r_4) \\ To\ R_2, M_2\ is: f(R_2\ r_1) \geq f(R_2\ r_2) \geq f(R_2\ r_4) \geq f(R_2\ r_3) \\ To\ R_3, M_3\ is: f(R_3\ r_4) \geq f(R_3\ r_1) \geq f(R_3\ r_3) \geq f(R_3\ r_2) \\ To\ R_4, M_4\ is: f(R_4\ r_3) \geq f(R_4\ r_1) \geq f(R_4\ r_2) \geq f(R_4\ r_4) \end{cases}$$

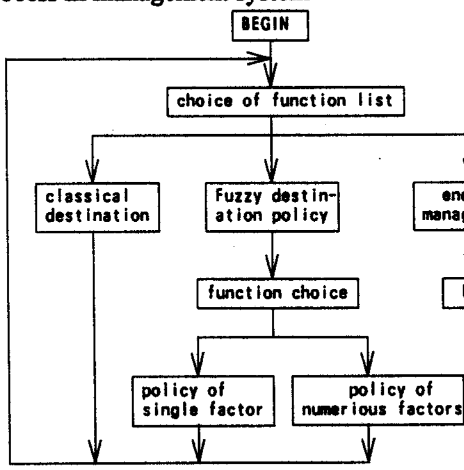
According to W and M , the table of the checking number is got as the table 2. If it is explained by the classical destinating method, the best destinating is $R_1 \to r_1$, $R_2 \to r_3$, $R_3 \to r_2$, $R_4 \to r_4$.

When the condition is not so strong, the element in W,M only can be arranged the order for two among them. In this case,the duality compared ordermg method is needed (this will be introduced in another article) to get W,M. Then explain it.

4 THE MANAGEMENT SYSTEM OF THE COMPUTERS

This essay studies about the work as signment to many personal work. But something in the theory for this item used more extensively is the destinating policy of the numerious working groups and the policy for the progect bids. For the convienient of the applying, we have designed the relative management system of the coputers. By the use of this method, the operating possibilities can be greathy strongthened.

4.1 The fig. of the technological process in management system



4.2 The instructions for the system

This system is composed be the language of Turbo C. It makes use of the conversational form to give the prompt for consumers' operating. This system can be run on IBM--PC and on its relatire airliners. This system has the characteristics of simple and easy operating and of fast speed of dealing with the datums.

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