JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Short Note of Problem Formulation on Different type of Goal Programming

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Abstract:
In this paper we focused on Different type of Goal Programming problem. In order to deal with such a problem formulation based on Different Type of problem according to the Goal Programming problem in Linear Programming. With respect to its properties, efficient solution and strength of the suggested model are given. Further a comparison id made with different existing method.

Keywords: Goal Programming, Fuzzy Goal Programming, Multi-Goal Programming, Linear Programming

1. Introduction:
Goal Programming is a mathematical optimization technique to solve, conflicting objective. Itself a part of multi criteria decision analysis Goal programming is multi criteria making techniques used in fuzzy goal programming approach [1-3]. Goal Programming is a method of dealing with multi objective programming was introduced by Charnes and copper [4].Goal Programming is assumed that the aspiration level of the objectives are known precisely. The objective function of Goal Programming is to minimize the sum of the weighted deviation from the goals, either positive or negative. The value of the objective function indicates the overall deviation from the goal. A Goal with an imprecise aspiration level could be optimized by fuzzy set theory. Fuzzy Goal Programming has been solve to deal with multi objective problem. The multi objective optimization, weight additive models have used in fuzzy Goal Programming approach [1-3]. The weighted models is presented by Yaghoobi el. al. [5]. The goal at the certain priority level are considered to be infinitely more important than the goal at the next level. A Goal Programming is as a method in multi objective optimization, there are some gaps in its usage in our real life, our main focus is on fuzzy goal programming to solve multi objective problem. This model is based on fuzzy goal programming. An efficient solution is achieved if the new model has a unique optimal solution. The new model may be considered as a modification of the weighted additive model which was presented by Yaghoobi et al. in [5]. The basic concept of goal programming is that an objective will be stated in which optimization gives a result which come as possible to the desired goals. In single goal programming problem, the formulation and solution is similar to linear programming is to convert original multiple objectives into a single goal. Weighted Goal Programming are attached to each of the objectives to measure the relative importance deviations. Weighted Goal Programming observed several objectives simultaneously by establishing a specific numeric goal for each of the objectives and find a solution that comes close to each of these goals. In goal programming, the objective function contains primarily the deviational variable is highly correlated to another variable called an auxiliary variable and the data an auxiliary variable are either available can be easily obtained. The objective of goal programming is to minimize the achievement of each actual goal level. The formulation and solution is similar to linear programming with the exception that, goal programming will attain solution and information to the decision makers. The goal programming is to convert original multi objective into a single.

2. Problem Formulation of Goal Programming Problem:

Case 1.

Let M_k be the optimal value of M_k under optimum allocation for the k_{th} characteristics obtained by solving the following integer non-linear programming for all the k = 1, 2…….q.

Minimize

$$M_k = \sum_{f=1}^{R} \frac{\alpha_{kf}}{p_f}$$

Subject to

$$\sum_{f=1}^{R} (g_{fl} + d_{fl} g_{fll})\, p_f \leq \widetilde{D}$$

$$2 \leq p_f \leq p'_f$$

and p_f integer; f = 1, 2………R

$$\widetilde{M_k} = \widetilde{M}_k(p_1, p_2 \ldots\ldots\ldots p_R) = \sum_{h=1}^{R} \frac{\alpha_{kf}}{p_f}$$

Denote the variance under the compromise allocation,
Where p_f ; f = 1, 2………R are to be worked out.
Obviously $\widetilde{M}_k \geq M_k$ and $\widetilde{M}_k - \widetilde{M}_k \geq 0$;
j = 1, 2……..q will give the increase in the variances due to not using the individual optimum allocation for k_{th} characteristics.
Let $e_k \geq 0$ denote the tolerance limit specified for ($\widetilde{M}_k \geq M_k$); k = 1, 2……..q
We have

$$\widetilde{M}_k - M_k \leq e_k;\ k = 1, 2\ldots\ldots q$$

$$\text{or, } \widetilde{M}_k - e_k \leq M_k;\ k = 1, 2\ldots\ldots\ldots q$$

$$\text{or, } \sum_{f=1}^{R} \frac{\alpha_{kf}}{p_f} - e_k \leq M_k;\ k = 1, 2\ldots\ldots\ldots q$$

The suitable compromise criterion to work out a compromise allocation at case 1. to minimize the sum of deviations e_k
Therefore the goal programming problem at case 1 is given as:
Minimize

$$\sum_{k=1}^{q} e_k$$

Subject to

$$\sum_{f=1}^{R} \frac{\alpha_{kf}}{p_f} - e_k \leq M_k$$

$$\sum_{f=1}^{R} (g_{fl} + d_{fl} g_{fl}) p_f\ \widetilde{D}_{\circ}$$

$$2 \leq p_f \leq p'_f$$

$$e_k \geq 0 \text{ and } p_k \text{ integers}$$

$$f = 1, 2\ldots\text{R};\ k = 1, 2\ldots\ldots q$$

Where $e_k \geq 0$; k = 1, 2………q are the goal variable,
The goal is now to minimize the sum of deviations from the respective optimum variances.

Case 2.

Similarly, Goal programming formulation of the problem.
Minimize

$\sum_{k=1}^{q} e'_k$

Subject to

$\sum_{f=1}^{R} \frac{\beta_{kf}}{z_f 2}$ - $e'_k \leq M'_k$

$\sum_{f=1}^{R} \boldsymbol{g_{fl2}} \, z_{f2} \leq \widetilde{D}'_{\circ}$

$2 \leq z_{f2} \leq p_{f^2}$

$e'_k \geq 0$

And z_{f^2} integer f = 1, 2…….R; k = 1, 2………..q

3. Problem Formulation on Fuzzy Goal Programming:

Fuzzy goal programming is formulated by Akoz and Petrovic [6]. It's followed by Li, Hu [7] and [cheng]. It suggested sequential approach in fuzzy goal programming, the important hierarchy of the goal is imprecise has presented by Arenas-parra el al. [8].
The model of goal programming with fuzzy is given as:

Maximize:

$$\lambda \sum_{b=1}^{z} (1- \frac{y_p}{x_p - g_p}) + (1- \lambda) \sum_{(p,q)=1}^{z} p \neq q$$

$$\sum_{h=1}^{3} b_{S_h}(p,q) \mu_{S_h}(p,q)$$

Subject to

g_p(k) $+ y_p - t_p = x_p$; p = 1……….z

1-($\frac{y_p}{x_p - \underline{g_p}}$ -$\frac{y_p}{x_q - \underline{g_q}}$) $\geq \mu_{\tilde{S}_1}(p, q)$'

If $d_{\tilde{S}}$ (p, q) = 1

1-($\frac{y_p}{x_p - \underline{g_p}}$ -$\frac{y_p}{x_p - \underline{g_p}}$) $\geq \mu_{\tilde{S}_2}(p, q)$

If $d_{\tilde{S}_2}$(p, q) =1

$\frac{y_q}{x_p - \underline{g_p}}$ - $\frac{y_p}{x_p - g_p} \geq \mu_{\tilde{S}_3}$ (p, q)

If $d_{\tilde{S}_3}$ (p, q) = 1

$0 \leq$ $d_{\tilde{S}_h}$ $(p, q) \leq 1$, h =1, 2, 3

$y_p, t_p \geq 0, y_p \times t_p = 0, p$ = 1………k

$k \in x$

Where 0 ≤ λ ≤ 1, and g (k) is the p^{th} linear function of the k vector of decision variable, p = 1 …z

Also, y_p and t_i and the negative and positive deviations, respectively, while x_p is the aspiration level and g_i is the anti-idea value for the i^{th} fuzzy goal constraint. Moreover, $d_{\tilde{S}}(p, g)$ (h = 1,2,3) is a binary variable associated with the membership function of the h^{th} importance relation (Slightly, moderately, significantly) of the p^{th}

goal more than the q^{th} goal; while $\mu_{\tilde{S}_h}(p, g)$ is the membership function of the h^{th} imprecise relation between the p^{th} and the q^{th} fuzzy goal.
Finally, x is a set of constraints which define the feasible set of the problem.
Hence, it is assume that the normalized deviation for the p^{th} fuzzy goal constraint between zero and one.

$$0 \leq y_p/(x_p - \underline{g_p}) \leq 1$$

This assumption may be violated, especially when the anti-ideal value is close to the aspiration level. In this case, $y_p/\,(x_p - \underline{g_p})$ may exceed one, due a small denominator value, which means that the value of the achieved goal is worse than the anti-ideal value of that goal.
Accordingly, for each class, the following constraints should be incorporated in the model

$$y_p \ \leq x_p - g_q \ (1)$$

If the negative deviation is required to be minimized for the p^{th} fuzzy goal constraints,

i.e. if g_i(k) ≥ x or $t_p \leq \underline{g_p}$- x (2)

If the positive deviation is required to be minimized for the p^{th} fuzzy goal constraint,

If $g_l(k) \leq x_p$

Constraint (1) and (2) correspond to the non-negative of the membership function of fuzzy goal constraints given by Akoz and petrovic [6].

4. Problem Formulation of Multiple-Goal Programming:

The multiple goal programming model is presented below:

$$min \sum_{p \in E} \ \sum_{q \in E \cap q \neq p} \ \sum_{r \in R \cap r \neq 0} \ z_{pq} \ \frac{(m^1{}_{pqr} + m^2{}_{pqr})}{2}$$

$$min \ \ \sum_{p = E} \ \sum_{q \in E \cap q \neq p} \ \sum_{r \in R \cap r \neq 1} (m^1{}_{pqr} \text{ -} m^2{}_{pqr})$$

$$m^l{}_{pqo} = 0$$

$$\sum_{q \in E \cap q \neq 1} min^1_{1qr} \ = \ F_r$$

$$m^2_{pqt} = (1 - S_{pqr}) m^1_{pqr}$$

$$\sum_{q \in E \cap q \neq p} m^1_{pqr} = H_{p,r-1} - n_{p,r-1}$$

$$m^1_{bqr} \leq f_{pq} I$$

$$\sum_{p \in E \cap p \neq q} x^2_{pqr} = H_{qr}$$

$$\sum_{p \in E} H_{pg} \leq \sum_{p=1}^{g} F_r$$

$0 \leq n_{pr} \leq \underline{\propto}_p \, J_p$

$0 \leq \ n_{pr} \leq \propto_p \beta_p h_p$

$$\sum_{r \in R} F_r = F$$

$$z_{pq} \geq 0, 0 \leq S_{pq} \leq 1, m^1_{pqr} \geq 0, m^2_{pqr} \geq 0, F_r \geq 0$$

In the Goal Programming model, every route has the two objective function are combined as:

$$\min\ \omega_1 \sum_{p\in E} \sum_{q\in E\cap q\neq p} \sum_{r\in R\cap r\neq 0} z_{pq} \frac{(m^1_{pqr}}{2} + m^2_{pqr}$$

$$+\ \omega_2 \sum_{p\in E} \sum_{q\in E\cap q\in p} \sum_{r\in R\cap r\neq 0} (m^1_{pqr} - m^2_{pqr})$$

The coefficient ω_1 and ω_2 represent the importance of efficiency and safety of the flows.

5. Conclusion:

We proposed formulation of goal Different type of goal programming. It's varying the weight in the model, different solution could be obtained. With regard to its principal properties, at least efficient solution is achieved if the formulation has a unique optimal solution. To emphasis the advantages of the new formulation, a comparison has been made with some existing method. The Goal Programming and fuzzy programming technique and some other techniques like dynamic programming and separable programming can be used to solve a wide variety of mathematical programming problem. In such cases the formulated problems becomes as multivariate stochastic programming.

6. Reference:

[1] Chen LH, Tsai FC. Fuzzy goal programming with different importance and priorities. *Eur J Oper Res.* 2001; 133:548–556

[2] Hannan EL. *On fuzzy goal programming. Decis Sci*. 1981; 12:522–531.

[3] Tiwari RN, Dharmar S, Rao JR. Fuzzy goal programming: an additive model. *Fuzzy Sets Syst.* 1987; 24:27–34.

[4] Dantzig GB. Linear programming and extensions. *Princeton: Princeton University Press;* 1963.

[5] Rivaz S, Yaghoobi MA. Some results in interval multi objective linear programming for recognizing different solutions. *OPSEARCH.* 2015; 52:75–85.

[6] Aköz, O. and Petrovic, D. (2007) A Fuzzy Goal Programming Method with Imprecise Goal Hierarchy. *European Journal of Operational Research,* 181, 1427-1433. http://dx.doi.org/10.1016/j.ejor.2005.11.049

[7] Li, S. and Hu, C. (2009) Satisfying Optimization Method Based on Goal Programming for Fuzzy Multiple Objective Optimization Problem. *European Journal of Operational Research,* 197, 675-684. http://dx.doi.org/10.1016/j.ejor.2008.07.007

[8] Arenas-Parra, M., Bilbao-Terol, A. and Jiménez, M. (2015) Standard Goal Programming with Fuzzy Hierarchies: *A Sequential Approach. Soft Computing*. http://dx.doi.org/10.1007/s00500-015-1644-2