

MULTICRITERIA INTEGER PROGRAMMING: A (HYBRID) DYNAMIC PROGRAMMING RECURSIVE APPROACH

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Dynamic programming recursive equations are used to develop a procedure to obtain the set of efficient solutions to the multicriteria integer linear programming problem. An alternate method is produced by combining this procedure with branch and bound rules. Computational results are reported.

Key words: Multicriteria Optimization, Integer Programming, Dynamic Programming.

1. Introduction

This paper presents a new approach to solving multicriteria integer linear programming problems. The approach is an extension of the fundamental dynamic programming recursive equation. Relaxations and fathoming criteria which are fundamental to branch and bound procedures, are suggested to obtain an alternate hybrid approach.

The problem of concern is formulated as follows.

$$\begin{aligned} \text{(MCILP)} \quad & \text{v-max} \quad \left\{ \sum_{n=1}^N C^n x_n \right\} = \{Cx\}, \\ & \text{s.t.} \quad \sum_{n=1}^N a^n x_n \leq b \triangleq S, \\ & \quad k \geq x \geq 0, \quad \text{integer.} \end{aligned}$$

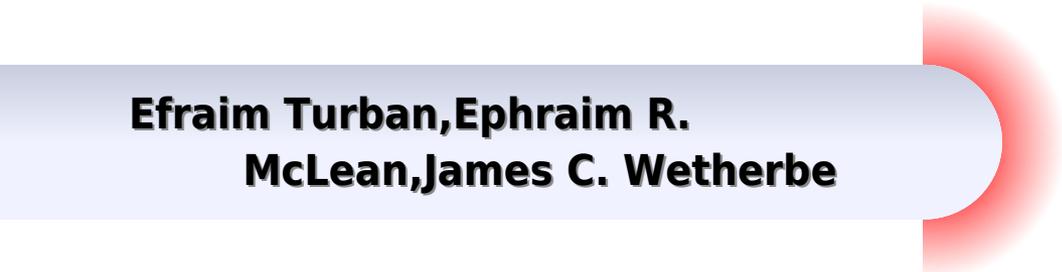
where $C^n = (c_{1n}, \dots, c_{pn})'$, $a^n = (a_{1n}, \dots, a_{mn})'$ and $k = (k_1, k_2, \dots, k_N)$ denote vectors of integers, and v-max (vector maximization) is used to differentiate the solution from the common single objective maximization. The solution to (MCILP) is a set of integer points, $X^0(b)$, called efficient, such that if $x^0 \in X^0(b)$, there does not exist any other feasible point, x , with

$$Cx \geq Cx^0$$

with at least one strict inequality. For the case in which $k_n = 1$, for all n , Bitran [3, 4] and Simopoulos [19] have developed procedures that generate the set of

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