

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

Bernardo VILLARREAL

*Instituto Tecnológico y de Estudios Superiores de Monterrey, Monterrey, Nuevo Leon, Mexico*

Mark H. KARWAN

*Industrial Engineering, State University of New York at Buffalo, Amherst, NY, U.S.A.*

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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.

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

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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## **Table of Contents Chapter 9 Multicriteria Integer Linear Optimization Via**

1. Understanding the eBook Chapter 9 Multicriteria Integer Linear Optimization Via
  - The Rise of Digital Reading Chapter 9 Multicriteria Integer Linear Optimization Via
  - Advantages of eBooks Over Traditional Books
2. Identifying Chapter 9 Multicriteria Integer Linear Optimization Via
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Chapter 9 Multicriteria Integer Linear Optimization Via
  - User-Friendly Interface
4. Exploring eBook Recommendations from Chapter 9 Multicriteria Integer Linear Optimization Via
  - Personalized Recommendations
  - Chapter 9 Multicriteria Integer Linear Optimization Via User Reviews and Ratings
  - Chapter 9 Multicriteria Integer Linear Optimization Via and Bestseller Lists

5. Accessing Chapter 9 Multicriteria Integer Linear Optimization Via Free and Paid eBooks
  - Chapter 9 Multicriteria Integer Linear Optimization Via Public Domain eBooks
  - Chapter 9 Multicriteria Integer Linear Optimization Via eBook Subscription Services
  - Chapter 9 Multicriteria Integer Linear Optimization Via Budget-Friendly Options
6. Navigating Chapter 9 Multicriteria Integer Linear Optimization Via eBook Formats
  - ePub, PDF, MOBI, and More
  - Chapter 9 Multicriteria Integer Linear Optimization Via Compatibility with Devices
  - Chapter 9 Multicriteria Integer Linear Optimization Via Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Chapter 9 Multicriteria Integer Linear Optimization Via
  - Highlighting and Note-Taking Chapter 9 Multicriteria Integer Linear Optimization Via
  - Interactive Elements Chapter 9 Multicriteria Integer Linear Optimization Via
8. Staying Engaged with Chapter 9 Multicriteria Integer Linear Optimization Via
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Chapter 9 Multicriteria Integer Linear Optimization Via
9. Balancing eBooks and Physical Books Chapter 9 Multicriteria Integer Linear Optimization Via
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Chapter 9 Multicriteria Integer Linear Optimization Via
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Chapter 9 Multicriteria Integer Linear Optimization Via
  - Setting Reading Goals Chapter 9 Multicriteria Integer Linear Optimization Via
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Chapter 9 Multicriteria Integer Linear Optimization Via
  - Fact-Checking eBook Content of Chapter 9 Multicriteria Integer Linear Optimization Via
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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