Table of Contents

Foreword xxiv

Preface xxvii

Acknowledgment xxix

Section 1
Mathematical Operation of the Order Picking Problem

Chapter 1
Variable Neighborhood Search Algorithm for the Variable Cost and Size Bin Packing Problem 1
Héctor J. Fraire-Huacuja, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Alejandro Estrada Padilla, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Laura Cruz-Reyes, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Claudia Gómez-Santillán, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Nelson Rangel-Valdez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
María Lucila Morales-Rodríguez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Juan Frausto, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Chapter 2
Tri-Objective Optimization Model for Order Picking 18
Francisco Federico Meza-Barrón, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Nelson Rangel-Valdez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Juan Carlos Hernández-Marín, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
María Lucila Morales-Rodríguez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Laura Cruz-Reyes, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Chapter 3
Intelligent Tool for Decision Making Associated With Hospitalization and Sandstorms for the Optimization of Ambulances 50
Estrella D. Molina-Herrera, University of Texas at El Paso, USA
Luis Ernesto Cervera-Gómez, El Colegio de Chihuahua, Mexico
Carlos Herrera, University of Texas at El Paso, USA & El Paso VA Health Care System, USA

Chapter 4
Use of Compensatory Fuzzy Logic for Knowledge Discovery Applied to the Warehouse Order Picking Problem for Real-Time Order Batching 62
Laura Cruz-Reyes, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Rafael Alejandro Espin-Andrade, Autonomous University of Coahuila, Mexico
Fernando López Irrarragorri, Autonomous University of Nuevo León, Mexico
César Medina-Trejo, Autonomous University of Nuevo León, Mexico
José Fernando Padrón Tristán, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Daniel A. Martinez-Vega, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Carlos Eric Llorente Peralta, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Chapter 5
Tuning Parameters Using VisTHAA Applied to a Metaheuristic Algorithm That Solves the Order Picking Problem 89
Luis Rodolfo Garcia Nieto, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Claudia Gómez-Santillán, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Laura Cruz-Reyes, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Nelson Rangel-Valdez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Héctor J. Fraire-Huacuja, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Chapter 6
Prioritization of Elements Selection in Order-Picking Problems Through a Preference Model Influenced by Personality 117
Jorge Castro-Rivera, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
María Lucila Morales-Rodríguez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Nelson Rangel-Valdez, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Laura Cruz-Reyes, National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico
Rodolfo A. Pazos R., National Institute of Technology of Mexico, Mexico & Technological Institute of Ciudad Madero, Mexico

Section 2
Innovative Aspects of Applied Metaheuristics for the Resolution of Order Picking

Chapter 7
Implementation of an Artificial Bee Colony to Solve an Order Picking Problem 144
Luis Enrique Cisneros Saucedo, Autonomous University of Juarez City, Mexico
Julia Patricia Sanchez-Solis, Autonomous University of Juarez City, Mexico
Francisco López-Ramos, Mexican National Council for Science and Technology (CONACYT), Mexico
Jorge Rodas-Osollo, Autonomous University of Juarez City, Mexico

Chapter 8
Use of Elephant Search Algorithm to Solve an Order Picking Problem in a Mobile Atelier 161
Rafael Jimenez, Autonomous University of Juarez City, Mexico
Rogelio Florencia, Autonomous University of Juarez City, Mexico
Vicente García, Autonomous University of Juarez City, Mexico
Abraham Lopez, Autonomous University of Juarez City, Mexico

Chapter 9
An Order-Picking Model Associated With Hospital Components and Solved by a Firefly Algorithm 173
Alan Alor, Autonomous University of Juarez City, Mexico
David Mota, Autonomous University of Juarez City, Mexico
Karla Olmos-Sánchez, Autonomous University of Juarez City, Mexico
Jorge Rodas-Osollo, Autonomous University of Juarez City, Mexico

Chapter 10
Improvement of the Optimization of an Order Picking Model Associated With the Components of a Classic Volkswagen Beetle Using an Ant Colony Approach 189
Jared Olmos, Autonomous University of Juarez City, Mexico
Rogelio Florencia, Autonomous University of Juarez City, Mexico
Francisco López-Ramos, Mexican National Council for Science and Technology (CONACYT), Mexico
Karla Olmos-Sánchez, Autonomous University of Juarez City, Mexico

Chapter 11
Design of an Order Picking Reduce Module Using Bat Algorithm 211
Rogelio Florencia, Autonomous University of Juarez City, Mexico
Julia Patricia Sanchez-Solis, Autonomous University of Juarez City, Mexico
Ivan Carvajal, Autonomous University of Juarez City, Mexico
Vicente García, Autonomous University of Juarez City, Mexico

Section 3
Avant-Garde Applications in the Use of Order Picking Models to Improve Competitiveness in the Supply Chain Sector of Companies in the Manufacturing Industry

Chapter 12
Application of the Order-Picking and Self-Organizing Maps Models to Optimize the Supply Chain: A Review of the Literature 227
Irving López-Santos, Autonomous University of Juarez City, Mexico
Gilberto Rivera, Autonomous University of Juarez City, Mexico
Saúl González, Autonomous University of Juarez City, Mexico

Chapter 13
Solving a Floral Order-Picking Model Using a Metaheuristic to Seven Societies of Central Asia 249
Alberto Ochoa Ortiz-Zezzatti, Autonomous University of Juarez City, Mexico

Chapter 14
Identification of Continued Improvement in the Resolution of an Order Picking Model for a Furniture Factory to Improve the Distribution of Wood Furniture 261
Adriana Del Angel, Instituto Tecnológico Superior de Naranjos, Mexico
Fernando Garcia-Isidro, Instituto Tecnológico Superior de Naranjos, Mexico

Chapter 15
Distribution and Selection of Ornamental Fishes' Issues on a Koi Fish Pond Using Krill Algorithm to an Order Picking Model 275
Erwin Adán Martinez Gomez, Autonomous University of Juarez City, Mexico

Chapter 16
Solving Instances of an Order Picking Model for the Second-Hand Toy Industry Combining Amalgam Case-Based Reasoning and PSO Algorithms 289
José Mejia, Autonomous University of Juarez City, Mexico
Alberto Hernández, Autonomous University of Juarez City, Mexico
Edgar Gonzalo Cossio Franco, Instituto de Información Estadística y Geográfica de Jalisco, Mexico
Martin Montes, Universidad Politécnica de Aguascalientes, Mexico
Carlos Lara-Alvarez, Centro de Investigación en Matemáticas, Mexico
Himer Avila-George, Universidad de Guadalajara, Mexico

Chapter 17
Implementing of a Business Model for an Order Picking Related to Agribusiness 303
Jose Jesus Jimenez Peralta, Instituto Tecnológico Superior de Naranjos, Mexico
Miguel Ángel García Pérez, Instituto Tecnológico Superior de Naranjos, Mexico
Rene Jimenez Santiago Ramirez, Instituto Tecnológico Superior de Naranjos, Mexico

Section 4
Innovation in the Context of Industry 4.0 and Applications Beyond the Technology Associated With Smart Manufacturing

Chapter 18
Perishing Goods Transportation Problem: Fundamentals, Advances, and Applications 315
Ocotlán Díaz-Parra, Universidad Politécnica de Pachuca, Mexico
Jorge A. Ruiz-Vanoye, Universidad Politécnica de Pachuca, Mexico
Alejandro Fuentes-Penna, Centro Interdisciplinario de Investigación y Docencia en Educación Técnica, Mexico
Ricardo A. Barrera-Cámara, Universidad Autónoma del Carmen, Mexico
Miguel A. Ruiz-Jaimes, Universidad Politécnica del Estado de Morelos, Mexico
Yadira Toledo-Navarro, Universidad Politécnica del Estado de Morelos, Mexico
Myrna Lezama-León, Universidad Popular Autónoma del Estado de Puebla, Mexico
Evangelina Lezama-León, Universidad Autónoma del Estado de Hidalgo, Mexico

Chapter 19
Functional Order Picking Model Associated With Italika Motorcycle Parts 339
Edna Cruz Flores, Instituto Tecnológico Superior de Naranjos, Mexico
José Alberto Hernández Aguilar, Universidad Autónoma del Estado de Morelos, Mexico
Jaime Del Ángel García, Instituto Tecnológico Superior de Naranjos, Mexico

Chapter 20
Searching for the Optimum Number of Capacitated Materialistic Cars for an Automotive Manufacturing Cell Using a Shuffled Frog Leap Algorithm 363
Denise Barzaga, Corporación Mexicana de Investigación en Materiales S.A. de C.V., Mexico
Elías Carrum, Corporación Mexicana de Investigación en Materiales S.A. de C.V., Mexico

Chapter 21
Implementation of an Intelligent Model for Decision Making Based on CBR for Supply Chain Solution in Retail for a Cluster of Supermarkets 381
Adrian F. Loera-Castro, Technological Institute of Ciudad Juarez, Mexico
Jaime Sanchez, Technological Institute of Ciudad Juarez, Mexico
Jorge Restrepo, Autonomous University of Juarez City, Mexico & Technological University of Pereira, Colombia
Angel Fabián Campoya Morales, Autonomous University of Juarez City, Mexico
Julian I. Aguilar-Duque, Universidad Autónoma de Baja California, Mexico

Chapter 22
Consumer Purchase Preference for the Perception of Quality of Perishable Products in a Smart City 398
Iván Alonso Rebollar-Xochicale, Universidad Autónoma de Querétaro, Mexico
Fernando Maldonado-Azpeitia, Universidad Autónoma de Querétaro, Mexico

Chapter 23
Predict Energy Charging Points to Electric Vehicles in a Smart City Using a Novel Metaheuristic 411
Daniel Rivera-Rojo, Autonomous University of Juarez City, Mexico
Carlos Martinez, Autonomous University of Juarez City, Mexico
Diego Almazo, Autonomous University of Juarez City, Mexico
Uzziel Caldiño, Autonomous University of Juarez City, Mexico
Abdiel Ramirez, Autonomous University of Juarez City, Mexico
Valdemar Tejeda, INEEL, Mexico

Chapter 24
Specification of a Model of Distribution of Traditional Clothing in a Mobile Atelier 423
Iván Bandala, National Institute of Technology of Mexico, Mexico & Instituto Technologico Superior de Naranjos, Mexico

Chapter 25
A Fuzzy Logic Classifier for the Three Dimensional Bin Packing Problem Deriving From Package Delivery Companies Application 433
Paula Hernández Hernández, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico
Norberto Castillo-García, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico
Edilberto Rodríguez Larkins, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico
Jorge Gilberto Guerrero Ruiz, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico
Selene Valeria Morales Díaz, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico
Erick Sobrevilla Resendiz, National Institute of Technology of Mexico, Mexico & Instituto Tecnológico Altamira, Mexico

Chapter 26
Order Picking Performance in Warehouses With Multi-Item Orders 443
Oliverio Cruz-Mejía, Universidad Autónoma del Estado de México, Mexico

Compilation of References 453

About the Contributors 488

Index 497