

Lecture Notes in Intelligent Transportation and Infrastructure
Series Editor: Janusz Kacprzyk

Alberto Ochoa-Zezzatti
Diego Oliva
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Technological and Industrial Applications Associated with Intelligent Logistics



Springer

Lecture Notes in Intelligent Transportation and Infrastructure

Series Editor

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The series “Lecture Notes in Intelligent Transportation and Infrastructure” (LNITI) publishes new developments and advances in the various areas of intelligent transportation and infrastructure. The intent is to cover the theory, applications, and perspectives on the state-of-the-art and future developments relevant to topics such as intelligent transportation systems, smart mobility, urban logistics, smart grids, critical infrastructure, smart architecture, smart citizens, intelligent governance, smart architecture and construction design, as well as green and sustainable urban structures. The series contains monographs, conference proceedings, edited volumes, lecture notes and textbooks. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution, which enable wide and rapid dissemination of high-quality research output.

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Introduction

This book is a novel, innovative, and adequate source of information that compiles interdisciplinary perspectives about diverse issues related to Intelligent Logistics in Industry 4.0 including Artificial Intelligent applications associated with Logistics 4.0 on different ways about Intelligent Optimization, Industrial Applications on real world, Social applications and Technology applications each one with a different perspective about the correct solution of this kind of methodologies. This book is a collective effort to introduce new ideas and paradigms from a variety of perspectives using innovative techniques related to Bioinspired Algorithms, metaheuristics, and methodologies associated with Logistics 4.0. An innovative and specialized book on optimization considers different aspects to realize this “Intelligent Optimization” and tries to improve with innovative techniques and methodologies different daily aspects of our lives, in each one of them it is possible to understand the necessity to improve scenarios, distances, time, costs, spaces, and a plethora of features associated with the modern life (labor associated with organize, kept, and delivery of goods, materials, people, life issues, or products).

We received manuscripts from renowned researchers from all around the world associated with Theoretical foundations of Intelligent Logistics to understand many paradigms on different Optimization implementation kinds. In addition, we received many manuscripts with expertise on improving optimization related to Logistics 4.0 of deliveries associated with products and services, Optimization of different elements in the time and location, Social Applications to enjoy our life of a better way to improve the life in a Smart City, and finally, Technologies Applications of diverse ways to increase our Life Quality. The book starts with a part entitled Industrial Logistics featuring seven chapters on the theoretical and mathematical ideas related to the correct implementation of a diverse range of Intelligent Logistics optimization algorithms and Logistics 4.0 applications in real world. The first chapter of this section is “[Determining and Applying Productive, Environmental and Economical Indicators and Indexes to a Cyber Physical System for Greening Process of Supply Chain](#)” which aboard that a company that transports goods to supply customers usually needs to plan the routes that the fleet must follow, since transportation means a high percentage of the value added to

goods. The chapter “[Design of Material Delivery Routes with Towing Equipment for the Automotive Sector Using a Von Neumann Topology of PSO Under the Logistics 4.0 Paradigm](#)” suggests that applying Warehousing in profit-oriented environments requires handling complex constraints for planning, organizing, or managing tasks. A large amount of input causes a high degree of complexity, as in the case of the management of customer’s time windows to accurately deliver them their products. The chapter “[Industrial Accident Induced Coma: A Multi-Disciplinary Perspective Within the Industry 4.0 Paradigm](#)” explains that the warehousing is an essential issue in the logistic supply chain. Among the order picking processes in a warehouse is the picker routing problem which consists in determining the best picking sequence to retrieve the items from locations to satisfy customer demand. The chapter “[Coahuila’s Future a Perspective Derived from the Growth Per Municipality to Establish a Car Assembler.](#)” explains an Order picking model as an activity in a warehouse, carried out by a team, where customer orders are prepared. In chapter, “[Layout Problem: Optimization with Material Tour in Open Field. Case of Study](#)”, is described also the activity with the highest logistic costs in a company. In this research, a proposal is presented, aimed at improving the order picking process in a warehouse. The chapter “[Waste Collection of Touristics Services Sector Residues Vehicle Routing Problem with Time Windows to an Industrial Polygon in a Smart City](#)” detailed that today the problem of product transportation has taken great importance due to the demand of products in the market that has to be delivered, solving the transportation problem is a complex task because it involves the solution of three NP-hard problems. Finally, the last chapter of this part is “[Distribution of Merchandise Through Clarke and Wright Heuristic and Mathematical Model: Case Study](#)” which determines that in the purchase of products, a warehouse is an integral part between producers and customers, where the Logistics 4.0 is one of several operations involved. The next part is named Transport and Movements of Vehicles in a Smart City, featuring six chapters related to different comparatives of Metaheuristics used in Intelligent Logistics in the search to improve resources in diverse aspects of our transportations or improve process to this. The chapter “[Rethinking the Effects of Fatal Falls on an Italian Scooter in a Smart City: An Approach from Ergonomics and an Ideal and Optimal Helmet: Conditioned Helmet for Improved Security on the Road in a Smart City](#)” explains the use of a metaheuristic algorithm as an optimization method based on swarm intelligence which has demonstrated to be capable of obtaining satisfactory results on a diversity of optimization problems. In the proposed chapter “[Design of an Urban Transport Network for the Optimal Location of Bus Stops in a Smart City Based on a Big Data Model and Spider Monkey Optimization Algorithm](#)”, is analyzed a novel metaheuristics; however, the implementation of this optimization method has not been much explored on Intelligent Logistics problems, even though Industry 4.0 represents up to 55% of the total operational cost of a typical transportation model. The chapter “[Public Urban Transportation in the Smart City: An Exploratory Study in the Northern México](#)” explains the optimization of bus stops in a Smart City, coupled with the improved use of mobile ateliers at some of these bus stops, also called pop-up stores, which sell their

products outside their store using a model called pret-a-porter. Therefore, it causes them to go back to it once a product in their mobile store runs out since the customer is waiting for them at the store. The chapter “[The Difficulties and Complications of Children When Going to a Zoo and Should Interact with the Colors of the Information in It: An Approach Based on the Use of a Humanoid NAO Robot in an Application for “Smart Cities”](#)”, determines as in nowadays that the health industry utilizes critical machines to treat and diagnose illness in patients. In a large majority of hospitals that treat patients with color blindness, especially children, mobile applications are beginning to be used to improve the quality of life of these patients in environments that require information associated with safety colors or the level of extinction of a species, such as in zoos; then, they choose to have many components of their critical machines stored inside a warehouse in the hospital. The chapter “[Optimization of Route Planning for the Package Delivery Problem Using Fuzzy Clustering](#)” is explains that nowadays, warehouse operations, specifically order picking process, are receiving close attention of researches due to the need of companies in minimizing operational costs. Finally, the last chapter in this part is “[State of the Art for the Creation of a Methodology for the Proper Location of Urban Truck Stops on Route 2A](#)” which determines that in these times, the human factor is key to improve order preparation processes—which is why it is necessary to determine a correct bus stop-. For example, in a Smart City associated with a line of replacement processes for different pieces of equipment or devices—which must be purchased in a specialized store-, it is necessary to find the best bus route in each case to minimize the time consumed, and that this does not affect the continuity of the assembly in small workshops specialized in automotive parts.

The third part is named Humanitarian Logistics, featuring five chapters related to different comparatives of Humanitarian Logistics and Intelligent Logistics Models in the search to improve resources in diverse aspects of companies and to improve our lives. The first chapter of this section is “[Financial Analysis Over the Smartest Companies](#)” and in this research chapter is focused the problem of the distribution of escape routes in a public space. The chapter “[Simulating Crowd Movements During Emergency Fire Situations: Mexico City Airport Simulation Case](#)” details as in several societies of emerging economies, increasingly large community linked to the scalability and adjustment of components to resolve a problem of Humanitarian Logistics. In the research chapter “[Modular Framework for Crowd Simulation “Menge” from a Production Warehouse Simulation Perspective](#)”, many industrial sectors use 3D components design customization to improve aspects of competitiveness. In the chapter “[Mobile Application for the Detection of COVID19 Suspicious Cases in Mexico Using an Intelligent Model of Virtual Patients](#)”. In hospitals with an excessive number of patients and the decrease of medical services associated with other diseases, we propose the use of an intelligent model of virtual patients that allows students of health sciences to practice in an adequate and valid way the detection of various symptoms that affect the health of the population in a

Smart City. The next chapter “[Humanitarian Logistics for the Optimal and Timely Evacuation in High Buildings Within a Smart City Using an Adaptive Metaheuristic Context](#)” explains about the analysis concerning the accommodation of safe escapes in a building inside a structure for their respective distribution, verifying the option of finding the correct stow model and accommodation of humanitarian logistics.

In fourth part, which is named E-commerce, Marketing and Mobile Application of Logistics Including Human Factor, are described five chapters related to technologies associated with Intelligent Logistics and Logistics 4.0. The first chapter of this part is “[Using Machine Learning to Predict Online Buying Behaviour, Wholesale and Fashion Marketing at Zara, an Analysis Including Z Generation](#)” which presents a problem solved by social modeling, associated with the adequate choice of colors to issues and their distribution in a Fashion Market using a range of 64 colors to specify different features related to the principal attributes of an issue adequate to represent the symbolic capital of a modern society. In the chapter “[Analysis of Mental Fatigue Under Delivery Pressure and Considering Creativity and Precision to Organize and Distribute a Diorama to Represent Social Issues Based on Cultural Algorithms](#)” details how mental fatigue is a decisive aspect in the creation of collectible issues, especially in a growing collecting community—mainly from emerging economies—which collects and buys “dioramas and click toys among others”, that is, scalable and adjustable collectibles composed of many pieces; this type of paper toys and dioramas have been used for educational purposes. In the chapter “[Medicine Inventory Control System Through Fuzzy Logic and Genetic Algorithms: Applied to a Biopharmaceutical](#)” is described a novel research focused on the main economic activities in a Smart City; in another chapter named “[Technical Analysis of Shipments in an Automotive Company to Forecast Sales Volumes](#)” is proposed the implementation of an order picking algorithm for the optimization of the packing and distribution of car component products. Finally, in this section is presented “[Distributed Programming Applied for the Optimization of Hydraulic Networks Through a Web Application](#)”, which proposes new ideas related to web applications by means of an Advanced Selection of systems, which is fundamental for the operational improvement and logistics global supply chain.

And finally, in the part entitled Diverse Kind of Logistics in Amalgamed Application Domains grouped nine different chapters related to solutions derived of specific aspects which try to improve daily activities on Optimization with real applications to amalgamed social topics. In the chapter “[What is the Best Location of a Smart Airport in Juarez, Mexico?](#)” is described, as the latter includes, customizing the user interface, as well as the way the system retrieves and processes cases afterward to distribute original products in a novel supply chain and its respective Intelligent Logistics. The purpose of the chapter “[Colombian Coffee Price Forecast via LSTM Neural Networks](#)” is to propose a conceptual order picking model to increase the commercialization of coffee in Colombia, through the sequential analysis of activities such as distribution in the warehouse, preparation,

packing of orders, and the issuance of orders to final customers. The next chapter “[Some Pragmatic Prevention’s Guidelines Regarding SARS-CoV-2 and COVID-19 in Latin-America Inspired by Mixed Machine Learning Techniques and Artificial Mathematical Intelligence. Case Study: Colombia](#)” details that due to the worldwide strengthening of the health sector, it presents itself as a challenge for the companies that comprise it to immerse themselves in processes of continuous improvement that contribute to increasing the satisfaction of the needs of its customers, as well as achieving a better positioning in the market. In the chapter “[A Drone System for Detecting, Classifying and Monitoring Solid Wastes Using Computer Vision Techniques in the Context of a Smart Cities Logistics Systems](#)” is proposed that the freshness, flavor, good presentation, and nutritional value of fruits and vegetables diminish as time passes until the food begins to lose them completely. That is why the correct implementation of supply chains is a subject of great interest for companies dedicated to the rotation of food marketing. The next chapter “[Geo-Referenced Correlation for a Fire in a Smart City Urban Forest Using Hybrid Drone Data and Satellite Images](#)” determines that the purpose of this research is to understand a Multivariable optimization associated with the path of a group of vehicles integrated in an Ecological Community and determine the optimal route involve speed, storage, and travel resources including time of charge for determining the cost-benefit linked to safety in case of a disaster as a wildfire at a Natural Park in a Smart City and considering that most of the drivers in such an ecological community own an electric car, which is coupled with a travel plan associated with the electric power charging point in a Smart City. In the chapter “[Evaluation of Drones for Inspection and Control in Industry 4.0](#)” is analyzed that Internet sales have increased exponentially in the last decade. Much of the internet sales are of physical products in urban areas that require product delivery transportation with a tight delivery lead time using drones for this purpose. And finally, in the chapter “[Uncertain Analysis Based on Milk-Runs Systems Using Bayesian Networks](#)” is a important considering that one of the most common operations in warehouses of package delivery companies (e.g., UPS or FedEx) is to pack the products in trucks in order to locally deliver them to the customers. The products are generally packed in rectangular-shaped boxes of different dimensions; in addition in the chapter “[Implementation of an Intelligent Visual Recognition System for the Proper Classification of Solid Waste Using a Mobile Application in a Smart City](#)” explains a model of ecological support to groutier people with shady hair linked to Greenpeace—which allows a better identification of solid waste and its correct and adequate separation, using a smart mobile application for recycling within the Z generation—to improve the lives of citizens in their environment within a smart city. The last chapter of this part is “[Logistics on the Designing of an Electronic Colorblindness Application for Early Colorblindness Detection in Children by Using a Modified Ishihara Test](#)”, which describes the social inclusion with colorblindness.

It is important to state that the chapters were selected following a rigorous analysis done by the book editors, and each chapter was double or triple-blind peer-reviewed by at least two experts in the area. This would not have been possible

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