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Handbook of Research on Advances and Applications of Fuzzy Sets and Logic

Said Broumi (/affiliate/said-broumi/360267/) (Laboratory of Information Processing, Faculty of Science Ben M'Sik, University Hassan II, Casablanca, Morocco & Regional Center for the Professions of Education and Training (CRMEF), Casablanca-Settat, Morocco)

Release Date: March, 2022
Copyright: © 2022
Pages: 944
DOI: 10.4018/978-1-7998-7979-4
ISBN13: 9781799879794
ISBN10: 1799879798
EISBN13: 9781799879817

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Description & Coverage

Description:

Fuzzy logic, which is based on the concept of fuzzy set, has enabled scientists to create models under conditions of imprecision, vagueness, or both at once. As a result, it has now found many important applications in almost all sectors of human activity, becoming a complementary feature and supporter of probability theory, which is suitable for modelling situations of uncertainty derived from randomness. Fuzzy mathematics has also significantly developed at the theoretical level, providing important insights into branches of traditional mathematics like algebra, analysis, geometry, topology, and more. With such widespread applications, fuzzy sets and logic are an important area of focus in mathematics.

The **Handbook of Research on Advances and Applications of Fuzzy Sets and Logic** studies recent theoretical advances of fuzzy sets and numbers, fuzzy systems, fuzzy logic and their generalizations, extensions, and more. This book also explores the applications of fuzzy sets and logic applied to science, technology, and everyday life to further provide research on the subject. This book is ideal for mathematicians, physicists, computer specialists, engineers, practitioners, researchers, academicians, and students who are looking to learn more about fuzzy sets, fuzzy logic, and their applications.

Coverage:

The many academic areas covered in this publication include, but are not limited to:

- Engineering
- Fuzzy Logic
- Fuzzy Models
- Fuzzy Numbers
- Fuzzy Sets
- Mathematics
- Neutrosophic Sets
- Rough Sets
- Soft Sets
- Structural Modeling
- Triangular Fuzzy Multisets

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S. Rajeswari (Queen Mary's College, University of Madras, Chennai, India), Sugapriya C. (Queen Mary's College, University of Madras, Chennai, India), Nagarajan Deivanayagam Pillai (Hindustan Institute of Technology and Science, India), Said Broumi (Laboratory of Information Processing, Faculty of Science Ben M'Sik, University Hassan II, Casablanca, Morocco & Regional Center for the Professions of Education and Training (CRMEF), Casablanca-Settat, Morocco), Florentin Smarandache (University of New Mexico, USA)

The advance payment of acquiring cost is mostly encouraged by both supplier and retailer in current situations. This chapter discusses the economic order...

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Irvanizam Irvanizam (Department of Informatics, Universitas Syiah Kuala, Indonesia), Nawar Nabila Zi (Department of Informatics, Universitas Syiah Kuala, Indonesia)

Many prestigious researchers have been exploring the issues of imprecision, inconsistency, and uncertain information in decision making, which are still...

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Sustainable supplier selection is one of the most important decisions for companies in sustainable supply chain management. Therefore, sustainable supplier...

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Somen Debnath (Umakanta Academy, India)

In 2020, Sujit et al. introduced the notion of the neutrosophic fuzzy set (NFS) to deal with uncertainty under a fuzzy environment where the fuzzy membership...

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The neutrosophic quadripartitioned soft model is a hybrid model by combining neutrosophic soft sets with quadripartitioned sets. This work concerns with the...

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Said Broumi was born in Casablanca , Morocco in 1978, is a PHD of Faculty of Science Ben M'Sik, University Hassan II casablanca, Morocco. He received his M.Sc in Industrial Automatic from Hassan II University Ainchok- Casablanca. His search major field is on neutrosophic graph theory, soft set theory, fuzzy theory, intuitionistic fuzzy theory, neutrosophic theory and neutrosophic soft set theory, neutrosophic decision making problem and networking.He published more than 200 articles. He is associate editor of neutrosophic sets and systems journal (http://fs.unm.edu/NSS/).

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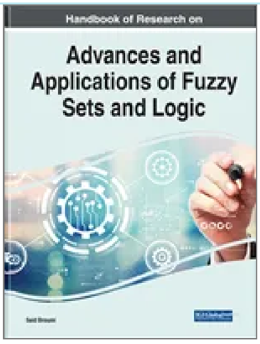

Application of Fractional Calculus on the Crisp and Uncertain Inventory Control Problem

Mostafijur Rahaman (Indian Institute of Engineering Science and Technology, Shibpur, India), Sankar Prasad Mondal (Maulana Abul Kalam Azad University of Technology, West Bengal, India), Banashree Chatterjee (Dr. B. C. Roy Engineering College, India) and Shariful Alam (Indian Institute of Engineering Science and Technology, Shibpur, India)

Source Title: Handbook of Research on Advances and Applications of Fuzzy Sets and Logic (/book/handbook-research-advances-applications-fuzzy/266800)

Pages: 29
DOI: 10.4018/978-1-7998-7979-4.ch006

Abstract

This chapter explores the possible application of fractional calculus in the field of operation research, more specifically inventory control problem. The sense of memory can be implemented in a dynamical system with the mathematical manipulation through fractional calculus. In this chapter, some recently published papers on generalized lot-sizing models described by fractional differential equation in crisp as well as uncertain environments are reviewed. The intuitional applicability, obstacles, and challenges for studying the inventory management problems under fractional differential equation (in Riemann-Liouville and Caputo approaches) are discussed in this chapter.

Chapter Preview

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1. Introduction

The journey of fractional calculus started with the famous conversation between L'Hospital and Liebnitz. Liebnitz's response to the question of L'Hospital on the existence of derivative of
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order was "an apparent paradox from which one day useful consequences will be drawn". The theory of fractional calculus grew very slowly through the last the centuries. However, the worldwide fervourfor fractional calculus (FC) as well as fractional order system (FOS) has been apparently exponential in the most recent decades because of its exactness on portraying the dynamical nature associated with different physical procedures as a general rule. As of late, this idea has been prominently utilized for the demonstrating in the broad area of AppliedMathematics, Physical Science, Technology and Management replacing the Newtonian calculus (Agila et al., 2016; Agrawal et al., 2004; Kilbas et al., 2006; Machado & Mata, 2015; Miller & Ross, 1993; Podlubny, 1999). Differential equation is one of the frequently used mathematical tools to describe the variability of a dynamic state over time. If the integer order derivative is replaced by the fractional counterpart, the differential equation is called the fractional differential equation (FDE). In reality has replaced the differential equation of integer order proving its smartness for describing dynamical system in a complicated situation. Several Studies and findings (Abbasbandy, 2007; Arikoglu & Ozkol, 2009; Bhrawy et al., 2013; Duan et al., 2013; Hajipour et al., 2019; Mainardi et al., 2007) are carried out to establishing that fact which ultimately enriched the world of technology and innovation it's applications. The physical meaning of fractional calculus seems to be little abstract. However, several studies proved the exactness of fractional calculus against the conventional integer order calculus on the fitting of real data from memory involved systems. Thus, interpretation of memory is regarded as one of the physical meaning of the fractional calculus. The Riemann-Liouville fractional

integration and derivative and Caputo fractional derivative gained the popularity in this context. Here, in this present article, we fix our focuses on the exploration of the possible implementation of fractional differential equations on the inventory control problems in both crisp and uncertain environments. Thus, the literature review in the next section will be limited into some specific keywords, namely theory of fractional differential equations in uncertainty, crisp fractional inventory models and fuzzy fractional inventory models.

The rest of this article is decorated as the following: Brief literature reviewing about some particular keywords has been carried out in the section 2. Some basic theory of the fractional calculus is presented in the section 3. The section 4 is involved in the comparison of fractional and integer order system to describe the inventory models. The section 5 presents the comparisons between Riemann-Liouville and Caputo derivative to describe the inventory models with different assumptions. Several other obstacles and challenges are described in section 6. Finally, concluding remarks are made in the section 7.

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Chapter 6
Application of Fractional Calculus on the Crisp and Uncertain Inventory Control Problem

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ABSTRACT

This chapter explores the possible application of fractional calculus in the field of operation research, more specifically inventory control problem. The sense of memory can be implemented in a dynamical system with the mathematical manipulation through fractional calculus. In this chapter, some recently published papers on generalized lot-sizing models described by fractional differential equation in crisp as well as uncertain environments are reviewed. The intuitional applicability, obstacles, and challenges for studying the inventory management problems under fractional differential equation (in Riemann-Liouville and Caputo approaches) are discussed in this chapter.

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