

Fuzzy Logic Type 1 And Type 2 Based On Labview Fpga Studies In Fuzziness And Soft Computing

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 ISPPC 2017
 Dedicated to Professor Jerry Mendel for his Pioneering Contribution
 Advanced Concepts in Fuzzy Logic and Systems with Membership Uncertainty
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 4th IEEE International Conference on Signal Processing, Computing and Control : September 21-23, 2017
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KHAN REED

Type-2 Fuzzy Logic: Theory and Applications Springer

This thesis reports the work of using simulated annealing to design more efficient fuzzy logic systems to model problems with associated uncertainties. Simulated annealing is used within this work as a method for learning the best configurations of type-1 and type-2 fuzzy logic systems to maximise their modelling ability. Therefore, it presents the combination of simulated annealing with three models, type-1 fuzzy logic systems, interval type-2 fuzzy logic systems and general type-2 fuzzy logic systems to model four bench-mark problems including real-world problems. These problems are: noise-free Mackey-Glass time series forecasting, noisy Mackey-Glass time series forecasting and two real world problems which are: the estimation of the low voltage electrical line length in rural towns and the estimation of the medium voltage electrical line

maintenance cost. The type-1 and type-2 fuzzy logic systems models are compared in their abilities to model uncertainties associated with these problems. Also, issues related to this combination between simulated annealing and fuzzy logic systems including type-2 fuzzy logic systems are discussed. The thesis contributes to knowledge by presenting novel contributions. The first is a novel approach to design interval type-2 fuzzy logic systems using the simulated annealing algorithm. Another novelty is related to the first automatic design of general type-2 fuzzy logic system using the vertical slice representation and a novel method to overcome some parametrisation difficulties when learning general type-2 fuzzy logic systems. The work shows that interval type-2 fuzzy logic systems added more abilities to modelling information and handling uncertainties than type-1 fuzzy logic systems but with a cost of more computations and time. For general type-2 fuzzy logic systems, the clear conclusion that learning the third dimension can add more abilities to modelling is an important advance in type-2 fuzzy logic systems research and should open the doors for more promising research and practical works on using general type-2 fuzzy logic systems to modelling applications despite the more computations associated with it.

General Type-2 Fuzzy Logic in Dynamic Parameter Adaptation for the Harmony Search Algorithm Springer Science & Business Media

This book explores recent perspectives on type-2 fuzzy sets. Written as a tribute to Professor Jerry Mendel for his pioneering works on type-2 fuzzy sets and systems, it covers a wide range of topics, including applications to the Go game, machine learning and pattern recognition, as well as type-2 fuzzy control and intelligent systems. The book is intended as a reference guide for the type-2 fuzzy logic community, yet it aims also at other communities dealing with similar methods and applications.

Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems Springer

The second edition of this textbook provides a fully updated approach to fuzzy sets and systems that can model uncertainty — i.e., “type-2” fuzzy sets and systems. The author demonstrates how to overcome the limitations of classical fuzzy sets and systems, enabling a wide range of applications from time-series forecasting to knowledge mining to control. In this new edition, a bottom-up approach is presented that begins by introducing classical (type-1) fuzzy sets and

systems, and then explains how they can be modified to handle uncertainty. The author covers fuzzy rule-based systems – from type-1 to interval type-2 to general type-2 – in one volume. For hands-on experience, the book provides information on accessing MatLab and Java software to complement the content. The book features a full suite of classroom material.

Fuzzy Logic in Its 50th Year John Wiley & Sons

Doctoral Thesis / Dissertation from the year 2010 in the subject Engineering - Artificial Intelligence, grade: PhD, Korea University, Seoul (College of Engineering - Dept of Industrial Systems and Information Engineering), course: Intelligence Control and Artificial Intelligence, language: English, abstract: Fuzzy Logic (FL) is a particular area of interest in the study of Artificial intelligence (AI) based on the idea that in fuzzy sets each element in the set can assume a value from 0 to 1, not just 0 or 1, as in classic or crisp set theory. The gradation in the extent to which an element is belonging to the relevant sets is called the degree of membership. This degree of membership is a measure of the element's belonging to the set, and thus of the precision with which it explains the phenomenon being evaluated. A linguistic expression is given to each fuzzy set. The information contents of the fuzzy rules are then used to infer the output using a suitable inference engine. The key contribution of fuzzy logic in computation of information described in natural language made it applicable to a variety of applications and problem domains; from simple control systems to human decision support systems. Yet, despite its long-standing origins, it is a relatively new field, and as such leaves much room for development. The thesis presents two novel applications of fuzzy systems; a human decision support system to help teachers to fairly evaluate students and two hybrid intelligent fuzzy systems; a type-2 fuzzy logic system and a combined type-1 fuzzy logic system and extended Kalam filter for controlling systems operating under high levels of uncertainties due to various sources of measurement and modeling errors. The combination of fuzzy logic and the classical student evaluation approach produces easy to understand transparent decision model that can be easily understood by students and teachers alike. The developed architecture overcomes the problem of ranking students with the same score. It also incorporated different dimensions of evaluation by considering subjective factors such as difficulty, complexity and importance of the questions. Although we discuss this approach with an example from the area of student evaluation, this method evidently has wide applications in other areas of decision making including student's project evaluation, learning management systems evaluation, as well as, other assessment applications. [...]

Hierarchical Type-2 Fuzzy Aggregation of Fuzzy Controllers Springer

In the early 1970s, fuzzy systems and fuzzy control theories added a new dimension to control systems engineering. From its beginnings as mostly heuristic and somewhat ad hoc, more recent and rigorous approaches to fuzzy control theory have helped make it an integral part of modern control theory and produced many exciting results. Yesterday's "art

Theory and Applications Butterworth-Heinemann

This book focuses on a particular domain of Type-2 Fuzzy Logic, related to process modeling and control applications. It deepens readers' understanding of Type-2 Fuzzy Logic with regard to the following three topics: using simpler methods to train a Type-2 Takagi-Sugeno Fuzzy Model; using the principles of Type-2 Fuzzy Logic to reduce the influence of modeling uncertainties on a locally linear n-step ahead predictor; and developing model-based control algorithms according to the Generalized Predictive Control principles using Type-2 Fuzzy Sets. Throughout the book, theory is always complemented with practical applications and readers are invited to take their learning process one step farther and implement their own applications using the algorithms' source codes (provided). As such, the book offers a valuable reference guide for all engineers and researchers in the field of computer science who are interested in intelligent systems, rule-based systems and modeling uncertainty.

Differential Evolution Algorithm with Type-2 Fuzzy Logic for Dynamic Parameter Adaptation with Application to Intelligent Control Springer Nature

Annotation This volume constitutes the refereed proceedings of the 8th International Workshop on Fuzzy Logic and Applications held in Palermo, Italy in June 2009. The papers are organized in topical sections on fuzzy set theory, intuitionistic fuzzy sets, fuzzy classification and clustering, fuzzy image processing and analysis, and fuzzy systems.

Uncertain Systems' Modeling and Control GRIN Verlag

This book offers a gentle introduction to type-2 fuzzy sets and, in particular, interval type-2 fuzzy sets and their application in biological modeling. Interval type-2 fuzzy modeling is a comparatively recent direction of research in fuzzy modeling. As the modeling of biological problems is inherently

uncertain, the use of fuzzy sets in this field is a natural choice. The coverage begins with a succinct review of type-1 fuzzy basic theory, before providing a comprehensive and didactic explanation of type-2 fuzzy set components. In turn, Fuzzy Rule-Based Systems, or FRBS, are shown for both types, interval type-2 and type-1 fuzzy sets. Applications include the pharmacological models, prediction of prostate cancer stages, a model for HIV population transfer (asymptomatic to symptomatic), an epidemiological disease caused by HIV, some models in population growth, included the Malthus Model, and an epidemic model refers to COVID-19. The book is ideally suited to graduate students in mathematics and related fields, professionals, researchers, or the public interested in interval type-2 fuzzy modeling. Largely self-contained, it can also be used as a supplementary text in specialized graduate courses.

Modeling Uncertainty with Fuzzy Logic Springer Nature

This book offers a multifaceted perspective on fuzzy set theory, discussing its developments over the last 50 years. It reports on all types of fuzzy sets, from ordinary to hesitant fuzzy sets, with each one explained by its own developers, authoritative scientists well known for their previous works. Highlighting recent theorems and proofs, the book also explores how fuzzy set theory has come to be extensively used in almost all branches of science, including the health sciences, decision science, earth science and the social sciences alike. It presents a wealth of real-world sample applications, from routing problem to robotics, and from agriculture to engineering. By offering a comprehensive, timely and detailed portrait of the field, the book represents an excellent reference guide for researchers, lecturers and postgraduate students pursuing research on new fuzzy set extensions.

New Medical Diagnosis Models Based on Generalized Type-2 Fuzzy Logic Springer

We describe in this book, hybrid intelligent systems based mainly on type-2 fuzzy logic for intelligent control. Hybrid intelligent systems combine several intelligent computing paradigms, including fuzzy logic, and bio-inspired optimization algorithms, which can be used to produce powerful automatic control systems. The book is organized in three main parts, which contain a group of chapters around a similar subject. The first part consists of chapters with the main theme of theory and design algorithms, which are basically chapters that propose new models and concepts, which can be the basis for achieving intelligent control with interval type-2 fuzzy logic. The second part of the book is comprised of chapters with the main theme of evolutionary optimization of type-2 fuzzy systems in intelligent control with the aim of designing optimal type-2 fuzzy controllers for complex control problems in diverse areas of application, including mobile robotics, aircraft dynamics systems and hardware implementations. The third part of the book is formed with chapters dealing with the theme of bio-inspired optimization of type-2 fuzzy systems in intelligent control, which includes the application of particle swarm intelligence and ant colony optimization algorithms for obtaining optimal type-2 fuzzy controllers.

ISPC 2017 Springer

This book presents different experimental results as evidence of the good results obtained compared with respect to conventional approaches and literature references based on fuzzy logic. Nowadays, the evolution of intelligence systems for decision making has been reached considerable levels of success, as these systems are getting more intelligent and can be of great help to experts in decision making. One of the more important realms in decision making is the area of medical diagnosis, and many kinds of intelligence systems provide the expert good assistance to perform diagnosis; some of these methods are, for example, artificial neural networks (can be very powerful to find tendencies), support vector machines, that avoid overfitting problems, and statistical approaches (e.g., Bayesian). However, the present research is focused on one of the most relevant kinds of intelligent systems, which are the fuzzy systems. The main objective of the present work is the generation of fuzzy diagnosis systems that offer competitive classifiers to be applied in diagnosis systems. To generate these systems, we have proposed a methodology for the automatic design of classifiers and is focused in the Generalized Type-2 Fuzzy Logic, because the uncertainty handling can provide us with the robustness necessary to be competitive with other kinds of methods. In addition, different alternatives to the uncertainty modeling, rules-selection, and optimization have been explored. Besides, different experimental results are presented as evidence of the good results obtained when compared with respect to conventional approaches and literature references based on Fuzzy Logic.

Dedicated to Professor Jerry Mendel for his Pioneering Contribution Springer

In this work - both psychologists working on concepts and mathematicians working on fuzzy logic - reassess the usefulness of fuzzy logic for the psychology of concepts.

Advanced Concepts in Fuzzy Logic and Systems with Membership Uncertainty Fuzzy Logic Type 1 and Type 2 Based on LabVIEWTM FPGA

This book describes the latest advances in fuzzy logic, neural networks, and optimization algorithms, as well as their hybrid intelligent combinations, and their applications in the areas such as intelligent control, robotics, pattern recognition, medical diagnosis, time series prediction, and optimization. The topic is highly relevant as most current intelligent systems and devices use some form of intelligent feature to enhance their performance. The book also presents new and advanced models and algorithms of type-2 fuzzy logic and intuitionistic fuzzy systems, which are of great interest to researchers in these areas. Further, it proposes novel, nature-inspired optimization algorithms and innovative neural models. Featuring contributions on theoretical aspects as well as applications, the book appeals to a wide audience.

With Recent Theory and Applications CRC Press

Jerry Mendel explains the complete development of fuzzy logic systems and explores a new methodology to build better and more intelligent systems. Two case studies are carried throughout the book to illustrate and expand on the theories introduced.

Type-2 Fuzzy Logic and Systems MIT Press

This book focuses on the fields of fuzzy logic, granular computing and also considering the control area. These areas can work together to solve various control problems, the idea is that this combination of areas would enable even more complex problem solving and better results. In this book we test the proposed method using two benchmark problems: the total flight control and the problem of water level control for a 3 tank system. When fuzzy logic is used it make it easy to performed the simulations, these fuzzy systems help to model the behavior of a real systems, using the fuzzy systems fuzzy rules are generated and with this can generate the behavior of any variable depending on the inputs and linguistic value. For this reason this work considers the proposed architecture using fuzzy systems and with this improve the behavior of the complex control problems.

Fuzzy Logic Type 1 and Type 2 Based on LabVIEWTM FPGA Springer

Fuzzy Logic: A Practical Approach focuses on the processes and approaches involved in fuzzy logic, including fuzzy sets, numbers, and decisions. The book first elaborates on fuzzy numbers and logic, fuzzy systems on the job, and Fuzzy Knowledge Builder. Discussions focus on formatting the knowledge base for an inference engine, personnel detection system, using a knowledge base in an inference engine, fuzzy business systems, industrial fuzzy systems, fuzzy sets and numbers, and quantifying word-based rules. The text then elaborates on designing a fuzzy decision and Fuzzy Thought Amplifier for complex situations. Topics include origins of cognitive maps, Fuzzy Thought Amplifier, training a map to predict the future, introducing the Fuzzy Decision Maker, and merging interests. The publication takes a look at fuzzy associative memory, fuzzy sets as hypercube points, and disk files and descriptions, including Fuzzy Thought Amplifier, Fuzzy Decision Maker, and composing and creating a memory. The text is a valuable source of data for researchers interested in fuzzy logic.

Fuzzy Logic and Applications Springer

Fuzzy set and logic theory suggest that all natural language linguistic expressions are imprecise and must be assessed as a matter of degree. But in general membership degree is an imprecise notion which requires that Type 2 membership degrees be considered in most applications related to human decision making schemas. Even if the membership functions are restricted to be Type1, their combinations generate an interval – valued Type 2 membership. This is part of the general result that Classical equivalences breakdown in Fuzzy theory. Thus all classical formulas must be reassessed with an upper and lower expression that are generated by the breakdown of classical formulas. Key features: - Ontological grounding - Epistemological justification - Measurement of Membership - Breakdown of equivalences - FDCF is not equivalent to FCCF - Fuzzy Beliefs - Meta-Linguistic axioms - Ontological grounding - Epistemological justification - Measurement of Membership - Breakdown of equivalences - FDCF is not equivalent to FCCF - Fuzzy Beliefs - Meta-Linguistic axioms

4th IEEE International Conference on Signal Processing, Computing and Control : September 21-23, 2017 Springer Nature

This book presents the synthesis and analysis of fuzzy controllers and its application to a class of mechanical systems. It mainly focuses on the use of type-2 fuzzy controllers to account for disturbances known as hard or nonsmooth nonlinearities. The book, which summarizes the authors' research on type-2 fuzzy logic and control of mechanical systems, presents models,

simulation and experiments towards the control of servomotors with dead-zone and Coulomb friction, and the control of both wheeled mobile robots and a biped robot. Closed-loop systems are analyzed in the framework of smooth and nonsmooth Lyapunov functions.

Uncertain Rule-based Fuzzy Logic Systems Elsevier

This book describes recent advances in the use of fuzzy logic for the design of hybrid intelligent systems based on nature-inspired optimization and their applications in areas such as intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. Based on papers presented at the North American Fuzzy Information Processing Society Annual Conference (NAFIPS 2017), held in Cancun, Mexico from 16 to 18 October 2017, the book is divided into nine main parts, the first of which first addresses theoretical aspects, and proposes new concepts and algorithms based on type-1 fuzzy systems. The second part consists of papers on new concepts and algorithms for type-2 fuzzy systems, and

on applications of type-2 fuzzy systems in diverse areas, such as time series prediction and pattern recognition. In turn, the third part contains papers that present enhancements to meta-heuristics based on fuzzy logic techniques describing new nature-inspired optimization algorithms that use fuzzy dynamic adaptation of parameters. The fourth part presents emergent intelligent models, which range from quantum algorithms to cellular automata. The fifth part explores applications of fuzzy logic in diverse areas of medicine, such as the diagnosis of hypertension and heart diseases. The sixth part describes new computational intelligence algorithms and their applications in different areas of intelligent control, while the seventh examines the use of fuzzy logic in different mathematic models. The eight part deals with a diverse range of applications of fuzzy logic, ranging from environmental to autonomous navigation, while the ninth covers theoretical concepts of fuzzy models

Theory and Applications Springer Science & Business Media

Applied Fuzzy Systems provides information pertinent to the fundamental aspects of fuzzy systems theory and its application. This book discusses the development of high-level artificial intelligence and information processing systems, as well as the realization of fuzzy computers. Organized into six chapters, this book begins with an overview of the fundamental problems addressed by fuzzy systems. This text then reviews standard computer logic or two-valued Boolean algebra. Other chapters consider bus scheduling, evaluation of structural reliability, applications of schema systems for decision-making, and processing of natural-language information and systems for medical diagnosis as examples of fuzzy expert systems. This book discusses as well a practical fuzzy expert system for durability evaluations of reinforced concrete slabs for bridges, along with an example of application. The final chapter deals with the important parts of the construction of fuzzy computers, their architecture, and the outlook for the future. This book is a valuable resource for engineers, mathematicians, technicians, and research workers.

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