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OPTIMIZATION OF SUPPLY CHAIN OF PULSES

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ABSTRACT-

Fuzzy sets are sets whose elements have degrees of membership. Fuzzy sets were introduced simultaneously by Lotfi A. Zadeh and Dieter Klaua in 1965 as an extension of the classical notion of set. In classical set theory, the membership of elements in a set is assessed in binary terms according to a bivalent condition — an element either belongs or does not belong to the set. By contrast, fuzzy set theory permits the gradual assessment of the membership of elements in a set; this is described with the aid of a membership function valued in the real unit interval [0, 1]. Fuzzy sets generalize classical sets, since the indicator functions of classical sets are special cases of the membership functions of fuzzy sets, if the latter only take values 0 or 1. In fuzzy set theory, classical bivalent sets are usually called crisp sets. The fuzzy set theory can be used in a wide range of domains in which information is incomplete or imprecise, such as bioinformatics.

Fuzzy sets can be applied, for example, to the field of genealogical research. When an individual is searching in vital records such as birth records for possible ancestors, the researcher must contend with a number of issues that could be encapsulated in a membership function. Looking for an ancestor named John Henry Pittman, whom you think was born in (probably eastern) Tennessee circa 1853 (based on statements of his age in later censuses, and a marriage record in Knoxville), what is the likelihood that a particular birth record for "John Pittman" is your John Pittman. What about a record in a different part of Tennessee for "J.H. Pittman" in 1851. (It has been suggested by Thayer Watkins that Zadeh's ethnicity is an example of a fuzzy set).

Keywords :

(1) Fuzzy

(2) Bioinformatics

(3) Genealogical research

(4) Crisp sets

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INTRODUCTION:

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Fuzzy sets were introduced simultaneously by Lotfi A. Zadeh and Dieter Klaua in 1965 as an extension of the classical notion of set.

LITERATURE REVIEW:

The fuzzy logic controller (FLC) provides a means of converting a linguistic control strategy. A survey of the FLC is presented, and a general methodology for constructing an FLC and assessing its performance is described. In particular, attention is given to fuzzification and defuzzification strategies, the derivation of the database and fuzzy control rules, the definition of fuzzy implication, and an analysis of fuzzy reasoning mechanisms By : Electron. Res. Lab., California Univ., Berkeley, CA

There are three basic concepts that underlie human cognition: granulation, organization and causation. Informally, granulation involves decomposition of whole into parts; organization involves integration of parts into whole; and causation involves association of causes with effects.

Granulation of an object *A* leads to a collection of granules of *A*, with a granule being a clump of points (objects) drawn together by indistinguishability, similarity, proximity or functionality. For example, the granules of a human head are the forehead, nose, cheeks, ears, eyes, etc. In general, granulation is hierarchical in nature. A familiar example is the granulation of time into years, months, days, hours, minutes, etc.

Modes of information granulation (IG) in which the granules are crisp (c-granular) play important roles in a wide variety of methods, approaches and techniques. Crisp IG, however, does not reflect the fact that in almost all of human reasoning and concept formation the granules are fuzzy (f-granular). The granules of a human head, for example, are fuzzy in the sense that the boundaries between cheeks, nose, forehead, ears, etc. are not sharply defined. Furthermore, the attributes of fuzzy granules, e.g., length of nose, are fuzzy, as are their values: long, short, very long, etc. The fuzziness of granules, their attributes and their values is characteristic of ways in which humans granulate and manipulate information.

The theory of fuzzy information granulation (TFIG) is inspired by the ways in which humans granulate information and reason with it. However, the foundations of TFIG and its methodology are mathematical in nature.The point of departure in TFIG is the concept of a generalized constraint. A granule is characterized by a generalized constraint which defines it. The principal types of granules are: possibilistic, veristic and probabilistic.

The principal modes of generalization in TFIG are fuzzification (f-generatization); granulation (g-generalization); and fuzzy granulation (f.g-generalization), which is a combination of fuzzification and granulation. F.g-generalization underlies the basic concepts of linguistic variable, fuzzy if-then rule and fuzzy graph. These concepts have long played a major role in the applications of fuzzy logic and differentiate fuzzy logic from other methodologies for dealing with imprecision and uncertainty. What is important to recognize is that no methodology other than fuzzy logic provides a machinery for fuzzy information granulation By Lotfi . Zadeh

This paper presents methodologies for modeling imprecision in the definition, analysis and synthesis of two-dimensional features. The imprecision may arise through incomplete information, the presence of varying concentrations of attributes, or the use of qualitative descriptions of spatial features or their relationships. The work is intended to have applications in geographical information systems (GIS), but is equally applicable to other types of spatial information systems or spatial database applications. Fuzzy sets are used as a representational and reasoning device. The paper contains definitions of an imprecisely defined spatial feature or *fuzzy region*; definitions of distance and directional metrics between two such regions; a methodology for analysis of the spatial relationship between two regions; and a methodology for synthesis of new regions that are subject to the presence of imprecise spatial constraints. By : david altman

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Improvement of adjustable speed drive system efficiency is important not only from the viewpoints of energy saving and cooling system operation, but also from the broad perspective of environmental pollution. The paper describes a fuzzy logic based on-line efficiency optimization control of a drive that uses an indirect vector controlled induction motor speed control system in the inner loop. At steady-state light-load condition, a fuzzy controller adaptively decrements the excitation current on the basis of measured input power such that, for a given load torque and speed, the drive settles down to the minimum input power, i.e., operates at maximum efficiency. The low-frequency pulsating torque due to decrementation of rotor flux is compensated in a feed forward manner. If the load torque or speed command changes, the efficiency search algorithm is abandoned and the rated flux is established to get the best transient response. The drive system with the proposed efficiency optimization controller has been simulated with lossy models of the converter and machine, and its performance has been thoroughly investigated. An experimental drive system with the proposed controller implemented on a TMS320C25 digital signal processor, has been tested in the laboratory to validate the theoretical development By : Sousa, G.C.D. Dept. de Engenharia Eletrica, Univ. Federal do Espirito Santo, Vitoria

This paper describes an experiment on the "linguistic" synthesis of a controller for a model industrial plant (a steam engine), Fuzzy logic is used to convert heuristic control rues stated by a human operator into an automatic control strategy. The experiment was initiated to investigate the possibility of human interaction with a learning controller. However, the control strategy set up linguistically proved to be far better than expected in its own right, and the basic experiment of linguistic control synthesis in a non-learning controller is reported here.By : E.H. Mamdani,S. AssilianQueen Mary College, London University, U.K.

In this paper, a fuzzy logic controller is developed for hybrid vehicles with parallel configuration. Using the driver command, the state of charge of the energy storage, and the motor/generator speed, a set of rules have been developed, in a fuzzy controller, to effectively determine the split between the two power plants: electric motor and internal combustion engine. The underlying theme of the fuzzy rules is to optimize the operational efficiency of all components, considered as one system. Simulation results were used to assess the performance of the controller. A forward-looking hybrid vehicle model was used for implementation and simulation of the controller. Potential fuel economy improvement is shown by using fuzzy logic, relative to other controllers, which maximize only the efficiency of

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the engine By : Schouten, N.J. Dept. of Electr. & Syst. Eng., Oakland Univ., Rochester, MI Salman, M.A. ; Kheir, N.A.

An adaptive tracking control architecture is proposed for a class of continuous-time nonlinear dynamic systems, for which an explicit linear parameterization of the uncertainty in the dynamics is either unknown or impossible. The architecture employs fuzzy systems, which are expressed as a series expansion of basis functions, to adaptively compensate for the plant nonlinearities. Global asymptotic stability of the algorithm is established in the Lyapunov sense, with tracking errors converging to a neighborhood of zero. Simulation results for an unstable nonlinear plant are included to demonstrate that incorporating the linguistic fuzzy information from human experts results in superior tracking performance By : Chun-Yi Su Dept. of Mech. Eng., Victoria Univ., BC Stepanenko, Y.

AIM OF PAPER:

Purpose - I aim to develop a multi-attribute decision making model for evaluating and selecting the best options for the pulses supply chain. In this project, I aim to apply Fuzzy logic technique on different attributes which do effects the pulses supply chain, with 5 different alternates. Thereby applying TOPSIS technique on 6 by 5 matrixes (decision making model or decision matrix).

In this project, I propose a new way of best option selection for supply chain by comparing feedbacks and alternatives which have been collected by the NATRAJ pulses manufacturer (local manufacturer in Indore).

METHODOLOGY:

Step 1: Construct normalized decision matrix. This step transforms various attribute dimensions into non-dimensional attributes, which allows comparisons across criteria. The formula which is to be applied is:

$$T= [(x-a)/(x-b)]*d$$

Where, **T** = score obtained in the fuzzifier, **x** = value assigned in the criteria

a = deviation from strongest value, **b** = strongest value, **c** = weakest value

d = priority scaling of the criteria

Step 2: Calculate the value of 'b-c' for each column.

Step 3: Determine the deviation from strongest value i.e. 'a' for each column.

Step 4: Calculate the value of 'x-a' for each column.

Step 5: Calculate '(x-a)/(b-c)' for each element of the column.

Step 6: Calculate '[(x-a)/(x-b)]*d' for each column.

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Then calculate the mean of all the elements for each car.

This will give us the final rating.

5. Analysis:

CALCULATION FOR SUPPLIER

VALUES OF 'X'

Priorities	0.4	0.6	1	0.8	0.2
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes
Alternates					
MH(Jalna)	0.8	0.8	1	0.4	0.8
MP(Khargone)	1	0.8	0.8	0.2	1
Karnataka	0.6	0.6	0.6	0.6	0.4
Tanzania	0.4	0.2	0.6	1	0.2
Kazakistan	0.4	0.2	0.4	0.8	0.2
Canada	0.2	0.1	0.2	0.4	0.1

Values of 'a'

Priorities	0.4	0.6	1	0.8	0.2
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes
Alternates					
MH(Jalna)	0.2	0	0	0.6	0.2
MP(Khargone)	0	0	0.2	0.8	0
Karnataka	0.4	0.2	0.4	0.4	0.6
Tanzania	0.6	0.6	0.4	0	0.8
Kazakistan	0.6	0.6	0.6	0.2	0.8
Canada	0.8	0.7	0.8	0.6	0.9
b-c	0.8	0.7	0.8	0.8	0.9

values of 'b-c'

Priorities	0.4	0.6	1	0.8	0.2
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes
Alternates					
MH(Jalna)	0.8	0.8	1	0.4	0.8
MP(Khargone)	1	0.8	0.8	0.2	1
Karnataka	0.6	0.6	0.6	0.6	0.4
Tanzania	0.4	0.2	0.6	1	0.2
Kazakistan	0.4	0.2	0.4	0.8	0.2
Canada	0.2	0.1	0.2	0.4	0.1
b-c	0.8	0.7	0.8	0.8	0.9

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values of 'x-a'					
Priorities	0.4	0.6	1	0.8	0.2
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes
Alternates					
MH(Jalna)	0.6	0.8	1	-0.2	0.6
MP(Khargone)	1	0.8	0.6	-0.6	1
Karnataka	0.2	0.4	0.2	0.2	-0.2
Tanzania	-0.2	-0.4	0.2	1	-0.6
Kazakistan	-0.2	-0.4	-0.2	0.6	-0.6
Canada	-0.6	-0.6	-0.6	-0.2	-0.8
b-c	0.8	0.7	0.8	0.8	0.9

values of '(x-a)/(b-c)'					
Priorities	0.4	0.6	1	0.8	0.2
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes
Alternates					
MH(Jalna)	0.75	1.14	1.25	-0.25	0.67
MP(Khargone)	1.25	1.14	0.75	-0.75	1.11
Karnataka	0.25	0.57	0.25	0.25	-0.22
Tanzania	-0.25	-0.57	0.25	1.25	-0.67
Kazakistan	-0.25	-0.57	-0.25	0.75	-0.67
Canada	-0.75	-0.86	-0.75	-0.25	-0.89
b-c	0.8	0.7	0.8	0.8	0.9

values of '[{(x-a)/(b-c)}*d]'							
Priorities	0.4	0.6	1	0.8	0.2		
Specifications	Transport Price	Raw Material (Location)	Quality Of Raw Material	Price	Taxes		
Alternates							
MH(Jalna)	0.30	0.69	1.25	-0.20	0.13		2.17
MP(Khargone)	0.50	0.69	0.75	-0.60	0.22		1.56
Karnataka	0.10	0.34	0.25	0.20	-0.04		0.85
Tanzania	-0.10	-0.34	0.25	1.00	-0.13		0.67
Kazakistan	-0.10	-0.34	-0.25	0.60	-0.13		-0.23
Canada	-0.30	-0.51	-0.75	-0.20	-0.18		-1.94
b-c	0.8	0.7	0.8	0.8	0.9		

CALCULATION FOR DESTONER

FINAL MATRIX FOR DESTONER

values of '((x-a)/(b-c))*d) Manufacturing Cycle Destoner						
Priorities	0.4	1	0.6	0.8	0.2	
Specifications	Power (KW)	Capacity (Tonn/Hr)	Efficiency	Cost	Maintenance	summation
Alternates						
Vibro Destoner (NVD 01)	0	0.3	-0.8	2.1	0	1.67
Vibro Destoner (NVD 02)	0.6	1.0	0	0.5	0	2.13
Vibro Destoner (NVD 03)	-0.2	2.3	0.4	0.0	0.16	2.69
Double Destoner	-0.2	1.0	0.4	-0.5	-0.08	0.59
Destoner With Canopy	0.6	1.7	0.8	0.0	0.32	3.39
b-c	0.4	0.3	0.6	0.6	0.5	

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CALCULATIONS FOR GRAVITY SEPARATOR

	values of '((x-a)/(b-c))*d'						
		Manufactiring Cycle					
		Gravity Seperator					
Priorities	0.6	0.3	1	0.16	0.83	0.5	
Specifications	Motor (Fan) KW	Motor (Seiveboat) KW	Estimated capacity (Tonn/Hr)	Screen area (sq.mt.)	Cost	Maintenance	summation
Alternates							
Pre Cleaner PC	0.8	0.36	-0.13	-0.11	1.11	0.67	2.69
Pre Cleaner Sab	0.4	0.36	0.13	-0.07	0.55	-0.17	1.20
Pre Cleaner Sac	0.4	0.36	0.38	0.07	0.00	0.33	1.54
Pre Cleaner Si	-0.4	-0.24	1.13	0.16	-0.55	0.00	0.09
Pre Cleaner Fau	-0.4	-0.12	-0.88	0.21	0.00	-0.33	-1.52
b-c	0.6	0.5	0.8	0.7	0.6	0.6	

CALCULATIONS FOR SORTEX

	valuesof '((x-a)/(b-c))*d'						
		Manufacturing Cycle					
		Sortex					
Priorities	0.33	0.83	0.66	1	0.5	0.16	
Specifications	Power (KW)	Capacity (Tonn/Hr)	Efficiency (for seperation)	Cost	Maintenance	Air Consumption (cfm@8kgf/cm sq.)	summation
Alternates							
Sortex Smart x40	0.66	-0.59	1.32	1.29	0.7	-0.08	3.29
Sortex Smart x60	0.66	-0.12	1.32	1.00	0.7	0.03	3.59
Sortex Smart x80	0.99	0.36	1.98	0.43	0.3	0.08	4.13
Sortex Smart x100	1.32	0.83	1.98	-0.14	0.1	0.19	4.27
Sortex Smart x120	1.32	1.07	2.64	-0.71	-0.3	0.24	4.25
b-c	0.2	0.7	0.2	0.7	0.5	0.6	

CALCULATIONS FOR ROLLER

	values of '((x-a)/(b-c)*d)'				
		Manufacturing Cycle			
		Roller			
Priorities	0.75	0.5	0.25	1	
Specifications	Power (KW)	Capacity (Kg/Hr)	Maintenance	Cost	summation
Alternates					
Roller JAS HR 1	0.00	-0.2	0.35	1.4	1.55
Roller JAS HR 2	0.38	0	0.15	1	1.53
Roller JAS HR 3	0.75	0.4	0.05	-0.2	1.00
Roller JAS HR 4	1.50	0.8	-0.15	-0.6	1.55
b-c	0.4	0.5	0.5	0.5	

6. LIST OF ACRONYMS:

T =Score obtained from fuzzifier

x-Value assigned in the criteria

a-Deviation from the strongest value

b-Strongest value

c-Weakest value

d-Priority scaling of the criteria

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RESULTS

Arrow represents the alternative with best rating and circle represents the alternative present in the dal mill.

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