APPLICATION OF FUZZY GENERALIZED α-BAIRE SPACE IN SELECTION PROCESS

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Abstract:

In this paper we introduce the application of fuzzy generalized α-Baire Spaces, with suitable examples.

Key words:

Fuzzy α - open sets, fuzzy α - generalized open sets, fuzzy α - generalized Baire space, and fuzzy generalized α-Baire space.

I. Introduction:

The theory of fuzzy logic is based on the notion of relative graded membership, as inspired by the processes of human perception and cognition. Lofti A. Zadeh published his first famous research paper on fuzzy sets in 1965. Fuzzy logic can deal with information arising from computational perception and cognition, that is, uncertain, imprecise, vague, partially true, or Without sharp boundaries. Fuzzy logic allows for the inclusion of vague human assessment in computing problems. Also, it provides an efficient means for conflict resolution of multiple criteria and better assessment of options. New computing methods based on fuzzy logic can be used in the development of intelligent systems for decision making, identification, pattern recognition, optimization and control.

Fuzzy logic is extremely useful for many people involved in research and development including engineers (electrical, mechanical, civil, chemical, aerospace, agricultural, biomedical, computer, environmental, geological, industrial and mechatronics), mathematicians, computer software developers and researchers, natural scientist (biology, chemistry, earth science and physics), medical researchers, social scientist (economics, management, political science and psychology), public policy analysts, business analysts and jurists. This paper deals with the application of fuzzy generalized α-Baire space for customer in choosing a best product.

II. Preliminaries:

Now review of some basic notions and results used in the sequel. In this work by (X,T) or simply by X, we will denote a fuzzy topological space due to Chang [2].

Definition 2.1 [2]:

Let λ and μ be any two fuzzy sets in a fuzzy topological space (X, T). Then we define:

$\lambda \vee \mu : X \to [0,1]$ as follows: $\lambda \vee \mu (x) = \max \{\lambda(x), \mu(x)\}$;

$\lambda \wedge \mu : X \to [0,1]$ as follows: $\lambda \wedge \mu (x) = \min \{ \lambda(x), \mu(x)\}$;

$\mu = \lambda^c \leftrightarrow \mu(x) = 1 - \lambda(x)$.

For a family $\lambda_i \in$ I of fuzzy sets in (X, T), the union $\psi = U_i \lambda_i$ and intersection $\delta = \wedge_i \lambda_i$ are defined respectively as $\psi (x) = Sup_i\{\lambda_i(x), x \epsilon X\}$, and $\delta(x) = Inf_i\{\lambda_i(x), x \epsilon X\}$.

Definition 2.2 [3]:

Let (X,T) be a fuzzy topological space. For a fuzzy set λ of X, the interior and the closure of λ are defined respectively as $int(\lambda) = \vee \{\mu \setminus \mu \leq \lambda, \mu \epsilon T$ and $cl(\lambda) = \wedge \{\mu \setminus \lambda \leq \mu, 1 - \mu \epsilon T\}$.

Definition 2.3[4]:

Let (X,T) be a topological space. For a fuzzy set λ of X is a α – generalized closed set (briefly αg-closed) if αcl(λ) ≤ μ whenever λ ≤ μ and μ is fuzzy open in X.

Definition 2.4 [9]:

A fuzzy set λ in a fuzzy topological space (X,T) is called fuzzy dense if there exists no fuzzy closed set μ ϵ (X,T) such that λ < μ < 1. That is cl(λ) = 1.

Definition 2.5 [8]:

A fuzzy set λ in a fuzzy topological space (X,T) is called fuzzy nowhere dense if there exists no non-zero fuzzy open set μ in (X,T) such that μ < cl(λ). That is, intcl(λ) = 0.

Definition 2.6 [8]:

Let (X,T) be a fuzzy topological space. A fuzzy set λ in (X,T) is called fuzzy first category set if $\lambda = \cup_{i=1}^{\infty} \lambda_i$, where λ_i's are fuzzy nowhere dense sets in (X,T). A fuzzy set which is not fuzzy first category set is called a fuzzy second category set in (X,T).

Definition 2.7 [7]:

A fuzzy topological space (X,T) is called fuzzy first category spaceif $1 = \cup_{i=1}^{\infty} \lambda_i$, where$\lambda_i$'s are fuzzy nowhere dense sets in (X,T). A topological space which is not of fuzzy first category is said to be of fuzzy second category space.

Definition 2.8 [8]:

Let (X,T) be a fuzzy topological space. Then (X,T) is called a fuzzy Baire space if $int(\cup_{i=1}^{\infty} (\lambda_i)) = 0$, where (λ_i) 's are fuzzy nowhere dense sets in (X,T).

Definition 2.9 [1]:

A fuzzy topological space (X,T) is called fuzzy generalized α- Baire space if $int(\cup_{i=1}^{\infty} (\lambda_i)) = 0$, where (λ_i) 's are fuzzy nowhere dense sets in (X,T).

CRITERIA:

λ → Cost   a → Samsung 43K5002

μ → Inches   b → LG 43LH576T

γ → Quality   c → Sony Bravia KDL- 32W700C

Name of Companies	λ (cost)	μ (Inches)	γ(Quality)
Samsung 43K5002 (a)	Rs. 41,300	43	Full HD 1920×1080Px 1×USB
LG 43LH576T (b)	Rs. 49,990	44	Full HD Smart LED 1920×1080Px
Sony Bravia KDL- 32W700C	Rs. 42,320	32	Full HD Smart

(c)			LED 1920×1080Px Motion Flow

Cost ⇒ Expensive (0.8), Reasonable (0.6), Cheap (<0.5)
Inch ⇒ Large (0.8), Medium (0.6), Small (<0.5)
Quality ⇒ Very good (0.7), Good (0.6), Poor (<0.5)

ALGORITHM:

Step 1: Let λ, μ, γ be a fuzzy set and a, b, c be a fuzzy subset. Write the values of λ, μ, γ, a, b, c in the form

	λ	**μ**	**γ**
a	λ(a)	μ(a)	γ(a)
b	λ(b)	μ(b)	γ(b)
c	λ(c)	μ(c)	γ(c)

Step 2: Find the orbitrary union and finite intersection for the fuzzy set and neglect the repeated values then enter the values in the corresponding tabular column convert to this value between 0 to1.
Step 3: Choose a fuzzy set which should be lesser than the fuzzy open set having greatest number and it should satisfy the condition cl (λ) ≤ μ
Step 4: Next step is to compute fuzzy generalized α-nowhere dense set which should satisfy the condition α-int α-cl (λ) = 0
Step 5: Finally compute fuzzy generalized α-Baire space which should satisfy the condition α-int $\{\cup_{i=1}^{\infty} \lambda_i\} = 0$

MATHEMATICAL MODELLING FOR THE FUZZY GENERALIZED α-BAIRE SPACE:

We are choosing a three branches of Television to purchase
1) Samsung 43K5002.
2) LG 43LH576T.
3) Sony Bravia KDL-32700C.

i. λ indicates the cost which is Expensive (0.7), Reasonable (0.6), Cheap (<0.5).
ii. μ indicates the inches which is Large (0.8), Medium (0.5), Small (<0.5).
iii. γ indicates the quality which is Very good (0.9), Good (0.6), Poor (<0.5).

Now we define a problem by using the above values.

Fuzzy open set:

λ	μ	γ	λVμ	λΛμ	λVγ	λΛγ	μVγ	μΛγ
λ(a)	μ(a)	γ(a)	λVμ(a)	λΛμ(a)	λVγ(a)	λΛγ(a)	μVγ(a)	μΛγ(a)
λ(b)	μ(b)	γ(b)	λVμ(b)	λΛμ(b)	λVγ(b)	λΛγ(b)	μVγ(b)	μΛγ(a)
λ(c)	μ(c)	γ(c)	λVμ(c)	λΛμ(c)	λVγ(c)	λΛγ(c)	μVγ(c)	μΛγ(a)

λV(μΛγ)	λΛ(μVγ)	μV(λΛγ)	μΛ(λVγ)	γV(λΛμ)	γΛ(λVμ)	λVμVγ	λΛμΛγ
λV(μΛγ)(a)	λΛ(μVγ)(a)	μV(λΛγ)(a)	μΛ(λVγ)(a)	γV(λΛμ)(a)	γΛ(λVμ)(a)	λVμVγ(a)	λΛμΛγ(a)
λV(μΛγ)(b)	λΛ(μVγ)(b)	μV(λΛγ)(b)	μΛ(λVγ)(b)	γV(λΛμ)(b)	γΛ(λVμ)(b)	λVμVγ(b)	λΛμΛγ(b)
λV(μΛγ)(c)	λΛ(μVγ)(c)	μV(λΛγ)(c)	μΛ(λVγ)(c)	γV(λΛμ)(c)	γΛ(λVμ)(c)	λVμVγ(c)	λΛμΛγ(c)

Fuzzy closed set:

1-λ	1-μ	1-γ	1-λVμ	1-λΛμ	1-λVγ	1-λΛγ	1-μVγ	1-μΛγ
1-λ(a)	1-μ(a)	1-γ(a)	1-λVμ(a)	1-λΛμ(a)	1-λVγ(a)	1-λΛγ(a)	1-μVγ(a)	1-μΛγ(a)
1-λ(b)	1-μ(b)	1-γ(b)	1-λVμ(b)	1-λΛμ(b)	1-λVγ(b)	1-λΛγ(b)	1-μVγ(b)	1-μΛγ(a)
1-λ(c)	1-μ(c)	1-γ(c)	1-λVμ(c)	1-λΛμ(c)	1-λVγ(c)	1-λΛγ(c)	1-μVγ(c)	1-μΛγ(a)

1-λV(μΛγ)	1-λΛ(μVγ)	1-μV(λΛγ)	1-μΛ(λVγ)
1-λV(μΛγ)(a)	1-λΛ(μVγ)(a)	1-μV(λΛγ)(a)	1-μΛ(λVγ)(a)
1-λV(μΛγ)(b)	1-λΛ(μVγ)(b)	1-μV(λΛγ)(b)	1-μΛ(λVγ)(b)

1-λ∨(μ∧γ)(c)	1-λ∧(μ∨γ)(c)	1-μ∨(λ∧γ)(c)	1-μ∧(λ∨γ)(c)

1-γ∨(λ∧μ)	**1-γ∧(λ∨μ)**	**1-λ∨μ∨γ**	**1-λ∧μ∧γ**
1-γ∨(λ∧μ)(a)	1-γ∧(λ∨μ)(a)	1-λ∨μ∨γ(a)	1-λ∧μ∧γ(a)
1-γ∨(λ∧μ)(b)	1-γ∧(λ∨μ)(b)	1-λ∨μ∨γ(b)	1-λ∧μ∧γ(b)
1-γ∨(λ∧μ)(c)	1-γ∧(λ∨μ)(c)	1-λ∨μ∨γ(c)	1-λ∧μ∧γ(c)

1-λ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-μ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∨μ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∧μ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∨γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∧γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-μ∨γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-μ∧γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∨(μ∧γ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ

1-λ∧(μ∨γ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-μ∨(λ∧γ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-μ∧(λ∨γ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-γ∨(λ∧μ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-γ∧(λ∨μ) < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∨μ∨γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ∧μ∧γ < λ ⇒ μ is open ⇒ cl (λ) ≤ λ
1-λ ,1-μ,1-γ ,1-λ∨μ,1-λ∧μ,1-λ∨γ,1-λ∧γ,1-μ∨γ,1-μ∧γ,1-λ∨(μ∧γ),1-λ∧(μ∨γ),1-μ∨(λ∧γ),1-μ∧(λ∨γ),1-γ∨(λ∧μ),1-γ∧(λ∨μ),1-λ∨μ∨γ,1-λ∧μ∧γ's are fuzzy generalized closed sets.
λ,μ,γ,λ∨μ,λ∧μ,λ∨γ,λ∧γ,μ∨γ,μ∧γ,λ∨(μ∧γ),λ∧(μ∨γ),μ∨(λ∧γ),μ∧(λ∨γ),γ∨(λ∧μ),γ∧(λ∨μ),λ∨μ∨γ,λ∧μ∧γ's are fuzzy generalized open.
Int cl 1-λ=0
Int cl 1-μ=0
Int cl 1-γ=0
Int cl 1-λ∨μ=0
Int cl 1-λ∧μ=0
Int cl 1-λ∨γ=0
Int cl 1-λ∧γ=0
Int cl 1-μ∨γ=0
Int cl 1-μ∧γ=0
Int cl 1-λ∨(μ∧γ) =0
Int cl 1-λ∧(μ∨γ) =0
Int cl 1-μ∨(λ∧γ) =0
Int cl 1-μ∧(λ∨γ) =0
Int cl 1-γ∨(λ∧μ) =0
Int cl 1-γ∧(λ∨μ)=0
Int cl 1-λ∨μ∨γ=0

Int cl 1-λ∧μ∧γ=0
1-λ ,1-μ,1-γ ,1-λ∨μ,1-λ∧μ,1-λ∨γ,1-λ∧γ,1-μ∨γ,1-μ∧γ,1-λ∨(μ∧γ),1-λ∧(μ∨γ),1-μ∨(λ∧γ),1-μ∧(λ∨γ),1-γ∨(λ∧μ),1-γ∧(λ∨μ),1-λ∨μ∨γ,1-λ∧μ∧γ's are fuzzy generalized α-nowhere dense sets.
Int [(1-λ) ∨ (1-μ) ∨ (1-γ) ∨ (1-λ∨μ) ∨ (1-λ∧μ) ∨ (1-λ∨γ) ∨ (1-λ∧γ) ∨ (1-μ∨γ) ∨ (1-μ∧γ) ∨ (1-λ∨(μ∧γ)) ∨ (1-λ∧(μ∨γ)) ∨ (1-μ∨(λ∧γ)) ∨ (1-μ∧(λ∨γ)) ∨ (1-γ∨(λ∧μ)) ∨ (1-γ∧(λ∨μ)) ∨ (1-λ∨μ∨γ) ∨ (1-λ∧μ∧γ)] = 0
Then it is a Fuzzy generalized α-Baire spae.

PROOF:

Now we solve the above problem by Fuzzy generalized α-Baire spae

λ	μ	γ
0.6	0.6	0.6
0.8	0.8	0.7
0.6	0.5	0.6

Fuzzy open set

λ	μ	γ	μ∧γ
0.6	0.6	0.6	0.6
0.8	0.8	0.7	0.7
0.6	0.5	0.6	0.5

Fuzzy closed set

1-λ	1-μ	1-γ	1-μ∧γ
0.4	0.4	0.4	0.4
0.2	0.2	0.3	0.3
0.4	0.5	0.4	0.5

1-λ < λ ⇒ μ is open ⇒ cl (1-λ) ≤ λ ⇒1-λ ≤ λ
1-μ < λ ⇒ μ is open ⇒ cl (1-μ) ≤ λ ⇒1-μ ≤ λ
1-γ < λ ⇒ μ is open ⇒ cl (1-γ) ≤ λ ⇒1-γ ≤ λ
1-μ∧γ < λ ⇒ μ is open ⇒ cl (1-μ∧γ) ≤ λ ⇒1-μ∧γ ≤ λ
1-λ ,1-μ ,1-γ ,1-μ∧γ's are fuzzy closed set.
Now
Int cl 1-λ=0
Int cl 1-μ=0
Int cl 1-γ=0
Int cl (1-μ∧γ)=0
1-λ ,1-μ ,1-γ ,1-μ∧γ's are fuzzy generalized α-nowhere dense set.
Int [(1-λ) ∨ (1-μ) ∨ (1-γ) ∨ (1-μ∧γ)] = 0
Int (1-μ∧γ) = 0

Thus it is a fuzzy generalized α- Baire space in (X,T).
Finally the defined problem has satisfied the condition cl (λ) ≤ μ

int (1-λ ∨ 1-μ ∨ 1-γ ∨ 1-μ∧γ) ≤ 1-μ∧γ (0.4, 0.3, 0.5)
Now giving rank to the values of 1-μ∧γ = (0.4,0.3,0.5)

Name of Companies	1-λ (cost)	1-μ (Inches)	1-γ(Quality)	1- [μ (Inches)∧γ(Quality)]
Samsung 43K5002	Rs. 41,300 (0.4)	43 (0.4)	Full HD 1920×1080Px 1×USB (0.4)	inches and quality of a = (0.4)
LG 43LH576T	**Rs. 49,990 (0.2)**	**44 (0.2)**	**Full HD Smart LED 1920×1080Px (0.3)**	**inches and quality of b = (0.3)**
Sony Bravia KDL-32W700C	Rs. 42,320 (0.4)	32 (0.5)	Full HD Smart LED 1920×1080Px Motion Flow (0.4)	inches and quality of c = (0.5)

Thus it satisfies the condition of fuzzy generalized α- Baire space.

So we conclude that **LG 43LH576T** is the best one for the customer to purchase.

III. Conclusion:

In this paper we have discussed a basic definition of fuzzy dense and fuzzy nowhere dense set and fuzzy generalized α-Baire space and also we develope an application of Fuzzy generalized α– Baire space by using product for the customer to purchase the best one.

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