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A New Technique for Finding Optimal Person for an Appurtenant Position

K. Ponnalagu[1], G. Hemaa Nandhini[2], S. Naveen Kumar[3]

[1,2,3]Department of Mathematics, Sri Krishna Arts and Science College, Coimbatore, Tamilnadu.

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Abstract

One can observe differences in theoretical problems and its appearance in application problems. Uncertainties in data acts as barriers in mathematical problems. Fuzzy theory and possibility theory are developed to solve data with unreliability and imprecision. In recent decades Fuzzy Soft Sets are used to represent imprecise data .Generalization of Fuzzy Soft set were widely used in decision making problem. The notion of fuzzy soft expert sets and possibility fuzzy soft sets are pioneered by Alkhazaleh and Salleh. The duo of the authors then make a lead and defined the concept of possibility intuitionistic fuzzy soft sets and extended their studies in medical diagnosis. This article is prepared to express the advance of possibility intuitionistic fuzzy soft sets over intuitionistic fuzzy sets. In this study we define a universal set of elements containing each element which has an opportunity adhered to the parameterization of intuitionistic fuzzy sets while constructing an intuitionistic fuzzy soft set. Furthermore, from the view point of set of experts applications are discussed to enrich the users to understand the expert's opinions without the use of any functional operations. This would significantly result in a better and enhance rationalization of the intuitionistic fuzzy soft sets which consequently produces more genuine results when these concepts are put in the application of decision making problems.

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INTRODUCTION

The operations and properties on Intuitionistic Possibility intuitionistic fuzzy soft sets are reproduced and a few equities are re- admitted. The soft expert set was defined by Alkhazeleh and Saleh and elaborated with an application to their idea of decision making. Development of soft set theory and its generalization leads to the introduction of the possibility value. The possibility value which demonstrates the intensity of possibility of belongingness in addition to the degree of membership and expert set elements enabled the users to know the option of all experts without the use of any functionals. These characteristics

January - February 2020
ISSN: 0193 - 4120 Page No. 4435 - 4440

improved the working rule of soft expert sets in the decision making problems. The basic component of a fuzzy set is only a degree of membership whereas the intuitionistic fuzzy set uses the degree of membership and degree of non-membership. These restrictions states that both the membership and the non-membership functions do not exceed one. In this article, we considered the universal set of parameters, number of experts and the opinions of the users. Since the utilizers expect to know the experts opinions without the use of any functional, the decision using generalization of intuitionistic fuzzy soft sets would yield authentic results.

The brief organization of the article follows:

It includes applicable backdrop information connected to softs sets, intuitionistic fuzzy sets, intuitionistic fuzzy soft sets, soft expert sets, and possibility intuitionistic fuzzy soft sets. Further it is followed by the connection and the approach of intuitionistic fuzzy sets, interval valued fuzzy sets, bipolar-valued fuzzy sets. Then the interpretation of possibility intuitionistic fuzzy soft expects sets and the associated conceptions are given. The basic operation namely union, intersection, complement, AND and OR are introduced and their equities are demonstrated. Finally a break- through is introduced to the PIFSES to solve decision making problem and possibility of further study is defined in conclusion

II. BASIC DEFINITIONS

Soft Set: A pair (F,G) is defined as a soft set over U, where F is a mapping given by $F : G \rightarrow P(U)$. In other words, a soft set over U is an argumented family of subgroup of the universe U. For $\varepsilon \in$ G, F(ε) denotes the set of ε – elements of the soft expert set (F,G) or as the ε – approximate elements of the soft set.

Intuitionistic Fuzzy Set: An Intuitionistic Fuzzy set G characterized over a Universal Domain U is an object represented as:

$G = \{(x, \mu_G(x), \gamma_G(x)): x \in U\}$ (1)

where the membership is defined as μ_G:U→[0,1] and non-membership function is defined as and γ_G: U→[0,1] and $0 \leq \mu_G(x) + \gamma_G(x) \leq 1$ for every x ∈ U.

Suppose that $0 \leq \mu_G(x) + \gamma_G(x) < 1$, then there exists a degree of ambiguity for some element x in connection with the set G.

Then the intuitionistic fuzzy sets G and H are defined as:

$G = \{(x, \mu_G(x), \gamma_G(x)): x \in U\}$ and

$H = \{(x, \mu_H(x), \gamma_H(x)): x \in U\}$ (2)

Soft Expert Set: A soft expert set is defined as a pair (F,G) over U, where F is a mapping given by $F : G \rightarrow P(U)$ where P(U) denotes the power set U.

Complement Set: Consider PIFSES (Fp,G) over the universal domain U. Its complement is defined as:

$(F_p,G)^c = (\bar{c}\ (\ F\ (\alpha)\ ),\ c\ (\ p\ (\alpha)\ ))$ for all g ∈ G (3)

where is an Intuitionistic fuzzy complement and c is a fuzzy complement.

The union, intersection and complement of two IFS G and H are defined as:

a) $G \cup H = \{(\max(\mu_G(x), \mu_H(x)), \min(\gamma_G(x), \gamma_H(x)))$, for all x in U}
b) $G \cap H = \{(\min(\mu_G(x), \mu_H(x)), \max(\gamma_G(x), \gamma_H(x)))$, for all x in U}
c) $\bar{G} = \{(x, \gamma_G(x), \mu_G(x))$ for all x in U}

III. POSSIBILITY INTUITIONISTIC FUZZY SOFT EXPERT SETS (PIFSES)

U - Universal domain,

K - Set of limiting factors(parameters),

Y – Set of experts,

S – Set of opinions, and

Z = K x Y x S, A is a member in Z.

January - February 2020
ISSN: 0193 - 4120 Page No. 4435 - 4440

Let $U = \{u_1, u_2, u_3, \ldots, u_n\}$,

$K = \{k_1, k_2, k_3, \ldots, k_m\}$,

$Y = \{y_1, y_2, y_3, \ldots, y_i\}$

$S = \{1 = \text{agree}, 0 = \text{disagree}\}$

Let $Z = K \times Y \times S$ and A is a member in Z.

Then the soft universe is defined by the set of two (U,Z).

Let p be the intuitionistic fuzzy subset of Z.

Let J^U denotes the collection of all intuitionistic fuzzy subset of U.

Consider the mapping $F_p : Z \rightarrow J^U \times J^U$ and it is defined by

$F_p(z) = (F(z) (u_i), p(z) (u_i))$ for all u_i in U (6)

This F_p is called a PIFSES over the soft universe (U,Z).

Consider an element z_i in Z. Then from equation (6), we get $F_p(z_i) = (F(z_i)(u_i), p(z_i)(u_i))$.

Here the first element $F(z_i)(u_i) = (\mu_{F(z_i)}(u_i), \gamma_{F(z_i)}(u_i))$, represent the degree of inclusion and exclusion of the elements of U in $F(z_i)$ and the second element $p(z_i)(u_i))$ denotes the degree of possibility of such inclusions. Therefore $F_p(z_i)$ is represented as

$$F_p(z_i) = \left\{\left(\frac{u_i}{F(z_i)(u_i)}\right),\ p(z_i)(u_i)\right\} \quad \text{, for } i=1,2,3,\ldots\ldots \quad (7)$$

IV. METHODOLOGY OF PIFSES

A generalized algorithm enforced to PIFSES model is introduced here. This algorithm is imposed in speculative decision making process. Suppose a company ABC has to hire a optimal person for an appurtenant position. Among all the applicants, three candidates were shortlisted for the position. 3 These three candidates represent the universal domain $U=\{u_1,u_2,u_3\}$. This hiring committee contains three members like the Department Head, Legal Advisor, and HR, and these people represent the set of experts.

Let $Y=\{r,s,t\}$ - Set of Experts,

$V=\{1=\text{agree},0=\text{disagree}\}$ - Set of opinions

$k=\{k_1, k_2, k_3, k_4\}$ – Set of the parameters representing Job Involvement, Academic Capability, Level of Professionalism and Industrial Knowledge. PIFSES algorithm is constructed as below for selecting an appropriate person.

(F_P,Z)

$$=\left\{(k_1,r,1) = \left\{\frac{(u_1)}{(0.4,0.6)}(0.3), \frac{(u_2)}{(0.2,0.4)}(0.1), \frac{(u_3)}{(0.1,0.7)}(0.2)\right\}\right\}$$

$$\left\{(k_2,r,1)\right.$$

$$\left.= \left\{\frac{(u_1)}{(0.4,0.2)}(0.7), \frac{(u_2)}{(0.25,0.2)}(0.6), \frac{(u_3)}{(0.3,0.7)}(0.14)\right\}\right\}$$

$$\left\{(k_3,r,1) = \left\{\frac{(u_1)}{(0.1,0.6)}(0.1), \frac{(u_2)}{(0.4,0.3)}(0.5), \frac{(u_3)}{(0.2,0.5)}(0.2)\right\}\right\}$$

$$\left\{(k_4,r,1) = \left\{\frac{(u_1)}{(0.2,0.5)}(0.8), \frac{(u_2)}{(0.3,0.1)}(0.4), \frac{(u_3)}{(0.3,0.2)}(1)\right\}\right\}$$

$$\left\{(k_1,s,1) = \left\{\frac{(u_1)}{(0.4,0.6)}(0.3), \frac{(u_2)}{(0.3,0.4)}(0.1), \frac{(u_3)}{(0.3,0.1)}(0.3)\right\}\right\}$$

$$\left\{(k_2,s,1) = \left\{\frac{(u_1)}{(0.4,0.4)}(0.5), \frac{(u_2)}{(0.8,0.2)}(0.4), \frac{(u_3)}{(0.2,0.3)}(0.4)\right\}\right\}$$

$$\left\{(k_3,s,1) = \left\{\frac{(u_1)}{(0.2,0.5)}(0.7), \frac{(u_2)}{(0.6,0.2)}(0.3), \frac{(u_3)}{(0.3,0.5)}(0.4)\right\}\right\}$$

$$\left\{(k_4,s,1)\right.$$

$$\left.= \left\{\frac{(u_1)}{(0.5,0.3)}(0.6), \frac{(u_2)}{(0.9,0.1)}(0.25), \frac{(u_3)}{(0.3,0.4)}(0.35)\right\}\right\}$$

$$\left\{(k_1,t,1) = \left\{\frac{(u_1)}{(0.4,0.6)}(0.5), \frac{(u_2)}{(0.5,0.4)}(0.25), \frac{(u_3)}{(0.3,0.6)}(0)\right\}\right\}$$

$$\left\{(k_2,t,1)\right.$$

$$\left.= \left\{\frac{(u_1)}{(0.3,0.4)}(0.3), \frac{(u_2)}{(0.4,0.2)}(0.85), \frac{(u_3)}{(0.2,0.2)}(0.1)\right\}\right\}$$

$$\left\{(k_3,t,1)\right.$$

$$\left.= \left\{\frac{(u_1)}{(0.5,0.1)}(0.75), \frac{(u_2)}{(0.1,0.5)}(0.7), \frac{(u_3)}{(0.3,0.1)}(0.3)\right\}\right\}$$

January - February 2020
ISSN: 0193 - 4120 Page No. 4435 - 4440

$$\left\{(\mathrm{k}_1,\mathrm{r},0)=\left\{\frac{(\mathrm{u}_1)}{(0.1,0.3)}(0.4),\frac{(\mathrm{u}_2)}{(0.3,0.4)}(0),\frac{(\mathrm{u}_3)}{(0.2,061)}(0.1)\right\}\right\}$$

$$\left\{(\mathrm{k}_3,\mathrm{r},0)\right.$$

$$\left.=\left\{\frac{(\mathrm{u}_1)}{(0.3,0.1)}(0.65),\frac{(\mathrm{u}_2)}{(0.2,0.4)}(0.1),\frac{(\mathrm{u}_3)}{(0.3,0.2)}(0.4)\right\}\right\}$$

$$\left\{(\mathrm{k}_4,\mathrm{r},0)\right.$$

$$\left.=\left\{\frac{(\mathrm{u}_1)}{(0.3,0.2)}(0.52),\frac{(\mathrm{u}_2)}{(0.6,0.3)}(0.05),\frac{(\mathrm{u}_3)}{(0.4,0.2)}(0.7)\right\}\right\}$$

$$\left\{(\mathrm{k}_1,\mathrm{s},0)\right.$$

$$\left.=\left\{\frac{(\mathrm{u}_1)}{(0.1,0.3)}(0.45),\frac{(\mathrm{u}_2)}{(0.2,0.8)}(1),\frac{(\mathrm{u}_3)}{(0.4,0.3)}(0.75)\right\}\right\}$$

$$\left\{(\mathrm{k}_2,\mathrm{s},0)=\left\{\frac{(\mathrm{u}_1)}{(0.4,0.5)}(0.2),\frac{(\mathrm{u}_2)}{(0.8,0.1)}(0.1),\frac{(\mathrm{u}_3)}{(0.5,0.6)}(0.2)\right\}\right\}$$

$$\left\{(\mathrm{k}_3,\mathrm{s},0)=\left\{\frac{(\mathrm{u}_1)}{(0.3,0.6)}(0.4),\frac{(\mathrm{u}_2)}{(0.1,0.3)}(0.6),\frac{(\mathrm{u}_3)}{(0.8,0.1)}(1)\right\}\right\}$$

$$\left\{(\mathrm{k}_4,\mathrm{s},0)=\left\{\frac{(\mathrm{u}_1)}{(0.2,0.3)}(1),\frac{(\mathrm{u}_2)}{(0.6,0.4)}(0.4),\frac{(\mathrm{u}_3)}{(0.3,0.5)}(0.5)\right\}\right\}$$

$$\left\{(\mathrm{k}_1,\mathrm{t},0)\right.$$

$$\left.=\left\{\frac{(\mathrm{u}_1)}{(0.3,0.6)}(0.2),\frac{(\mathrm{u}_2)}{(0.2,0.5)}(0.1),\frac{(\mathrm{u}_3)}{(0.25,0.2)}(0.2)\right\}\right\}$$

$$\left\{(\mathrm{k}_2,\mathrm{t},0)\right.$$

$$\left.=\left\{\frac{(\mathrm{u}_1)}{(0.4,0.6)}(0.5),\frac{(\mathrm{u}_2)}{(0.4,0.3)}(0.4),\frac{(\mathrm{u}_3)}{(0.5,0.2)}(0.15)\right\}\right\}$$

$$\left\{(\mathrm{k}_4,\mathrm{t},0)=\left\{\frac{(\mathrm{u}_1)}{(0.4,0.2)}(0.1),\frac{(\mathrm{u}_2)}{(0.4,0.8)}(0.1),\frac{(\mathrm{u}_3)}{(0.6,0.1)}(0.3)\right\}\right\}$$

Algorithm

1. Absorpt the PIFSES (F_p,Z).
2. Compute the values of $\mu_{Fp(zi)}(u_i)$ - $\gamma_{Fp(zi)}(u_i)$ where $\mu_{Fp(zi)}(u_i)$ and $\gamma_{Fp(zi)}(u_i)$ are membership and non- membership functions of elements $u_i \in$ U.
3. Calculate the systematic score for the inclusion and exclusion of PIFSES.
4. Let A_i denote the degree of possibility μ_i for the degree of inclusion of PIFSES and let D_i denote the degree of possibility μ_i for the degree of exclusion of PIFSES. Figure-out the value of each element by taking sum of the products of the systematic score .
5. Calculate the values $t_i = A_i - D_i$ for every $u_i \in$ U.
6. Compute the greatest score using s=$max_{ui \in U}\{t_i\}$. Finally the action is to pick an element u_i as the ideal result to the problem.

The values of $\mu_{Fp(zi)}(u_i)$, $\gamma_{Fp(zi)}(u_i)$ for each element u_i in U is represented in Table 1. It is noted that in the table the first terms and second terms represent the values of $\mu_{Fp(zi)}(u_i)$, $\gamma_{Fp(zi)}(u_i)$

The systematic score for the inclusion of PIFSES is calculated in Table 2.

The systematic score for the exclusion of PIFSES is calculated in Table 3

The value of A_i and D_i is represented in Table 4.

Table 1

	u_1	u_2	u_3
$(k_1,r,1)$	-0.2,0.3	0.2,0.1	-0.6,0.2
$(k_2,r,1)$	-0.2,0.7	0.05,0.6	-0.4,0.14
$(k_3,r,1)$	-0.5,0.1	0.1,0.5	-0.4,0.2
$(k_4,r,1)$	-0.3,0.8	0.2,0.4	0.1,1
$(k_1,s,1)$	-0.2,0.3	-0.1,0.1	0.2,0.3
$(k_2,s,1)$	0,0.5	0.6,0.4	-0.1,0.4
$(k_3,s,1)$	-0.3,0.7	0.4,0.3	-0.2,0.4
$(k_4,s,1)$	0.2,0.6	0.8,0.25	-0.1,0.35
$(k_1,t,1)$	-0.2,0.5	0.1,0.25	-0.3,0
$(k_2,t,1)$	-0.1,0.3	0.2,0.85	00.1
$(k_3,t,1)$	0.4,0.75	-0.4,0.7	0.2,0.3
$(k_1,r,0)$	-0.2,0.4	-0.1,0	-0.4,0.1
$(k_3,r,0)$	0.2,0.65	-0.2,0.1	0.1,0.4
$(k_4,r,0)$	0.1,0.52	0.3,0.05	0.2,0.7
$(k_1,s,0)$	-0.2,0.45	-0.6,1	0.1,0.75
$(k_2,s,0)$	-0.1,0.2	0.7,0.1	-0.1,0.2
$(k_3,s,0)$	-0.3,0.4	-0.2,0.6	0.7,1
$(k_4,s,0)$	-0.1,1	0.2,0.4	-0.2,0.5
$(k_1,t,0)$	-0.3,0.2	-0.3,0.1	0.05,0.2
$(k_2,t,0)$	-0.2,0.5	0.1,0.4	0.3,0.15
$(k_3,t,0)$	0.2,0.1	-0.4,0.4	0.5,0.3

January - February 2020
ISSN: 0193 - 4120 Page No. 4435 - 4440

Table 2:

Systematic Score for the inclusion of PIFSES

	u_i	Systematic Score	Degree of possibility, u_i
$(k_{1,}r,1)$	u_1	-0.2	0.1
$(k_{2,}r,1)$	u_2	0.05	0.6
$(k_{3,}r,1)$	u_2	0.1	0.5
$(k_{4,}r,1)$	u_2	0.2	0.4
$(k_{1,}s,1)$	u_2	0.6	0.1
$(k_{2,}s,1)$	u_2	0.6	0.4
$(k_{3,}s,1)$	u_2	0.4	0.3
$(k_{4,}s,1)$	u_2	0.8	0.25
$(k_{1,}t,1)$	u_2	0.1	0.25
$(k_{2,}t,1)$	u_2	0.2	0.85
$(k_{3,}t,1)$	u_1	0.4	0.7

Computation for A_i

Score(u_1) = - 0.02

Score(u_2) = 0.03 + 0.05 + 0.08 + 0.06 + 0.2 + 0.12 + 0.2 + 0.025 + 0.017 + 0.28 = 1.255

Score(u_3) = 0

Table 3:

Systematic Score for the exclusion of PIFSES

	u_i	Systematic Score	Degree of possibility, u_i
$(k_1,r,0)$	u_3	-0.1	0
$(k_3,r,0)$	u_1	0.2	0.65
$(k_4,r,0)$	u_2	0.3	0. 5
$(k_1,s,0)$	u_3	0.1	0.75
$(k_2,s,0)$	u_2	0.7	0.1
$(k_3,s,0)$	u_3	0.7	1
$(k_4,s,0)$	u_2	0.2	0.4
$(k_1,t,0)$	u_3	0.005	0.2
$(k_2,t,0)$	u_3	0.3	0.15
$(k_3,t,0)$	u_3	0.5	0.3

Computation for D_i

Score(u_1) = 0.13
Score(u_2) = 0.015 + 0.07 + 0.7 + 0.7 + 0.08 = 0.165
Score(u_3) = 0 + 0.075 + 0.7 + 0.01 + 0.045 + 0.15 = 0.98

Table 4: Compute t_i= $A_{i-}D_i$

	A_i	D_i	t_i
u_1	0.2	0.13	-0.15
u_2	1.255	0.165	1.09
u_3	0	0.98	-0.98

The maximum value corresponds to u2. So the second person is chosen for the appurtenant position.

CONCLUSION

The conceptualization of PIFSES is established in this article. The basic operations and few applicable laws in PIFSES are developed. Finally a generalized algorithm is imported and enforced to PIFSES model to solve the speculative decision making problem. In future this study is proposed to apply through MATLAB software.

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January - February 2020
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