Invention Of Best Technology In Agriculture Using Intuitionistic Fuzzy Soft Matrices

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Abstract: Soft Matrix theory is a newly emerging mathematical tool to deal with uncertain problems. In this paper, we define IFSM and different types of IFSM with example. Finally we extend our approach in application of these matrices in (Agriculture) decision making problems.

Key words: Addition of IFSM, Complement of IFSM, Fuzzy soft matrix(FSM), Fuzzy soft set(FSS), Inuitionistic fuzzy soft matrix(IFSM), Soft set, Subtraction of intuitionistic fuzzy soft matrix.

1 INTRODUCTION

In 1965, Fuzzy set was introduced by Lotfi.A.Zadeh **[14]** considered as a special case of soft sets. An intuitionistic fuzzy was introduced in 1983, by K.Atanassov **[1]** as an extension of Zadeh's fuzzy set. In the year 1999, Molodtsov **[10]** introduced soft set theory as a mathematical tool for dealing with the uncertainties which tradition mathematics failed to handle. Molodtsov was shown numerous applications of this theory in solving practical problems in engineering, medical sciences, economics, environment and social sciences. In 2001,P.K.Maji, R.Biswas and A.R.Roy **[7]** studied the theory of soft sets initiated by Molodtsov **[10]** and developed several basic notions of soft set theory. In 2004, Maji et al **[8]** introduced the concept of intuitionistic soft sets. In 2010, Cagman and Enginoglu **[3]**defined soft matrices which were a matrix representation of the soft set and constructed a soft max-min decision making method. Matrices play an important role in the broad area of science and engineering. However, the classical matrix theory sometimes fails to solve the problems involving uncertainties. In 2011**[13]**, Yong et al initiated a matrix representation of a fuzzy soft set and applied it in certain decision making problems. In 2011, Babita and John **[2]** described generalized intuitionistic fuzzy soft sets and solved multicriteria decision making problem in generalized intuitionistic fuzzy soft sets. In 2012, Borah et al **[9]** extended fuzzy soft matrix theory and its application. In 2012, Chetia and Das **[4]** defined five types of product of intuitionistic fuzzy soft matrices. In 2012, Basu and Mahapatra and Mondal **[12]** defined different types of matrices in IFSS theory. Further we have adopted some new operations on these matrices and suggested here all the definitions and operations by suitable examples.

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In 2013, Deli and Cagman **[5]** introduced intuitionistic fuzzy parameterized soft sets. They have also applied to the problems that contain uncertainties based on intuitionistic fuzzy parameterized soft sets. In 2013, Rajarajeswari and Dhanalakshmi **[11]** described intuitionistic fuzzy soft matrix with some traditional operations. In 2013, Jalilul and Tapan Kumar Roy **[6]** introduced properties on intuitionistic fuzzy soft matrix. In this paper, we proposed intuitionistic fuzzy soft matrices and defined different types of intuitionistic fuzzy soft matrices and some operations. Finally, We extend our approach in application of these matrices in decision making problems.

2 PRELIMINARIES

In this section, We recall some basic notion of fuzzy soft set theory and fuzzy soft matrices.

2.1 Soft Set [10]

Let U be an initial universe set and E be a set of parameters. Let P(U) denotes the power Set of U. Let A⊆E. A pair (F_A,E) is called a soft set over U, where F_A is a mapping given by F_A:E→ P(U) Such that F_A(e) = φ if e∉A. Here F_A is called approximate function of the soft set (F_A,E). The set F_A(e) is called e- approximate value set which consist of related objects of the parameter e∈E. In other words, a soft set over U is a parameterized family of subsets of the universe U.

Example 2.1:

Let U={u_1,u_2,u_3,u_4} be a set of four shirts and E={white(e_1),blue(e_2),green(e_3)} be a set of parameters. If A={e_1,e_2}⊆E. Let F_A(e_1)={ u_1,u_2,u_4} and F_A(e_2)={ u_1,u_2,u_3} then we write the soft set (F_A,E) ={(e_1,{u_1,u_2,u_4}),(e_2,{u_1,u_2,u_3})} over U which describe the "colour of the shirts" Which Mr.C is going to buy. We may represent the soft set in the following form:

U	White(e_1)	Blue(e_2)	Green(e_3)
u_1	1	1	0
u_2	1	1	0
u_3	0	1	0
u_4	1	0	0

Table2.1.1

2.2 Fuzzy soft set [7]

Let U be an initial universe set and E be a set of parameters. Let P(U) denotes the set of all fuzzy sets of U. Let A⊆E. A pair (F_A,E) is called a fuzzy soft set (FSS)over

U, where F_A is a mapping given by, F_A:E→ P(U) Such that F_A(e) = $\tilde{\varphi}$ if e∉A, Where $\tilde{\varphi}$ is a null fuzzy set.

Example 2.2:
Consider the example 2.1., here we cannot express with only two real numbers 0 and 1, we can characterized it by a membership function instead of crisp number 0 and 1, which associate with each element a real number in the interval [0,1]. Then

(F_A,E) ={ F_A(e$_1$) ={(u_1,0.2),(u_2,0.5),(u_3,0.9),(u_4,0.3)},
F_A(e$_2$) ={(u_1,0.3),(u_2,0.4),(u_4,0.7)}} is the fuzzy soft set representing the "colour of the shirts" which Mr.C is going to buy. We may represent the fuzzy soft set in the following form:

U	White(e_1)	Blue(e_2)	Green(e_3)
u_1	0.2	0.3	0.0
u_2	0.5	0.4	0.0
u_3	0.9	0.0	0.0
u_4	0.3	0.7	0.0

Table 2.2.2

2.3 Fuzzy Soft Matrices(FSM) [4]

Let (F_A,E) be a fuzzy soft set over U. Then a subset of U×E is uniquely defined by R_A ={(u,e): e∈A, u ∈ F_A(e)} which is called relation form of (F_A,E). The characteristic function of R_A is written by μ_{R_A} :U×E→[0,1],where μ_{R_A} (u,e) ∈[0,1] is the membership value of u∈U for each e∈U.

If $[\mu_{ij}] = \mu_{R_A}(u_i,e_j)$, we can define a matrix

$$[\mu_{ij}]_{m\times n} = \begin{bmatrix} \mu_{11} & \mu_{12} & \cdots & \mu_{1n} \\ \mu_{21} & \mu_{22} & \cdots & \mu_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \mu_{m1} & \mu_{m2} & \cdots & \mu_{mn} \end{bmatrix}$$

Which is called an m×n soft matrix of the soft set (F_A,E) over U. Therefore we can say that a fuzzy soft set (F_A,E) is uniquely characterized by the matrix $[\mu_{ij}]_{m\times n}$ and both concepts are interchangeable.

Example 2.3:
Assume that U = {u_1,u_2,u_3,u_4,u_5} is a universal set and E ={e_1,e_2,e_3,e_4} is a set of all parameters.

If A⊆ E = {e_1,e_2,e_3} and
F_A(e$_1$) ={(u_1,0.2),(u_2,0.3),(u_3,0.5),(u_4,0.1),(u_5,0.6) }
F_A(e$_2$) ={(u_1,0.5),(u_2,0.6),(u_3,0.7),(u_4,0.3),(u_5,0.1) }
F_A(e$_3$) ={(u_1,0.3),(u_2,0.8),(u_3,0.4),(u_4,0.5),(u_5,0.7) }

Then the fuzzy soft set (F_A,E) is a parameterized family {F_A(e$_1$), F_A(e$_2$), F_A(e$_3$)} of all fuzzy set over U. Hence the fuzzy soft matrix $[\mu_{ij}]$ can be written as

$$[\mu_{ij}] = \begin{bmatrix} 0.2 & 0.5 & 0.3 & 0.0 \\ 0.3 & 0.6 & 0.8 & 0.0 \\ 0.5 & 0.7 & 0.4 & 0.0 \\ 0.1 & 0.3 & 0.5 & 0.0 \\ 0.6 & 0.1 & 0.7 & 0.0 \end{bmatrix}$$

2.4 Intuitionistic Fuzzy Soft Set (IFSS) [8]

Let U be an initial universe, E be the set of parameters and A⊆E. A pair ($\tilde{F}_A$,E) is called an intuitionistic fuzzy soft set (IFSS) over U, where $\tilde{F}_A$ is a mapping given by $\tilde{F}_A$:E→ I^U ,where I^U denotes the collection of all intuitionistic fuzzy subsets of U.

Example 2.4:
Suppose that U = {u_1,u_2,u_3,u_4} be a set of four shirts and E={white(e_1),blue(e_2),green(e_3)} be a set of parameters. If A = {e_1,e_2}∈E.

Let $\tilde{F}_A$(e$_1$)={(u_1,0.3,0.7),(u_2,0.8,0.1),(u_3,0.4,0.2),(u_4,0.6,0.2)}
$\tilde{F}_A$(e$_2$)= {(u_1,0.8,0.1),(u_2,0.9,0.1),(u_3,0.4,0.5),(u_4,0.2,0.3)}
then we write intuitionistic fuzzy soft set is
($\tilde{F}_A$,E)={ $\tilde{F}_A$(e$_1$)={(u_1,0.3,0.7),(u_2,0.8,0.1),(u_3,0.4,0.2),(u_4,0.6, 0.2)}
$\tilde{F}_A$(e$_2$)= {(u_1,0.8,0.1),(u_2,0.9,0.1),(u_3,0.4,0.5),(u_4,0.2,0.3)}}

We would represent this intuitionistic fuzzy soft set in matrix form as

$$\begin{bmatrix} (0.3,0.7) & (0.8,0.1) & (0.0,0.0) \\ (0.8,0.1) & (0.9,0.1) & (0.0,0.0) \\ (0.4,0.2) & (0.4,0.5) & (0.0,0.0) \\ (0.6,0.2) & (0.2,0.3) & (0.0,0.0) \end{bmatrix}$$

2.5 Intuitionistic Fuzzy Soft Matrix (IFSM) [4]

Let U be an initial universe , E be the set of parameters and A⊆E. Let ($\tilde{F}_A$,E) be an intuitionistic fuzzy soft set(IFSS) over U. Then a subset of U×E is uniquely defined by

R_A= {(u,e): e∈A, u∈ $\tilde{F}_A$(e) }

Which is called relation form of ($\tilde{F}_A$,E). The membership and non-membership functions of are written by μ_{R_A} : U×E→[0,1] and γ_{R_A} : U×E→[0,1] where μ_{R_A} :(u,e) ∈ [0,1] and γ_{R_A} :(u,e) ∈[0,1] are the membership value and non-membership value of u∈U for each e∈E.

If $(\mu_{ij},\gamma_{ij}) = (\mu_{R_A}(u_i,e_j),\gamma_{R_A}(u_i,e_j))$ we can define a matrix

$$[(\mu_{ij},\gamma_{ij})]_{m\times n}= \begin{bmatrix} (\mu_{11},\gamma_{11}) & (\mu_{12},\gamma_{12}) & \cdots & (\mu_{1n},\gamma_{1n}) \\ (\mu_{21},\gamma_{21}) & (\mu_{22},\gamma_{22}) & \cdots & (\mu_{2n},\gamma_{2n}) \\ \vdots & \vdots & \vdots & \vdots \\ (\mu_{m1},\gamma_{m1}) & (\mu_{m2},\gamma_{m2}) & \cdots & (\mu_{mn},\gamma_{mn}) \end{bmatrix}$$

Which is called an m×n IFSM of the IFSS ($\tilde{F}_A$,E) over U. Therefore, we can say that IFSS ($\tilde{F}_A$,E) is uniquely characterized by the matrix $[(\mu_{ij},\gamma_{ij})]_{m\times n}$ and both concepts are interchangeable .The set of all m×n IFS matrices will be denoted by $IFSM_{m\times n}$.

Example 2.5 :
Let U={u_1,u_2,u_3,u_4,u_5} is a universal set and E ={e_1,e_2,e_3,e_4} is a set of parameters. If A={e_1,e_2,e_3}⊆E and
$\tilde{F}_A(e_1)$ ={(u_1,0.5,0.4),(u_2,0.8,0.1),(u_3,0.7,0.2),(u_4,0.2,0.6)}
$\tilde{F}_A(e_2)$ ={(u_1,0.3,0.5),(u_2,0.4,0.6),(u_3,0.1,0.8),(u_4,0.3,0.7)}
$\tilde{F}_A(e_3)$ ={(u_1,0.6,0.2),(u_2,1.0,0.0),(u_3,0.9,0.1),(u_4,0.6,0.4)}

Then the IFS set ($\tilde{F}_A$,E) is a parameterized family {$\tilde{F}_A(e_1)$, $\tilde{F}_A(e_2)$, $\tilde{F}_A(e_3)$} of all IFS sets over U.

Hence IFSM $[(\mu_{ij},\gamma_{ij})]$ can be written as

$$[(\mu_{ij},\gamma_{ij})]=\begin{bmatrix}(0.5,0.4) & (0.3,0.5) & (0.6,0.2) & (0.0,0.0)\\(0.8,0.1) & (0.4,0.6) & (1.0,0.0) & (0.0,0.0)\\(0.7,0.2) & (0.1,0.8) & (0.9,0.1) & (0.0,0.0)\\(0.2,0.6) & (0.3,0.7) & (0.6,0.4) & (0.0,0.0)\end{bmatrix}$$

2.6 Complement of Intuitionistic Fuzzy Soft Matrices
Let Ã = $[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$ .Then complement of Ã denoted by Ã° is defined as Ã°= $[(\gamma_{ij}^{\tilde{A}},\mu_{ij}^{\tilde{A}})]$for all i and j.

Example 2.6:
Consider the example 2.5,

$$\tilde{A}^\circ=[(\gamma_{ij}^{\tilde{A}},\mu_{ij}^{\tilde{A}})]=\begin{bmatrix}(0.4,0.5) & (0.5,0.3) & (0.2,0.6) & (0.0,0.0)\\(0.1,0.8) & (0.6,0.4) & (0.0,1.0) & (0.0,0.0)\\(0.2,0.7) & (0.8,0.1) & (0.1,0.9) & (0.0,0.0)\\(0.6,0.2) & (0.7,0.3) & (0.4,0.6) & (0.0,0.0)\end{bmatrix}$$

2.7 Addition of Intuitionistic Fuzzy Soft Matrices
If Ã = $[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$, $\tilde{B} = [(\mu_{ij}^{\tilde{B}},\gamma_{ij}^{\tilde{B}})] \in IFSM_{m\times n}$ then $\tilde{C} = [(\mu_{ij}^{\tilde{C}},\gamma_{ij}^{\tilde{C}})] \in IFSM_{m\times n}$ we define Ã+$\tilde{B}$, addition of Ã and $\tilde{B}$ as $\tilde{A}+\tilde{B}=\tilde{C} = (\max(\mu_{ij}^{\tilde{A}},\mu_{ij}^{\tilde{B}}),\min(\gamma_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{B}}))$ ∀ i and j.

2.8 Subtraction of Intuitionistic Fuzzy Soft Matrices
If Ã = $[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$, $\tilde{B} = [(\mu_{ij}^{\tilde{B}},\gamma_{ij}^{\tilde{B}})] \in IFSM_{m\times n}$ then $\tilde{C} = [(\mu_{ij}^{\tilde{C}},\gamma_{ij}^{\tilde{C}})] \in IFSM_{m\times n}$ we define Ã−$\tilde{B}$, subtraction of Ã and $\tilde{B}$ as $\tilde{A}-\tilde{B}=\tilde{C} = (\min(\mu_{ij}^{\tilde{A}},\mu_{ij}^{\tilde{B}}),\max(\gamma_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{B}}))$ ∀ i and j.

3 Intuitionistic Fuzzy Soft Matrix Theory Apply in Agriculture

3.1 Value Matrix
Let Ã = $[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$. Then Ã is said to be value of intuitionistic fuzzy soft matrix denoted by V(Ã) and is defined as V(Ã) =$[(\mu_{ij}^{\tilde{A}}-\gamma_{ij}^{\tilde{A}})]$ if i=1,2,3,…m, j=1,2,3,…n for all i and j.

3.2 Score Matrix
If Ã =$[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$, $\tilde{B} = [(\mu_{ij}^{\tilde{B}},\gamma_{ij}^{\tilde{B}})] \in IFSM_{m\times n}$. Then Ã and $\tilde{B}$ is said to be intuitionistic fuzzy soft score matrix denoted by $S_{(\tilde{A},\tilde{B})}$ and is defined as $S_{(\tilde{A},\tilde{B})}$ = V(Ã)–V($\tilde{B}$).

3.3 Total Score
If Ã = $[(\mu_{ij}^{\tilde{A}},\gamma_{ij}^{\tilde{A}})] \in IFSM_{m\times n}$, $\tilde{B} = [(\mu_{ij}^{\tilde{B}},\gamma_{ij}^{\tilde{B}})] \in IFSM_{m\times n}$. Let the corresponding value matrix be V(Ã),V($\tilde{B}$) and their score matrix is $S_{(\tilde{A},\tilde{B})}$ .Then the total score for each u_i in U is

$$S_i=\sum_{j=1}^{n}(V(\tilde{A})-V(\tilde{B})) = \sum_{j=1}^{n}[(\mu_{ij}^{\tilde{A}}-\gamma_{ij}^{\tilde{A}})-(\mu_{ij}^{\tilde{B}}-\gamma_{ij}^{\tilde{B}})].$$

Methodology

Suppose U is a set of farmers producing quality of paddy to be selected as the best farmer for the healthier yields produced to the human existence without affecting their health .This will be Scientifically selected and tested by the experts in Agriculture according to the natural manures, Chemical fertilizers, pesticides used by the farmers. Let E is a set of parameters related to the yield cultivated by the farmers from the fields, for good health. We construct IFSS($\tilde{F}_A$,E) over U represent the selection of farmers by the scientist, expert in Agriculture X ,Where $\tilde{F}_A$ is a mapping $\tilde{F}_A$:E→I^U, is the collection of all intuitionistic fuzzy subsets of U. We further construct another IFSS ($\tilde{G}_B$,E) over U represent the selection of farmers by the expert in Agricultural field Y, Where $\tilde{G}_B$ is a mapping $\tilde{G}_B$:E→I^U, I^U is the collection of all intuitionistic fuzzy subsets of U. The matrices Ã and $\tilde{B}$ corresponding to the intuitionistic fuzzy soft sets ($\tilde{F}_A$,E) and ($\tilde{G}_B$,E) are constructed . We compute the complements ($\tilde{F}_A$,E)° and ($\tilde{G}_B$,E)° and their matrices A° and B° corresponding to ($\tilde{F}_A$,E)° and ($\tilde{G}_B$,E)° respectively .Then compute Ã+$\tilde{B}$ which is the maximum membership of farmers who will be selected by the scientist as Judges. Further compute Ã°+$\tilde{B}$° which is the maximum membership of non selection of farmers by the scientist as judges. Using definition(3.1),compute V(Ã+$\tilde{B}$), V(Ã°+$\tilde{B}$°) and $S_{((\tilde{A}+\tilde{B}),(\tilde{A}^\circ+\tilde{B}^\circ))}$ and the total score secured S_i for each farmer in U. Finally S_k= max(S_i), then we conclude that the farmer u_k has been selected by the judges. If S_k has more than one value occurs and by investigating this process repeatedly by reassessing the parameters.

4 ALGORITHM

Step 1: Input the intuitionistic fuzzy soft set ($\tilde{F}_A$,E), ($\tilde{G}_B$,E) and obtain the intuitionistic fuzzy soft matrices Ã,$\tilde{B}$corresponding to ($\tilde{F}_A$,E) and ($\tilde{G}_B$,E) respectively.

Step 2: Write the intuitionistic fuzzy soft complement sets ($\tilde{F}_A$,E)°,($\tilde{G}_B$,E)° and obtain the intuitionistic fuzzy soft matrices Ã° ,B̃° corresponding to ($\tilde{F}_A$,E)° and ($\tilde{G}_B$,E)° respectively.

Step 3: Compute (Ã+$\tilde{B}$), (Ã°+$\tilde{B}$°), V(Ã+$\tilde{B}$), V(Ã°+$\tilde{B}$°) and $S_{((\tilde{A}+\tilde{B}),(\tilde{A}^\circ+\tilde{B}^\circ))}$.

Step 4: Compute the total score S_i for each u_i in U.

Step 5: Find S_k= max(S_i),then we conclude the best farmer u_k has the maximum value, since u_k produced healthy and Quality of paddy.

Step 6: If S_k has more than one value, then go to step (1) so as to repeat the process by reassessing the parameter for selecting the best farmer.

5 echnology in a Decision Making Problem

Let ($\tilde{F}_A$,E) and ($\tilde{G}_B$,E) be two intuitionistic fuzzy soft set representing the selection of four farmers from the universal set U = {u_1,u_2,u_3,u_4} by the experts X and Y. Let E = {e_1,e_2,e_3} be the set of parameters which stand for different types of manures like, natural manure, chemical fertilizer and pesticides will be taken to identify the best farmer by testing the paddy which will be considered for good health to human race.

($\tilde{F}_A$,E)={{$\tilde{F}_A$(e_1)={(u_1,0.8,0.2),(u_2,0.5,0.4),(u_3,0.6,0.1),(u_4,0.6, 0.3)}

$\tilde{F}_A$(e_2)={(u_1,0.7,0.2),(u_2,0.4,0.6),(u_3,0.2,0.6),(u_4,0.8,0.1)}

$\tilde{F}_A$(e_3)={(u_1,0.6,0.4),(u_2,0.7,0.3),(u_3,0.7,0.1),(u_4,0.4,0.3)}}

($\tilde{G}_B$,E)={{$\tilde{G}_B$(e_1)={(u_1,0.7,0.3),(u_2,0.6,0.3),(u_3,0.4,0.5),(u_4,0.7, 0.1)}

$\tilde{G}_B$(e_2)={(u_1,0.6,0.4),(u_2,0.7,0.2),(u_3,0.9,0.1),(u_4,0.4,0.6)}

$\tilde{G}_B$(e_3)={(u_1,0.5,0.3),(u_2,0.8,0.2),(u_3,0.5,0.5),(u_4,0.3,0.7)}}

These two intuitionistic fuzzy soft sets are represented by the following intuitionistic fuzzy soft matrices respectively.

$$\tilde{A} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.8,0.2) & (0.7,0.2) & (0.6,0.4) \\ (0.5,0.4) & (0.4,0.6) & (0.7,0.3) \\ (0.6,0.1) & (0.2,0.6) & (0.7,0.1) \\ (0.6,0.3) & (0.8,0.1) & (0.4,0.3) \end{bmatrix} \end{array}$$

$$\tilde{B} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.7,0.3) & (0.6,0.4) & (0.5,0.3) \\ (0.6,0.3) & (0.7,0.2) & (0.8,0.2) \\ (0.4,0.5) & (0.9,0.1) & (0.5,0.5) \\ (0.7,0.1) & (0.4,0.6) & (0.3,0.7) \end{bmatrix} \end{array}$$

Then the intuitionistic fuzzy soft complement matrices are

$$\tilde{A}^\circ = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.2,0.8) & (0.2,0.7) & (04.,0.6) \\ (0.4,0.5) & (0.6,0.4) & (0.3,0.7) \\ (0.1,0.6) & (0.6,0.2) & (0.1,0.7) \\ (0.3,0.6) & (0.1,0.8) & (0.3,0.4) \end{bmatrix} \end{array}$$

$$\tilde{B}^\circ = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.3,0.7) & (0.4,0.6) & (0.3,0.5) \\ (0.3,0.6) & (0.2,0.7) & (0.2,0.8) \\ (0.5,0.4) & (0.1,0.9) & (0.5,0.5) \\ (0.1,0.7) & (0.6,0.4) & (0.7,0.3) \end{bmatrix} \end{array}$$

Then the addition matrices are

$$\tilde{A}+\tilde{B} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.8,0.2) & (0.7,0.2) & (0.6,0.3) \\ (0.6,0.3) & (0.7,0.2) & (0.8,0.2) \\ (0.6,0.1) & (0.9,0.1) & (0.7,0.1) \\ (0.7,0.1) & (0.8,0.1) & (0.4,0.3) \end{bmatrix} \end{array}$$

$$\tilde{A}^\circ+\tilde{B}^\circ = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} (0.3,0.7) & (0.4,0.6) & (0.4,0.5) \\ (0.4,0.5) & (0.6,0.4) & (0.3,0.7) \\ (0.5,0.4) & (0.6,0.2) & (0.5,0.5) \\ (0.5,0.6) & (0.6,0.4) & (0.7,0.3) \end{bmatrix} \end{array}$$

$$V(\tilde{A}+\tilde{B}) = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} 0.6 & 0.5 & 0.3 \\ 0.3 & 0.5 & 0.6 \\ 0.5 & 0.8 & 0.6 \\ 0.6 & 0.7 & 0.1 \end{bmatrix} \end{array}$$

$$V(\tilde{A}^\circ+\tilde{B}^\circ) = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 \end{matrix} \\ \begin{bmatrix} -0.4 & -0.2 & -0.1 \\ -0.1 & 0.2 & -0.4 \\ 0.1 & 0.4 & 0.0 \\ -0.3 & 0.2 & 0.4 \end{bmatrix} \end{array}$$

Calculate the score matrix $S_{((\tilde{A}+\tilde{B}),(\tilde{A}^\circ+\tilde{B}^\circ))}$ and total score for the best former who produced Quality of paddy.

$$S_{((\tilde{A}+\tilde{B}),(\tilde{A}^{\circ}+\tilde{B}^{\circ}))} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{array}{ccc} e_1 & e_2 & e_3 \end{array} \\ \begin{bmatrix} 1.0 & 0.7 & 0.4 \\ 0.4 & 0.3 & 1.0 \\ 0.5 & 0.4 & 0.6 \\ 0.9 & 0.5 & -0.3 \end{bmatrix} \end{array}$$

Total score for the best farmer : $\begin{array}{c} S_1 \\ S_2 \\ S_3 \\ S_4 \end{array} \begin{bmatrix} 2.1 \\ 1.7 \\ 1.5 \\ 1.1 \end{bmatrix}$

We know that S_1 has the maximum value and the farmer who has used natural manure has the maximum yield. Thus we conclude that from both the scientific experts opinion farmer u_1 is selected as best one.

6 Conclusion

In this paper, we have proposed the concept of intuitionistic fuzzy soft matrix and applied various new technologies on the matrices. Finally a new efficient solution procedure has been developed to solve intuitionistic fuzzy soft set based on real life decision making problems, which will contain more than one decision and to study whether the technology put forth in this paper may emerge a note worthy result in this field.

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