# ON SOFT MATRICES AND THEIR APPLICATION IN DECISION MAKING

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**Abstract**: In this work, we define soft matrices and their operations which are more functional to make theoretical studies in the soft set theory. Molodtsov in 1999 initiated the concept of soft sets as a general mathematical tool for the dealing with uncertainty.N. Cagman and S. Enginoglu introduced the notion of soft matrices in 2010 from the theory of soft sets. We also define products of soft matrices and their properties. We finally construct a soft max-max decision making method which can be successfully applied to the problems that contain uncertainties.

**Key words:** Soft set, Soft Matrix, Product soft Matrix, Soft Max-Maxdecision making

**Introduction:** Molodtsov introduced the concept of Soft Set as a completely new mathematical tool for dealing with uncertainties. Recently, soft set theory has been developed rapidly and focused by some scholars in theory and practice. Based on the work of Molodtsov, Maji et al and Ali et al published detailed theoretical studies on operations of Soft Sets and their algebraic properties. Soft set theory has also a rich potential for applications in many directions, some of which have been discussed in Maji et al and Cogman and Enginoglu applied soft set theory to decision making problems. have studied algebraic properties Softvector spaces and softvector subspaces.

**Preliminaries:**

**Soft set theory:** Let U be an initial universe set and E be a set of parameters with respect to U. Let P(U) denote the power set of U and A be subset of E.

**Definition:** A pair (F, A) is called a soft set over U, where F is a mapping F: A→P(U). In other words, a soft set over U is parameterised family of subsets of the universe U. For x∈ A, F(x) may be considered as the set of x-approximate elements of the soft set (F, A) i.e (F,A)={ F(x)∈P(U): x∈A⊆ E }

**Definition:** For a soft set (F,A), the set Supp(F,A), called the support of (F,A) is given by Supp(F,A)={ x∈A/ f(x)≠∅}. If Supp(F,A) ≠ ∅, then the soft set (F,A) is called non null.

**Definition:** Let (F, A), (G, B) be two soft sets over U. Then

i) (F,A) is said to be a soft subset of (G,B) denoted by (F,A)⊆(G,B) if A⊆B and F(x)⊆G(x)for all x∈A

ii) (F,A) and (G,A) are said to be a soft equal sets denoted by (F,A)=(G,A) if by (F,A)⊆(G,B) and G(B)⊆F(A)

**Definition (AND operation on two soft sets):** If $(F, A)$ and $(G,B)$ be two soft sets then ``$(F, A)$ AND $(G,B)$" denoted by $(F, A) \wedge (G,B)$ and is defined by $(F, A) \wedge (G,B) = (H, A\times B)$where $H(\alpha,\beta) = F(\alpha) \cap G(\beta)$ *for all* $(\alpha,\beta) \in A\times B$ .

**Definition (OR operation on two soft sets):** If $(F, A)$ and $(G,B)$ be two soft sets then ``$(F, A)$ OR $(G,B)$" denoted by $(F, A) \vee (G,B)$ is defined by $(F,A) \vee (G,B) = (O,A\times B)$ where$O(\alpha,\beta) = F(\alpha) \vee G(\beta)$ ) *for all* $(\alpha,\beta) \in A\times B$ .

**Definition: union of two soft sets:** The union of (F,A) and (G,B) over a common universe U denoted by (F,A) ⋓ (G,B) is the soft set (H,C) where C=A∪B and for all x∈C

$$H(x)=\begin{cases} F(x), if\ x \in A-B \\ G(x), if\ x \in B-A \\ F(x) \cup G(x), if\ x \in A \cap B \end{cases}$$

**Definition: extended intersection of two soft sets:** The union of (F,A) and (G,B) over a common universe U denoted by (F,A) ⋒ (G,B) is the soft set (H,C) where C=A∪B and for all x∈C

$$H(x)=\begin{cases} F(x), if\ x \in A-B \\ G(x), if\ x \in B-A \\ F(x) \cap G(x), if\ x \in A \cap B \end{cases}$$

**Definition:**

1. The restricted union of (F,A) and (G,B) over a common universe U, denoted by (F,A)⋓ (G,B)is the soft set (H,C) where C= A∩ B and for all x∈C, H(x)= F(x)⋓ G(x)
2. The restricted intersection of (F,A) and (G,B) over a common universe U, denoted by (F,A)⋒ (G,B)is the soft set (H,C) where C= A∩ B and for all x∈C, H(x)= F(x)∩ G(x)

We recall some basic notions in soft set theory. Molodtsov defined soft set in the following way.

Throughout the paper, let U be an initial universe set and E be a set of parameters. Let P(U) denotes the power set of U and A, B, C ⊆E.

**Definition: Cartesian product of two soft sets:** Let $(F, A)$ and $(G,B)$ be two soft sets over a common universe $U$ , then the cartesian product of these two soft sets is denoted by $(F, A) \times (G, B)$ and is defined by$(F, A)\times(G,B) = (H, A\times B)$ $where$ $H(\alpha,\beta) = F(\alpha)\times G(\beta)$.

**Soft Matrix:**

**Definition:** Let (F,A) be a soft set over U. Then, a subset ofU × E is uniquely defined by $R_A$ ={(u, e) : e ∈A, u ∈$f_A$(e)} which is called a relation from (F,A). The characteristic function of $R_A$is written byμ$R_A$ : U × E → {0, 1},

$$\mu R_A\,(u, e) = \begin{cases} 1, & (u, e) \in R_A \\ 0, & (u, e) \notin R_A \end{cases}$$

If U = {$u_1$,$u_2$,$u_3$,$u_4$, • • • ,$u_m$},E = {$e_1$,$e_2$, $e_3$, • • • , $e_n$} and A ⊆E,then the $R_A$ can be represented by a table as in the following form

| $R_A$ | $e_1 e_2 e_3$ ..........................$e_n$ |
|---|---|
| $u_1$ | $\mu R_A(u_{1,}e_1)$ $\mu R_A(u_{1,}e_2)$........................... $\mu R_A(u_{1,}e_n)$ |
| $u_2$ | $\mu R_A(u_{2,}e_1)$ $\mu R_A(u_{2,}e_2)$........................... $\mu R_A(u_{2,}e_n)$ |
| $u_3$ | $\mu R_A(u_{3,}e_1)$ $\mu R_A(u_{3,}e_2)$........................... $\mu R_A(u_{3,}e_n)$ |
| ....<br>$u_m$ | $\mu R_A(u_{m,}e_1)$ $\mu R_A(u_{m,}e_2)$........................... $\mu R_A(u_{m,}e_n)$ |

If aij = μ$R_A(u_{i,}e_j)$we define a matrix

$$SMm\times p = \begin{pmatrix} a_{11}\, a_{12} & \cdots & a_{1n} \\ a_{21}\, a_{22} & \ddots & a_{2n} \\ a_{m1}\, a_{m2} & \cdots & a_{mn} \end{pmatrix}$$ which is called an m × n soft matrix of the soft set (F,A) over U.

**Example:** Let (F,A) = {(($e_1$), {$u_{2,}u_3\, u_5$}), (($e_2$), {$u_1\, u_3$}), (($e_3$),{$u_4$})}. Then, the relation form of (F,A) is written by$R_A$ = { ($u_1$, $e_2$), ($u_2$, $e_1$),($u_{3,}e_1$),($u_{3,}e_2$),($u_{4,}e_3$),($u_{5,}e_1$)}.Hence, the soft matrix

$$[aij] = \begin{pmatrix} 0\,1\,0\,0 \\ 1\,0\,0\,0 \\ 1\,1\,0\,0 \\ 0\,0\,1\,0 \\ 1\,0\,0\,0 \end{pmatrix}$$

**Definition:** Let $[a_{ij}]$ ∈$SM_{m\times n}$.

1. Then $[a_{ij}]$ is called a zero soft matrix denoted by [0], if $a_{ij}$=0 for all i and j.
2. A universal matrix denoted by [1], if $a_{ij}$=1, for all i and j.

Let us consider A = E = {$e_1$,$e_2$, $e_3$, $e_4$} and U ={$u_1$,$u_2$,$u_3$,$u_4$, $u_5$} where (F,A) = {F($e_1$) = expensive wear = {$u_1$,$u_3$,$u_5$}, F($e_2$) = stunning wear = {$u_1$,$u_3$,$u_4$,$u_5$}, F($e_3$) =branded wear= {$u_2$,$u_3$,$u_4$}, F($e_4$) = discounted wear= {$u_2$,}}. Let

$$[M(F,A)] = \begin{pmatrix} \text{expensive wear} = \{u_1, u_3, u_5\} \\ \text{branded wear} = \{u_2, u_3, u_4\}, \\ \text{stunning wear} = \{u_1, u_3, u_4, u_5\} \\ \text{discounted wear} = \{u_2,\} \end{pmatrix}$$

Here we see that all the elements of the matrix [M(F,A)] are of the soft set (F,A). Hence the above matrix is a soft matrix.

**Product Soft matrices:**

**Definition (union of two soft matrices):** *Let* [M(F,A )] = $(m_{ij})$ *and* [ N(F ,A )] = $(n_{ij})$ *be two soft matrices of any order over a common soft set* $(F, A)$ *, then* $m_{ij}$= $F(\alpha)$ *and* $n_{ij}$= $F(\beta)$ *for some* $\alpha,\beta$ ∈*A. The union of* $[M(F, A)]$ *and* $[N(F, A)]$ *is denoted by* $[M(F, A)]\cup[N(F, A)] = [L(F, A)]$ *, where* $[L(F, A)] = l_{ij}$*is a soft matrix whose number of rows is equal to the number of rows of* $[M(F, A)]$ *and number of columns is equal to the number of columns of* $[N(F, A)]$ *and is defined by* $l_{ij}$=$\cup_\alpha F(\alpha)$, where $\alpha$is the common parameter of the $i$ th row of $[M(F, A)]$ and $j$ th column of$[N(F, A)]$.

**Definition 24 (intersection of two soft matrices):** *Let* [ M(F ,A )] = $(m_{ij})$ *and* [ N(F ,A )] = $(n_{ij})$ *be two soft matrices of any order over a common soft set* $(F, A)$ *, then* $m_{ij}$= $F(\alpha)$ *and* $n_{ij}$= $F(\beta)$ *for some* $\alpha,\beta$ ∈*A. The union of* $[M(F, A)]$ *and* $[N(F, A)]$ *is denoted by* $[M(F, A)]\cup[N(F, A)] = [L(F, A)]$ *, where* $[L(F, A)] = l_{ij}$*is* *a soft matrix whose number of rows is equal to the number of rows of* $[M(F,A)]$ *and number of columns is equal to the number of columns of* $[N(F,A)]$ *and is defined by* $l_{ij}=\bigcap_{\alpha} F(\alpha)$, where $\alpha$ is the common parameter ofthe $i$ th row of $[M(F,A)]$ and $j$ th column of$[N(F,A)]$.

**Example**: Let us consider two soft sets A and B over a common universe U . Let U = $\{m_1, m_2, m_3, m_4, m_5\}$, A = $\{x_1, x_2\} \subseteq$ E and B = $\{x_2, x_3\} \subseteq$ E. Then F $(x_1) = \{m_1, m_3, m_4\}$, F $(x_2) = \{m_2, m_3, m_5\}$, $G(x_2) = \{m_1, m_3\}$ and $G(x_3) = \{m_2, m_3\}$. Here A × B = $\{(x_1, x_2), (x_1, x_3), (x_2, x_2), (x_2, x_3)\}$. Then, the relation form of

$R_{(H,A\times B)}$ =

$\{((x_1, x_2), \{(m_1, m_1), (m_1, m_3), (m_3, m_1), (m_3, m_3), (m_4, m_1), (m_4,m_3)\}),$

$((x_1, x_3), \{(m_1, m_2), (m_1, m_3), (m_3, m_2), (m_3, m_3), (m_4, m_2), (m_4, m_3)\}),$

$((x_2, x_2), \{(m_2, m_1), (m_2, m_3), (m_3, m_1), (m_3, m_3), (m_5, m_1), (m_5, m_3)\}),$

$((x_2, x_3)\{(m_2, m_2), (m_2, m_3), (m_3, m_2), (m_3, m_3), (m_5, m_2), (m_5, m_3)\})\}.$

**Definition:** Let U be the universal set. Let (F, A) and (G, B) be a two soft sets over common universe. Then the Cartesian product soft sets (F, A)×(G, B) = (H, A×B). We define the relation of (H, A×B) is $R_{(H,A\times B)} = \{(h, e) : h \in H(\alpha, \beta), e \in A\times B\}$. The special function of $R_{(H,A\times B)}$ is written by

$$CR_{(H,A\times B)}: U \times E \to \left\{0, \frac{1}{2}, 1\right\},$$

$$CR_{(H,A\times B)} = \begin{cases} 1, \ if (h,e) \in A \cap B \\ \frac{1}{2} = 0.5 \ if \ (h,e) \in A \triangle B \\ 0, if \ (h,e) \notin A \cup B \end{cases}$$

If $(d_{ij}) = d(h,e)$, we define a matrix $(d_{ij})_{(n\times p)}$= $\begin{pmatrix} d_{11}d_{12} \dots \dots d_{1p} \\ d_{21}d_{22} \dots \dots . d_{2p} \\ \dots \dots \dots \dots \dots . \\ d_{n1}d_{n2} \dots \dots . d_{np} \end{pmatrix}$ is called as a product soft matrices, where n is the number of elements is U and p is the product of the number of element in the set A and the number of elements in the set B.

**Definition:** Let (F, A) = $(a_{ij})$ and (G, B) = $(b_{ij})$ be two soft matrices. Then (F, A) AND (G, B) is denoted by $[(F, A)] \wedge [(G, B)] = [H, A \times B] = (d_{ij})$ is a soft matrix, is defined by $(d_{ij}) = (a_{ij}) \cap (b_{ij})$.

**Example:** Let U = $\{m_1, m_2, m_3, m_4, m_5\}$ and E = $\{x_1, x_2, x_3, x_4\}$. Assume that A = $\{x_1, x_2, x_3\}$ and B = $\{x_2, x_3, x_4\} \subseteq$ E. Let (F, A) = $\{((x_1), \{m_1, m_3, m_4, m_5\}), ((x_2), \{m_2, m_3, m_5\}), ((x_3), \{m_4\})\}$

(F, B) = $\{((x_2), \{m_1, m_3, m_5\}), ((x_3), \{m_2, m_3\}), ((x_4), \{m_2\})\}$.

Hence (F, A)∧(F, B) = $\{((x_1,x_2), \{m_1,m_3,m_5\}), ((x_1,x_3), \{m_3\}), ((x_1, x_4),\{\phi\}), ((x_2, x_2), \{m_3, m_5\}), ((x_2, x_3), \{m_2, m_3\}),$

$((x_2, x_4),\{m_2\}),(x_3, x_2), \{\phi\}), ((x_3, x_3), \{\phi\}), ((x_3, x_4), \{\phi\})\}$.

Hence the product of the soft matrices is

$$(d_{ij})_{(n\times p)} = \begin{pmatrix} 1\,0\,0\,0\,0\,0\,0\,0\,0 \\ 0\,0\,0\,01\,1\,0\,0\,0 \\ 1\,1\,01\,1\,0\,0\,\,0\,0 \\ 0\,0\,0\,0\,0\,0\,0\,0\,0 \\ 1\,0\,0\,1\,0\,0\,0\,0\,0 \end{pmatrix}$$

**Definition:** Let(F, A) = $(a_{ij})$ and (G, B) = $(b_{ij})$ are two soft matrices.

Then (F, A) OR (G, B) is denoted by $[(F, A)] \vee [(G, B)] = [H, A \times B] = (d_{ij})$ is a soft matrix, is defined by $(d_{ij}) = (a_{ij}) \cup (b_{ij})$.

**Example:** Let U = $\{m_1, m_2, m_3, m_4, m_5\}$ and E = $\{x_1, x_2, x_3, x_4\}$. Assume that A = $\{x_1, x_2, x_3\}$ and B = $\{x_2, x_3, x_4\} \subseteq$ E.

Let (F, A) = $\{((x_1), \{m_1, m_3, m_4, m_5\}), ((x_2), \{m_2, m_3, m_5\}), ((x_3), \{m_4\})\}$

(G, B) =$\{((x_2), \{m_1, m_3, m_5\}), ((x_3), \{m_2, m_3\}), ((x_4),\{m_2\})$

Hence (F, A)∪(G, B) = $\{((x_1, x_2), \{m_1, m_3, m_4, m_5\}), ((x_1, x_3), \{m_1, m_2, m_3,m_4, m_5\}), ((x_1, x_4), \{m_1, m_2, m_3, m_4, m_5\}), ((x_2 ,x_2),\{m_1, m_2, m_3, m_5\}),((x_2, x_3), \{m_2, m_3, m_5\}), ((x_2, x_4), \{m_2, m_3, m_5\}), ((x_3, x_2),\{m_1, m_3, m_4, m_5\}), ((x_3,x_3),$

$\{m_2, m_3, m_4\}), ((x_3, x_4), \{m_2, m_4\})\}$.

Hence, the product soft matrices is

$$(d_{ij})_{(5\times 9)} =$$

Matrix of
$$\begin{pmatrix} 1 & 0.5 & 0.5 & 0.5 & 0 & 0 & 0.5 & 0 & 0 \\ 0 & 0.5 & 0.5 & 0.5 & 1 & 1 & 0.5 & 0.5 & 0.5 \\ 1 & 1 & 0.5 & 1 & 1 & 0.5 & 0.5 & 0.5 & 0 \\ 0.5 & 0.5 & 0.5 & 0 & 0 & 0 & 0.5 & 0.5 & 0.5 \\ 1 & 0.5 & 0.5 & 1 & 0.5 & 0.5 & 0.5 & 0 & 0 \end{pmatrix}$$

**Definition:** The Choice value of an object $d_j \in U$ is defined by $d_j$=max{max(d(h,e)}, where d(h,e) are the entries of $d_j$

**Definition:** Let U={ $m_1, m_2, m_3, \dots, m_n$} be an initial universe and max{max(d(h,e))=[ $u_{i1}$]. Then a subset of U can be obtained by using $[u_{i1}]$ as in the following way opt$_{u_{i1}}$= { $u_i : u_i \in U, u_{i1}$= max(1 or $\frac{1}{2}$ )}, which is called optimum set of U.

Assume that a set of alternative and a set of parameters are given. Now, we can construct a soft max – max decision making method by the following

algorithm.
Step 1: Choose feasible subsets of the set of parameters,
Step 2: Construct the Cartesian product soft set,
Step 3: Find a Cartesian or product of the soft matrices,
Step 4: Compute the max – max decision matrix of the product.
Step 5: Find an optimum set of U

**Example**: Assume that a mobile shop has a set of different types of mobiles U = $\{m_1, m_2, m_3, m_4, m_5\}$ which may be characterized by a set of parameters E = $\{x_1, x_2, x_3, x_4\}$. For j = 1, 2, 3, 4, the parameters $x_J$ stand for expensive, beautiful, branded, cheap, respectively.

Step 1: Suppose that the two friends M r.X and M r.Y have the choose the sets of their parameters, A = $\{x_1, x_2, x_3\}$ and B = $\{x_2, x_3, x_4\}$, respectively.

Step 2: The Cartesian product soft set are

(F, A) = $\{((x_1), \{m_1, m_3, m_4, m_5\}), ((x_2), \{m_2, m_3, m_5\}), ((x_3), \{m_4\})\}$ (G, B) = $\{((x_2), \{m_1, m_3, m_5\}), ((x_3), \{m_2, m_3\}), ((x_4), \{m_2\})\}$.

The "OR product" of cartesian set is defined as

(F, A)∨(G, B) = $\{((x_1, x_2), \{m_1, m_3, m_4, m_5\}), ((x_1, x_3), \{m_1, m_2, m_3, m_4, m_5\}),$
$((x_1, x_4), \{m_1, m_2, m_3, m_4, m_5\}), ((x_2, x_2), \{m_1, m_2, m_3, m_5\}),$
$((x_2, x_3), \{m_2, m_3, m_5\}), ((x_2, x_4), \{m_2, m_3, m_5\}), ((x_3, x_2), \{m_1, m_3, m_4, m_5\}), ((x_3, x_3), \{m_2, m_3, m_4\}), ((x_3, x_4), \{m_2, m_4\})\}$.

Step 3: Now, we can find a cartesian product of the soft matrix A and B by using Or – product as follows

$$(d_{ij})_{(5\times 9)} =$$

Matrix of
$$\begin{pmatrix} 1 & 0.5 & 0.5 & 0.5 & 0 & 0 & 0.5 & 0 & 0 \\ 0 & 0.5 & 0.5 & 0.5 & 1 & 1 & 0.5 & 0.5 & 0.5 \\ 1 & 1 & 0.5 & 1 & 1 & 0.5 & 0.5 & 0.5 & 0 \\ 0.5 & 0.5 & 0.5 & 0 & 0 & 0 & 0.5 & 0.5 & 0.5 \\ 1 & 0.5 & 0.5 & 1 & 0.5 & 0.5 & 0.5 & 0 & 0 \end{pmatrix}$$

Step 4: We can find a max-max decision soft matrix as Max{Max values in every column}
= Max$\{\{m_1, m_3, m_5\}, \{m_3\}, \{m_1, m_2, m_3, m_4, m_5\}, \{m_3, m_5\}, \{m_2, m_3\}, \{m_2\}, \{m_1, m_2, m_3, m_4, m_5\}, \{m_2, m_3, m_4\}, \{m_2, m_4\}\} = m_3$.

And $(\bar{d}_J) = (0\ 0\ 1\ \bar{0}\ 0)^T$

Step 5: Finally, we can find an optimal set of U according to M ax{Max(d(h, e))} = $[u_{I_1}] = m_3$, where $m_3$ is an optimum mobile to buy for Mr. X and Mr. Y.

**Conclusion:** The Soft-set theory is being applied to many fields varying from theoretical to practical. In this paper, we defined soft matrices which are matrix representation of the soft-sets. we have presented a new algorithm using the product soft marix and proposed a new "OR" operations of soft matrix to solve soft matrix based decision making problems. This new decision making method depends on the ideas of fuzzy and soft sets. Therefore, this method is more feasible than the others, because of its fuzziness. Thus, the advantage of this new suggested method is that it is very convenient and easy to apply when compared with the other methods.

**References:**


1. U. Acar, F. Koyuncu and B. Tanay, Soft sets and soft rings, Computers and Mathematics with Applications, 59 (2010), 3458-3463.
2. Bharati M Shettar, N. M. Bujurke, Analysis Of Petrusevich Pressure Spike In Ehl Using Newton-Multigrid Method; Mathematical Sciences International Research Journal : ISSN 2278-8697Volume 4 Issue 2 (2015), Pg 352-356
3. B. Ahmad and A. Kharal, On fuzzy soft sets, Advances in Fuzzy Systems, (2009), 1-6.
4. H. Aktas¸ and N. C¸agman, Soft sets and soft groups, Information Sciences, 1(77) (2007), 2726-2735.
5. C. Jayasekaran, S. Robinson Chellathurai, M. Jaslin Melbha, Mean Square Sum Labeling of Some Graphs; Mathematical Sciences international Research Journal : ISSN 2278-8697 Volume 4 Issue 2 (2015), Pg 238-242
6. M. I. Ali, F. Feng, X. Liu, W. K. Min and M. Shabir, On some new operations in soft set theory, Computers and Mathematics with Applications, 57(2009), 1547-1553.
7. D.V.S.R. Anil Kumar, Y.V. Seshagiri Rao, on Various Decompositions of A Signed Lattice Measure; Mathematical Sciences international Research Journal ISSN 2278 – 8697 Vol 3 Issue 2 (2014), Pg 604-606
8. A. O. Atag•un and A. Sezgin, Soft substructures of rings, elds and modules, Comput. Math. Appl., 61(3) (2011), 592-601.

9. N. C̣agman and S. Enginoglu, Soft set theory and uni-int decision making, European Journal of Operational Research, 207 (2010), 848-855.
10. Vidya M Shettar, Shanmukhappa A Angadi, A Genetic Algorithm For Graph Matching Using Node Characteristics; Mathematical Sciences International Research Journal : ISSN 2278-8697Volume 4 Issue 2 (2015), Pg 347-351
11. N. C̣agman and S. Enginoglu, Soft matrix theory and its decision making, Computers and Mathematics with Applications, 59 (2010), 3308-3314.
12. U. Revathy, R.Murugesan, S.Somasundaram, Orthogonal Reverse Semiderivations on Semiprime Semiring; Mathematical Sciences international Research Journal : ISSN 2278-8697 Volume 4 Issue 2 (2015), Pg 247
13. N. C̣agman, F. C tak and S. Enginoglu, Fuzzy parameterized fuzzy soft set theory and its applications, Turkish Journal of Fuzzy Systems, 1(1) (2010), 21-35.
14. S S.Benchalli, P G.Patil, J B.toranagatti, Delta Generalized B-Closed Functions in topological Spaces; Mathematical Sciences international Research Journal : ISSN 2278-8697 Volume 4 Issue 2 (2015), Pg 243-246
15. N. C̣agman, S. Enginoglu and F. C tak, Fuzzy soft set theory and its applications, Iranian Journal of Fuzzy Systems, 8(3) (2011), 137-147.
16. Renukadevi S. Dyavanal, Madhura M. Mathai, On Transcendental Entire Solution Of Certain Type Of Difference Equation; Mathematical Sciences International Research Journal : ISSN 2278-8697Volume 4 Issue 2 (2015), Pg 263-266
17. N.Cagman, S.Enginoglu, Fuzzy Soft Matrix Theory and its application in Decision making, Iranian Journal of Fuzzy systems Vol. 9, No. 1, (2012) pp. 109-119
18. A.P.Dhana Balan, C.Santhi, Rm.Sivagama Sundari, Soft Feebly Separation Spaces and Soft Feebly Continuous; Mathematical Sciences international Research Journal ISSN 2278 – 8697 Vol 3 Issue 2 (2014), Pg 575-577
19. S.Vijaya Balaji, A.Ramesh, A newDecision making theory in Soft Matrices, International Journal of Pure and Applied Mathematics Volume 86,No. 6 2013,927-939
20. S. Elizabeth, L. Sujatha, on Searching Shortest Path in A Classical Network; Mathematical Sciences international Research Journal ISSN 2278 – 8697 Vol 3 Issue 2 (2014), Pg 568-574
21. Sanjib Mondal and Madhumangal Pal, Soft Matrices Afriacan Journal of Mathematics and Computer Science Research Vol. 4(13), pp. 379-388, Dec2011

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