Review Paper on Common "Fixed Point Theorems in Intuitionistic Fuzzy Metric Space"

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"ABSTRACT"

"In this paper, as an overview paper, we survey numerous works identified with fixed point hypothesis for some normal settled point hypotheses in intuitionistic fuzzy metric spaces utilizing regular cutoff of range, Non Archemedian space, Strict Contractive conditions, Weakly companionable maps."

1. "INTRODUCTION":

The concept of fuzzy sets is introduced by Zadeh [19]. In 1975, Kramosil & Michlek [7] introduced the concept of Fuzzy sets, Fuzzy metric spaces. George & Veeramani [5] gave the modified version of Fuzzy metric spaces continuous t norms. In 2005, Park, Kwun, and Park [15] proved some theorems in intuitionistic fuzzy metric spaces. In 1986, Jungck [6] introduced the concept of compatible mappings.Lots of the theorems were proved for the existence of common fixed points in classical and fuzzy metric spaces. Aamri and Moutawakil [1] introduced the concept of non compatibility using E.A property and proved several fixed point theorems under contractive conditions. Atanassove [3] introduced the concept of Intuitionistic fuzzy sets which is a generalization of fuzzy sets. In 2004, Park [14] defined Intuitionistic Fuzzy metric spaces using t-norms & t- conorms as a generalization of fuzzy metric spaces. Turkoglu [18] generalized Jungck common fixed point theorem to Intuitionistic Fuzzy metric spaces. E.A property in Intuitionistic Fuzzy metric spaces is used to prove fixed point theorems for a pair of fixed maps. S.Kumar, S.S.Bhatia, S.Manro [8] proved a common fixed point theorem for weakly mappings satisfying E.A property in Intuitionistic Fuzzy metric spaces using Implicit relation. Fixed point theorems for weakly compatible mappings satisfy E.A property in Intuitionistic Fuzzy metric spaces. The concept of non Archimedean intuitionistic fuzzy 3 metric spaces by using the concept of Archimedean fuzzy metric space by Dorel Mihet[4], Sushil Sharma[21] and Renu Chugh and Sumitra^[17] is used.

2. PRELIMINARIES :

2.1 : BASIC DEFINITIONS USED :

"Definition 2.1.1":

"A couple of self maps (f,g) in an 'intuitionistic fuzzy metric space (X,M,N, \Diamond)' satisfies, as far as possible in the scope of g property (CLRg), if there exists a succession { x_n } in X" with the end

such that,

$$\lim_{n \to \infty} M\left(f_n, g_z, t\right) = 1, \lim_{n \to \infty} M\left(g_n, g_z, t\right) = 1 \text{ "and,}$$
$$\lim_{n \to \infty} N\left(f_n, g_z, t\right) = 1 \text{ and } \lim_{n \to \infty} N\left(g_n, g_z, t\right) = 0 \text{", `for some } z \in X \text{'}.$$

"Definition 2.1.2":

"An intuitionistic fuzzy metric space(X, M, N, 0) is said to be absolute, if each Cauchy arrangement in X is merged."

"Definition 2.1.3":

"An intuitionistic fuzzy metric space (X, M, N, 0) is said to be dense, if every sequence in X has a convergent subsequence."

"Definition 2.1.4":

"Two maps An and B from an intuitionistic fuzzy metric space(X,M,N,, \diamond) into itself are said to be incapable ideal on the off possibility that they constrain at their incident focuses, that is, Ax = Bx suggests, ABx = BAx."

"Definition 2.1. 5":

"A binary operation $\diamond: [0,1] \times [0,1] \rightarrow [0,1]$ is continuous t-conorm" if, " \diamond is satisfying the following conditions";

- (1) ' \diamond is commutative and associative';
- (2) ' \diamond is continuous';
- (3) 'a $\diamond 0 = a$ }, for all $a \in [0,1]$ '

(4) 'a \diamond b \leq c \diamond d', 'whenever a \leq c and b \leq d ,for all a, b, c, d \in [0, 1]'.

2.2 :	LITERATURE SURVEY :	

S.NO	AUTHOR	TITLE OF THE	NAME OF	YEAR	PAGES
1.	"V. Malliga Devi, R.Mohan Raj and M.Jeyara man"	"Common Fixed point theorem in intuitionistic fuzzy metric space"	"International Journal of Advanced Engineering Technology"	2016	58-65
2.	"M. Jeyaraman and M. Barveen Banu"	"Fixed point theorem in intuitionistic fuzzy metric space using (CLRg) property"	"International Journal of Applied Mathematical Sciences"	2016	21-29
3.	"Nidhi Verma , Dr.Rajesh Shrivastav a"	"A Fixed point theorem in Non Archimedean intuitionistic Fuzzy 3 Metric Spaces"	"International Journal of Advanced Technology and Engineering research"	2017	112-117
4.	"Piyush Kumar Tripathi , Sajjan Lal Maurya , Neelam Yadav"	"Coincidences and Common Fixed-Point Theorems in Intuitionistic Fuzzy Metric Space"	"Global Journal of Pure and Applied Mathematics"	2017	1035-1047
5.	"Akhilesh Jain, Chandel R.S., Hasan Abbas and Uday Dolas"	"Common Fixed point theorem in intuitionistic fuzzy metric space under strict contractive conditions"	"International Journal of Recent Scientific Research"	2018	27716-27721

6.	"Saurabh	"Coincidence and	"An International	2018	97-105
	Manro,	Common Fixed Point	Journal,		
	and Anita	of Weakly Compatible	Mathematical		
	Tomar"	Maps in Intuitionistic	Sciences Letters"		
		Fuzzy Metric Space"			

<u>2.3</u> : <u>APPLICATIONS</u> :

<u>2.3.1</u>: <u>Applications in 2016</u> :

"Some regular fixed point hypotheses for superior mappings in total intuitionistic fuzzy metric spaces are demonstrated and furthermore, some case of basic fixed hypothesis for a couple of once in a while ineffectively perfect mappings by utilizing the (CLRg) property in intuitionistic fuzzy metric spaces are introduced".

RESEARCH WORK	APPLICATION AREA	PROBLEM SOLVING
PUBLISHED IN 2016		
"V. Malliga Devi, R.Mohan	"FUZZY METRIC SPACES"	"compatible mappings"
Raj and M.Jeyaraman"		
"M. Jeyaraman and M.	"FUZZY METRIC SPACES"	"weakly compatible mappings
Barveen Banu"		by using the (CLRg) property"

<u>2.3.2</u>: <u>Applications in 2017</u> :

The idea of "Non Archimedean intuitionistic fuzzy-3 metric spaces" by means of "the notion of Archimedean Fuzzy Metric Space" has been presented and several Result of Fixed Point are proved by using coincidently commuting mappings and without using continuity of mappings.

RESEARCH WORK PUBLISHED IN 2017	APPLICATION AREA	PROBLEM SOLVING
"Nidhi Verma , Dr.Rajesh	"FUZZY METRIC SPACES"	"Non Archimedean
Shrivastava"		intuitionistic fuzzy 3 metric
		spaces"
"Piyush Kumar Tripathi ,	"FUZZY METRIC SPACES"	"Coincidently commuting
Sajjan Lal Maurya , Neelam		mappings"
Yadav"		

<u>2.3.3</u>: <u>Applications in 2018</u> :

"The idea of intuitionistic Fuzzy Metric Spaces", among the aid of "continuous t- norms" and "continuous t-conorms" as an overview of "fuzzy metric space" is defined. Various frequent "fixed point theorem in intutionistic fuzzy metric space under strict contractive conditions for the existence of coincidence" and "common fixed point for non-compatible maps even when all the maps are discontinuous" has been proved.

RESEARCH WORK	APPLICATION AREA		PROBLEM SOLVING
PUBLISHED IN 2018			
"Akhilesh Jain, Chandel	"FUZZY	METRIC	"Strict contractive conditions."
R.S., Hasan Abbas and Uday	SPACES"		
Dolas"			
"Saurabh Manro, and Anita	"FUZZY	METRIC	"Existence of coincidence and
Tomar"	SPACES"		common fixed point for non
			compatible maps without
			closedness /completeness."

<u>2.4</u> : <u>THEOREMS :</u>

<u>2.4.1</u>:Theorem:

"Let (X, M, N, \emptyset) be a 'intuitionistic fuzzy metric space', '* being continuous t-norm' and ' \emptyset being continuous t-conorm' with { $a * b \ge ab$ and $a \& b \le ab, \forall a. b \in [0,1]$ }. Let { $P, Q: X \times X \to X$ }, and { $R, S: X \times X \to X$ } be 'four mappings' fulfilling following conditions";

(i) 'The pairs (P, R) and (Q, S) satisfy CLRg property';

(ii)
$${}^{"}M(P(x,y),Q(u,v),kt) \ge \emptyset \{ M(P(x,y),Rx,t) * M(Q(u,v),Su,t) \}$$
" and

 $"N(P(x,y),Q(u,v),kt) \le \varphi\{N(Rx,Su,t) \land N(P(x,y),Rx,t)\} \land N(Q(u,v),Su,t)\}"$

$$\forall [x, y, u, v \in X, k \in (0,1)] and \{ \emptyset, \varphi: [0,1] \rightarrow [0,1] \}, such that [\emptyset(t) > t] and [\varphi(t) < t] for 0 < t < 1.$$

'Then (P, R) and (Q, S) have point of coincidence. Furthermore if the pairs (P, R) and (Q, S) are irregularly weakly compatible, then there exists exceptional x in X", such that;

$$"P(x, x) = S(x =) = Q(x, x), R(x) = x"$$

<u>2.4.2</u>:Theorem:

"Let (f,g) be a couple of self maps in intuitionistic fuzzy metric space(X,M,N, \Diamond) where * is a constant t-standard and \Diamond is a nonstop t-conorm. If the combine (f,g) satisfies the (CLRfg) property then f and g have a one of a kind basic fixed point in X gave that the match (f,g) is feebly good".

2.4.3: 'Theorem':

"Let (X, M, N, δ) be an "intuitionistic fuzzy metric space" and 'Y be a nonempty set", Assume, " $f, g: Y \to X$ " are two mappings agreeable to following conditions;

- i. " $f(Y) \subseteq g(Y)$ and either f(Y) or g(Y) are complete".
- ii. " $\exists k \in (0,1)$ such that $M(fx, fy, kt) \ge M(gx, gy, t)$ " and

 $"N(fx, fy, kt) \le N(gx, gy, t) \forall x, y \in Y, \forall t > 0"$

"Then, 'f and g' contain coincidence point".

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