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An Overview of Implication Based Interval Valued on Fuzzy K-Ideals and Its Applications

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ABSTRACT

Ideals of semirings play a central role in the structure theory and are useful for many purposes. Henriksen defined in a more restricted class of ideals in semirings, which is called the class of k-ideals, with the property that if the semiring R is a ring then a complex in R is a k-ideal if and only if it is a ring ideal.
The Aim of this project is to introduce and study new different sorts of interval-valued fuzzy k-ideals of semiring and to investigate the new aspects of related properties. In particular interval-valued fuzzy k-ideals with thresholds are investigated

KEYWORDS: Semiring, k-Ideals, $\tilde{t}$ –tautology, Ordinary interval, Consequence

INTRODUCTION:

Set theoretic multi-valued logic is a special case of fuzzy logic such that the truth values are linguistic variables (or terms of the linguistic variables truth).by $\wedge, \vee, -, \rightarrow$ can be applied in fuzzy proposition P. In the following, we show a correspondence between fuzzy logic and set-theoretical notions.

$[x \in F] = \tilde{\mu}_{F(x)}$,

$[P \wedge Q] = \min\{[P],[Q]\}$,

$[P \rightarrow Q] = \min\{[1, 1],[1,1]-[P]+[Q]\}, \forall x$

$P(x) = \inf[P(x)]$,

$[x \notin F] = [1, 1]-\widetilde{\mu_F}(x)$,

$$[P \vee Q] = \max\{[P],[Q]\},$$

$\vDash$ P if and only if [P] = [1, 1] for all valuations.

We show some of important implication operators, where α and β is the degree of membership of the consequence and I the resulting degree of the truth for the implications.

Early zad	$I_m(\alpha, \beta) = \max\{1-\alpha, \min\{\alpha, \beta\}\}$,
Lukasiewicz	$I_a(\alpha, \beta) = \min\{1, 1-\alpha+\beta\}$,
Standard star (Godel)	$I_g(\alpha, \beta) = \begin{cases} 1 & \text{if } \alpha \leq \beta \\ \beta & \text{Otherwise} \end{cases}$
Contraposition of Godel	$I_{cg}(\alpha, \beta) = \begin{cases} 1 & \text{if } \alpha \leq \beta \\ 1-\alpha & \text{Otherwise} \end{cases}$
Gaines Rescher	$I_{gr}(\alpha, \beta) = \begin{cases} 1 & \text{if } \alpha \leq \beta \\ 0 & \text{Otherwise} \end{cases}$

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Kleene-Dienes $I_b(\alpha, \beta)=\max\{1, 1-\alpha,\beta\}$,

DEFINITIONS:

An interval-valued fuzzy set F of R is called an **interval-valued fuzzifying k-ideal of R.**

If it satisfies the following

1) For any $x, y \in R$,

$$\vDash \left[\{[x\in F]\wedge [y\in F]\}\rightarrow[x+y\in F]\right],$$

2) For any x, a $\in$R,
$\vDash\left[\{[x\in F]\}\rightarrow[a\,x\in F]\right]$and
$\vDash\left[\{[x\in F]\}\rightarrow[x\,a\in F]\right]$,
3) For any x, b $\in$R,

$$\vDash \left[\{[x + b\in F]\wedge [y+ b\in F]\}\rightarrow[x \in F]\right],$$

Obviously, inter-valued fuzzifying k-ideal and Ordinary interval-valued fuzzy k-ideals are equivalent. Therefore, there is no difference between k-ideals.

Now, we have the concept of interval-valued $\tilde{t}$ –tautology, In fact $\vDash_{\tilde{t}} = P$ if and only if $[P]\geq\tilde{t}$, for all valuations.

We extend the concept of **implication –based fuzzy k-ideals.**

DEFINITION:

Let F be an interval-valued fuzzy set of R$[0,0]<\tilde{t}\leq[1,1]$. Then F is called a $\tilde{t}$ –**implications –based interval-valued fuzzy k-ideal of R.**

If it satisfies the following conditions:

1) For any $x, y \in R$,

$\vDash_{\tilde{t}}\left[\{[x \in F]\wedge [y \in F]\}\rightarrow[x+ y \in F]\right]$,

2) For any x, a $\in$R,
$\vDash_{\tilde{t}}\left[\{[x \in F]\}\rightarrow[a\,x \in F]\right]$and
$\vDash_{\tilde{t}} \left[\{[x \in F]\}\rightarrow[x\,a \in F]\right]$,
3) For any x, b $\in$R ,

THEOREM

An interval-valued fuzzy set F of R is a $\tilde{t}$-implication –based interval-valued fuzzy k-ideal of R.

If for all a, x, y $\in$R we have:

1) $I\left(\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y),\widetilde{\mu_F}(x+y)\right)\geq\tilde{t}$,
2) $I\left(\widetilde{\mu_F}(x),\widetilde{\mu_F}(a\,x)\geq\tilde{t}\right)$ and $I\left(\widetilde{\mu_F}(x),\widetilde{\mu_F}(x\,a)\geq\tilde{t}\right)$
3) $I\left(\widetilde{\mu_F}(x+a)\wedge\widetilde{\mu_F}(a),\widetilde{\mu_F}(x)\right)\geq\tilde{t}$

Where I is an implication operator.

PROOF:

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(1) $I\left(\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y),\widetilde{\mu_F}(x+y)\right)\geq\tilde{t}$ is obvious.

(2) **"⇒"**

i) $I_g\left(\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y),\widetilde{\mu_F}(x+Y)\geq[0.5,0.5]\right)$

$\widetilde{\mu_F}(x+y)\geq\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y)$ (or) $\left(\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y)>\widetilde{\mu_F}(x+Y)\geq[0.5,0.5]\right)$

Then

$\left(\widetilde{\mu_F}(x)\wedge\widetilde{\mu_F}(y)>\widetilde{\mu_F}(x+Y)\geq[0.5,0.5]\right)$

"⇐" clearly.

3) similar to proof of (2).

THEOREM:

i. Let $I=I_{gr}$(Gaines- Rescher.) Then F is an $[0.5, 0.5]$ –implication –Based interval -valued fuzzy k-ideal with thresholds $(\tilde{r}=[0,0],\tilde{s}=[1,1])$ of R.
ii. Let $I=I_g$ (Godel).Then F is an [0.5,0.5]-implication –based interval-valued fuzzy k-ideal of R if and only if F is an interval-valued fuzzy k-ideal with thresholds $(\tilde{r}=[0,0],\tilde{s}=[0.5, 0.5])$of R.
iii. Let $I=I_{cg}$ (contraposition of Godel). Then F is an [0.5,0.5]-implication-based interval-valued fuzzy k-ideal of R if and only if F is an interval-valued fuzzy k-ideal with thresholds $(\tilde{r}=[0.5,0.5],\tilde{s}=[1,1])$ of R.

CONCLUSION:

We computed the concepts of generalized fuzzy k-ideal of semi ring with interval-valued membership functions. Also using this idea of quasi – coincide of a fuzzy point with a fuzzy set, the concept of an (α,β) – fuzzy ideal, which is generalization of a fuzzy ideal, in a semi ring is introduced and relationship between logical implication operators and fuzzy k – ideals with thresholds are investigated.

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