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Uncertainty Structure of Parameterised Finite Groups

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Abstract: In this paper, we study soft normal subgroups of subgroups, direct product of fuzzy soft normal subgroups and their properties.
Keywords: Fuzzy set, fuzzy relation, soft set, s-norm, normal subgroup, similar.

I. INTRODUCTION

In various algebra, a normal subdivision group is a subgroup that is invariant under opposition by members of the group of which it is a part. Alternatively a subgroup H of a group G is normal in G if and only if eH = He for all e in G [4]. For centuries uncertain theory[5] and error study have been the only models to treat imprecision and uncertainty in [3]. Even though [2] recently a lot of new models have been analysed for handling incomplete information. In this article, we obey the direct product form of uncertainty function.

II. PRELIMINARIES

A. Definition 2.1:

A uncertainty subset of G, we mean a function cv: $G \to I$ The set of all uncertainty subsets of G is known the I-power set of G and is denoted by I^G. A uncertainty combination, on G we mean a map $cv: G \times G \to I$ Denote by $F_R(G)$, the set of all uncertainty relations on G.

B. Definition 2.2:

Let $cv_1, cv_2 \in F_R(G)$ *and* $x, y \in G.$ we set

(i) $cv_1 \subseteq cv_2$ *if and only if* $cv_1(x, y) \le cv_2(x, y)$

(ii) $cv_1 = Acv_2$ *if and only if* $cv_1(x, y) = cv_2(x, y)$.

C. A Co-norm S is a map $cv: I \times I \to I$ *having the following Rules:*

(cv_1) $cv(xm^* + p, 0) = x$ $(neutral\ element)$

(cv_2) $cv(xm^* + p, ym^* + c) \le cv(x, z)$ $if\ y \le z$ $(monotonicity)$

(cv_3) $cv(xm^* + p, ym^* + c) = cv(y, x)$ $(commutativity)$

(cv_4) $cv(x, cv(ym^* + p, z)) = cv(cv(x, ym^* + c), z)$ $(associativity)$ $for\ all\ x, y, z \in I$

D. Definition 2.4:

Let 'j' be a uncertainty parameterised subset of a group G, then 'j' is called a uncertainty parameterised subgroup of G under a co norm (S- uncertainty parameterised subgroup) if and only if for all $x, y \in G$.

(i) $cv(xym^* + c) \le cv(j(x), j(y))$

(ii) $cv(x^{-1}m^* + c) \le cv(x)$.

Denote by cv(G), the set of all co norm- uncertainty parameterised subgroup of G.

Example 2.5: Let $G = \{1, i, -1, -i\}$ be a group with respect to . Define uncertainty subset $cv: G \to [I]$ as

$$cv(x) = \begin{cases} am^*/b, & if\ \ x = 1 \\ bm^*/c, & if\ \ x = -1 \\ am^*/c, & if\ \ x = \pm i \end{cases}$$

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E. Definition 2.5:

Let $f:\frac{G_1}{H_1}\to\frac{G_2}{H_2},\ cv1\in[I]^{\frac{G_1}{H_1}}\ and\ cv2\in[I]^{\frac{G_2}{H_2}}$

Define $f(cv1)\in[I]^{\frac{G_2}{H_2}}$ as $f(e_1H_1)=e_2H_2\ \ if\ \ f^{-1}(e_2H_2)\neq 0$

$$f(cv1)(e_2H_2)=\begin{cases}\inf\{cv1(e_1H_1)/e_1H_1\in\frac{G_1}{H_1}\\ 0,\quad if\ \ f^{-1}(e_2H_2)=\phi\end{cases}$$

$for\ all\ e_2H_2\in\frac{G_1}{H_1}.$

F. Definition 2.6:

A uncertainty parameterised relation $cv:Group\times Group\to[I]$ on a group G is a S- uncertainty parameterised combinations on G if the following conditions are satisfied.

$(i)\quad cv(xm^*+p,x)=0$

$(ii)\quad cv(xn^*+p,y)=cv(y,x)$

$(iii)\quad cv(xm^*+c,z)\le cv(cv(x,y),cv(y,z)),\ \ for\ all\ \ x,y,z\in G.$

G. Example 2.7:

Let $Group=(Z,+)$ be a group of integer numbers. Set $cv:Z^*\times Z^*\to[I]$ by $cv(x,y)=\begin{cases}0,\ \ if\ x=y\\ dm^*/c,\ otherwise\end{cases}$

H. Definition 2.8

Let 'G' be a group and 'H' be a normal subgroup of G. Then $cv_{\frac{G}{H}}:\frac{G}{H}\to[I]$ can be viewed by $cv_{\frac{G}{H}}(xm^*+cH)=\Delta(xm^*+c,h),\quad for\ all\ \ x\in G\ \ and\ \ h\in H.$

III. STRUCTURES OF VARIOUS CHARACTERISATIONS

A. Proposition 3.1:

Let $\mathrm{j}_{\mathrm{H}}\in cv(HM^*)$ and cv be similar co-norm. Then $\mathrm{j}_{\frac{G}{H}}\in cv\left(\frac{G}{H}\right).$

Proof: Let $xH,yH\in\frac{G}{H}\ and\ \mathrm{j}_{\mathrm{H}}\in cv(HM).$

Then, $\mathrm{j}_{\frac{G}{H}}(xm^*+cHym^*+cH)=\mathrm{j}_{\frac{G}{H}}(xym+cH)\ .=\Delta(xym+c,h)$

$$\begin{aligned}&=cv(j_H(xym+c),j_H(h))\\&\le cv(cv(j_H(x),j_H(y)),j_H(h))\\&=cv(cv(j_H(xm+c),j_H(ym+b)),cv(j_H(h),j_H(h)))\\&=cv(cv(j_H(xm+p),j_H(h)),cv(j_H(ym^*+c),j_H(h)))\\&=cv(\ \Delta(x,h),\Delta(y,h))\\&=cv\left(\ j_{\frac{G}{H}}(xHm+c),j_{\frac{G}{H}}(yHm+c)\right)\end{aligned}$$

Also, $j_{\frac{G}{H}}(xH)^{-1}=cv_{\frac{G}{H}}(x^{-1}m+cH)=\Delta(x^{-1},h)$

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$$= cv\left(j_H\left(x^{-1}m+c\right), j_H(h)\right) = cv\left(j_H(xm+p), {}_H(h)\right)$$

$= w(x,h) = A_{\frac{G}{H}}(xHm+c)$.Therefore, $j_{\frac{G}{H}} \in cv\left(\frac{G}{H}\right)$.

B. Proposition 3.2:

If cv be similar co-norm, then for all $xH \in \frac{G}{H}$, and $n \geq 1$,

(i) $j_{\frac{G}{H}}(H) \leq j_{\frac{G}{H}}(xHm+c)$

(ii) $j_{\frac{G}{H}}(xHm+c)^n \leq j_{\frac{G}{H}}(xHm*+c)$

(iii) $j_{\frac{G}{H}}(xHm*+c) = j_{\frac{G}{H}}(xHm+c)^{-1}$

Proof: Let $xH \in \frac{G}{H}$, and $n \geq 1$,

From Proposition 3.1, we have that $j_{\frac{G}{H}} \in cv\left(\frac{G}{H}\right)$

(i)
$$\begin{aligned} j_{\frac{G}{H}}(H) &= j_{\frac{G}{H}}\left(xx^{-1}Hm*+cp\right) \\ &= j_{\frac{G}{H}}\left(xHx^{-1}Hm+p\right) \\ &\leq \mathrm{cv}\left(j_{\frac{G}{H}}(xHm*+p), j_{\frac{G}{H}}\left(x^{-1}Hm+p\right)\right) \\ &\leq \mathrm{cv}\left(j_{\frac{G}{H}}(xHm+c), j_{\frac{G}{H}}(xHm+c)\right) \\ &= j_{\frac{G}{H}}(xHm*+c) \end{aligned}$$

(ii)
$$\begin{aligned} j_{\frac{G}{H}}(xHm*+c)^n &= j_{\frac{G}{H}} m*+p\left(xHm*+p, xHm*+p, xHm*+p, xHm*+p \ldots\ldots\ldots\ldots n\,times\right) \\ &\leq cv\left(j_{\frac{G}{H}}(xHm*+p), j_{\frac{G}{H}}(xHm*+p), j_{\frac{G}{H}}(xHm*+p) \ldots\ldots\ldots\ldots n\,times\right) \\ &= j_{\frac{G}{H}}(xHm*+c) \end{aligned}$$

(iii)
$$\begin{aligned} j_{\frac{G}{H}}(xHm*+c) &= j_{\frac{G}{H}}\left(x^{-1}H\right) \\ &\leq j_{\frac{G}{H}}\left(x^{-1}H\right) \\ &\leq j_{\frac{G}{H}}(xHm+c) \end{aligned}$$

. So, $j_{\frac{G}{H}}(xH) = j_{\frac{G}{H}}\left(x^{-1}Hm*+c\right)$

C. Proposition 3.3:

Let $j_{\frac{G}{H}}$ be a uncertainty parameterised set of a finite group $\frac{G}{H}$ and 'cv' be similar co-norm. If $j_{\frac{G}{H}}$ satisfies 2.6, then $j_{\frac{G}{H}} \in cvF\left(\frac{G}{H}\right)$.

Proof: Let $xHm*+c \in \frac{G}{H}$, $x \notin H$.

Since, $\frac{G}{H}$ is finite, xH has finite number, say n>1.

So, $(xHm*+c)^n = H$ and $x^{-1}H = x^{n-1}H$.

Now by using (i) occurrence same, we have that

$$j_{\frac{G}{H}}\left(x^{-1}Hm+c\right)= j_{\frac{G}{H}}\left(x^{n-1}H\right)= j_{\frac{G}{H}}\left(x^{n-2}xH\right)$$

$$\leq cv\left(j_{\frac{G}{H}}\left(x^{n-2}Hm\right), j_{\frac{G}{H}}\left(xHm+c\right)\right)$$

$$\leq cv\left(j_{\frac{G}{H}}\left(xHm*+c\right), j_{\frac{G}{H}}\left(xHm*+c\right), j_{\frac{G}{H}}\left(xHm*+c\right)............n\ times\right)$$

$$= j_{\frac{G}{H}}\left(xHm*+c\right).$$

IV. CONCLUSION

Main part of this uncertainty has been discussed with its application

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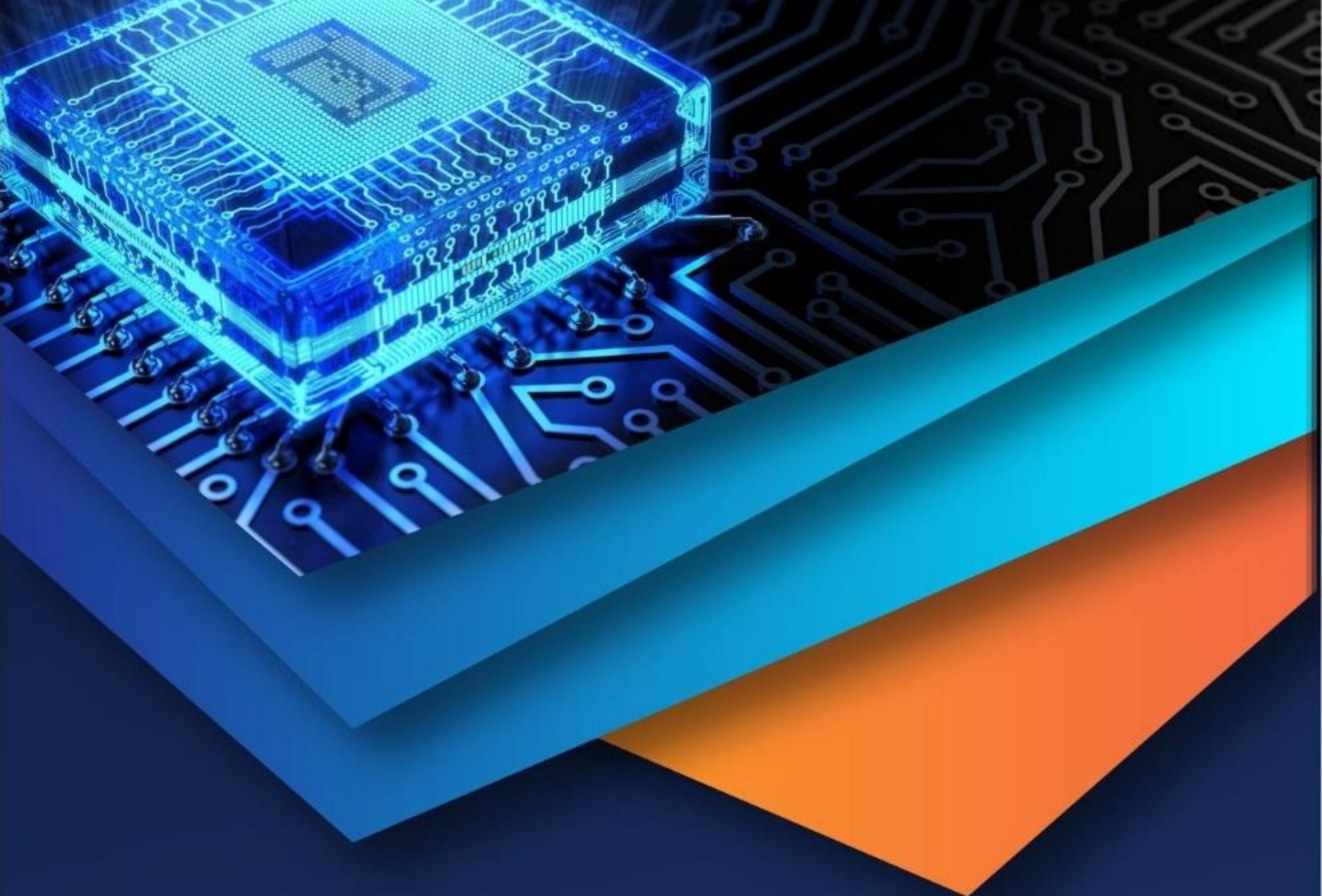

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