Refined Neutrosophic Crisp Set (RNCS)

Salama and Smarandache defined in 2014 and 2015 [1] the Neutrosophic Crisp Set as follows.

Definition of Neutrosophic Crisp Set (NCS)
Let X be a non-empty fixed space. A neutrosophic crisp set is an object D having the form
$D = <A, B, C>$, where A, B, C are subsets of X.

Types of Neutrosophic Crisp Sets

The object having the form $D = <A, B, C>$ is called:

(a) A neutrosophic crisp set of Type 1 (NCS-Type1) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ (empty set).

(b) A neutrosophic crisp set of Type 2 (NCS-Type2) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ and $A \cup B \cup C = X$.

(c) A neutrosophic crisp set of Type 3 (NCS-Type3) if it satisfies:
$A \cap B \cap C = \phi$ and $A \cup B \cup C = X$.

Of course, more types of Neutrosophic Crisp Sets may be defined by modifying the intersections and unions of the subsets A, B, and C.

Refined Neutrosophic Crisp Set

In 2019, Smarandache extended for the first time the Neutrosophic Crisp Set to Refined Neutroosphic Crisp Set, based on his 2013 definition of Refined Neutrosophic Set / Logic / Probability [2], i.e. the truth T was refined/split into sub-truths such as $T_1, T_2, \ldots, T_p$, similarly indeterminacy I was refined/split into sub-indeterminacies $I_1, I_2, \ldots I_r$, and the falsehood F was refined/split into sub-falsehoods $F_1, F_2, \ldots, F_s$.

Definition of Refined Neutrosophic Crisp Set (RNCS)

Let X be a non-empty fixed space. And let D be a Neutrosophic Crisp Set, where

$D = \langle A, B, C \rangle$, with A, B, C as subsets of X.

We refined/split D (and denote it by RD = *Refined* D) by refining/splitting A, B, C into sub-subsets as follows:

$RD = (A_1, \ldots, A_p; B_1, \ldots, B_r; C_1, \ldots, C_s)$, where $p, r, s \geq 1$ are positive integers,

and

$$A = \bigcup_{i=1}^{p} A_i, \quad B = \bigcup_{j=1}^{r} B_j, \quad C = \bigcup_{k=1}^{s} C_k .$$

Types of Refined Neutrosophic Crisp Set

Similarly, we have:

(a) A refined neutrosophic crisp set of Type 1 (RNCS-Type1) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ (empty set).

(b) A refined neutrosophic crisp set of Type 2 (RNCS-Type2) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ and $A \cup B \cup C = X$.

(c) A refined neutrosophic crisp set of Type 3 (RNCS-Type3) if it satisfies:
$A \cap B \cap C = \phi$ and $A \cup B \cup C = X$.

And, of course, more types of Refined Neutrosophic Crisp Sets may be defined: by modifying the intersections and unions of the subsets *A, B, C,* or the intersections and unions of their sub-subsets A_i, B_j, C_k, for $i \in \{1, 2, \ldots, p\}$, $j \in \{1, 2, \ldots, r\}$, and $k \in \{1, 2, \ldots, s\}$.

References

[1] A.A. Salama, F. Smarandache, *Neutrosophic Crisp Set Theory*, Educational Publisher, Columbus, Ohio, USA, 2015; http://fs.unm.edu/NeutrosophicCrispSetTheory.pdf

[2] Florentin Smarandache, *n-Valued Refined Neutrosophic Logic and Its Applications in Physics*, Progress in Physics, 143-146, Vol. 4, 2013; https://arxiv.org/ftp/arxiv/papers/1407/1407.1041.pdf and http://fs.unm.edu/n-ValuedNeutrosophicLogic-PiP.pdf

This section, called "Refined Neutrosophic Crisp Set (RNCS)" http://fs.unm.edu/RefinedNeutrosophicCrispSet.pdf
pp. 114-116, is extracted from the book:
Florentin Smarandache, Nidus Idearum, Vol. VII, third edition, 2019, Editions Pons, Brussels, Belgium;
http://fs.unm.edu/NidusIdearum7-ed3.pdf .