Malaya Journal of Matematik, Vol. 8, No. 1, 277-281, 2020

https://doi.org/10.26637/MJM0801/0046

A novel approach on MGNT and MSGNT via central sets

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Abstract

Exploring nanotopology from the viewpoint of multigranulation has become one of the promising topics in theory of nano topological space in which lower and upper approximations are using multiple binary relations. In this paper is to develop two new concepts on nanotopological models which are specified by multi granular nanotopology "(MGNT)" and multi star granular nano topology "(MSGNT)" models by using central sets in a given approximation space. Further, the concepts of the two new models are proposed.Then some important properties and the relationship of the models are given.

Keywords

Nanotopological Space, MGNT, MSGNT, Neighbourhood, Central set, Binary relation, Nano Type.

AMS Subject Classification

54B05, 54C05.

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Article History: Received **19** October **2019**; Accepted **23** January **2020**

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1. Introduction

Lellis Thivagar et al [6] introduced a nano topological space with respect to a subset X of an universe which is defined in terms of lower and upper approximations and boundary region of X.The elements of a nano topological space are called the nano open sets. But certain nano terms are satisfied simply to mean "very small". It originates from the Greek word "Nanos" which means "dwarf" in its modern scientific sense, an order to magnititude - one billionth of something. Nano car is an example. The topology recommended here is named so because of its size, since it has atmost five elements in it. In the granular computing point of view nano topological space is based on single granulation, its named as the indiscerniblity relation. This nano topological space model has been now extended to a multi granular nano topology and multi star granular nano topology[7,8] based on, central sets in where the set approximations are defined by using multiple binary relations on the universe. Several fundamental properties and an interesting classification of MGNT and MSGNT via central set have also been made.Further, we have studied the some examples are considered and given.

2. Preliminaries

The following definitions are necessitated in the sequel of our work.

Definition 2.1. [9]: Let $\mathscr{U}$ be a non-empty finite set of objects called the universe and R be an equivalence relation on $\mathscr{U}$ named as the indiscernibility relation. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair $(\mathscr{U}, R)$ is said to be the approximation space. Let $X \subseteq \mathscr{U}$.

(i) The lower approximation of X with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is, $L_R(X) = \bigcup_{x \in \mathscr{U}} \{R(x) : R(x) \subseteq X\}$, where R(x) denotes the equivalence class determined by x.

(ii) The upper approximation of X with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$. That is, $U_R(X) = \bigcup_{x\in\mathscr{U}} \{R(x) : R(x)\cap X \neq \phi\}$.

(iii) The boundary region of X with respect to R is the set of all objects, which can be classified neither as X nor as not-X with respect to R and it is denoted by $B_R(X)$. That is, $B_R(X) = U_R(X) - L_R(X)$.

Definition 2.2. [6]: Let $\mathscr{U}$ be an universe, R be an equivalence relation on $\mathscr{U}$ and $\tau_R(X) = \{\mathscr{U}, \phi, L_R(X), U_R(X), B_R(X)\}$ where X $\subseteq \mathscr{U}$. $\tau_R(X)$ satisfies the following axioms:

(i) $\mathscr{U}$ and $\phi \in \tau_R(X)$.

(ii) The union of the elements of any sub-collection of $\tau_R(X)$ is in $\tau_R(X)$.

(iii) The intersection of the elements of any finite sub-collection of $\tau_R(X)$ is in $\tau_R(X)$.

That is, $\tau_R(X)$ forms a topology on $\mathscr{U}$ called the nano topology on $\mathscr{U}$ with respect to X. We call $(\mathscr{U}, \tau_R(X))$ as the nano topological space. The elements of $\tau_R(X)$ are called nano-open sets.

Proposition 2.3. [7]: Let $\mathscr{U}$ be a non-empty finite universe and $X \subseteq \mathscr{U}$. Then the following statements hold:

(i) If $L_R(X) = \phi$ and $U_R(X) = \mathscr{U}$, then $\tau_R(X) = \{\mathscr{U}, \phi\}$, is the indiscrete nano topology on $\mathscr{U}$.

(ii) If $L_R(X) = U_R(X) = X$, then the nano topology, $\tau_R(X) = \{\mathscr{U}, \phi, L_R(X)\}$.

(iii) If $L_R(X) = \phi$ and $U_R(X) \neq \mathscr{U}$, then $\tau_R(X) = \{\mathscr{U}, \phi, U_R(X)\}$.

(iv) If $L_R(X) \neq \phi$ and $U_R(X) = \mathscr{U}$, then $\tau_R(X) = \{\mathscr{U}, \phi, L_R(X), B_R(X)\}$.

(v) If $L_R(X) \neq U_R(X)$ where $L_R(X) \neq \phi$ and $U_R(X) \neq \mathscr{U}$.

3. Multi Granular Nano Topological Space Based on Central sets (MGNT)

In this section, we proposes the concepts of multi granular nanotopology on the basis of central sets and investigate some of their properties of the models are disclosed.

Definition 3.1: Let $\mathscr{U}$ be a non empty finite set of objects called the universe and R be a binary relations on $\mathscr{U}$ .The pair $(\mathscr{U}, R)$ is said to be approximation space. For any $X \subseteq \mathscr{U}$ and $R_1, R_2 \in R$,the multi lower $(L'_{R_1+R_2}(X).)$and multi upper approximations and multi boundary regions of X based on central sets with respect to R_1, R_2 are defined as follows:

(i) $L'_{R_1+R_2}(X) = \bigcup_{x\in\mathscr{U}} \{C_{R_1}(x)\cap C_{R_2}(x) : x \in \mathscr{U}, ((N_{R_1}(x) \neq \emptyset, N_{R_1}(x) \subseteq X)\ or\ N_{R_2}(x) \neq \emptyset, N_{R_2}(x) \subseteq X))\}$.

(ii) U'$_{R_1+R_2}(X) = \bigcup_{x\in\mathscr{U}} \{C_{R_1}(x)\cap C_{R_2}(x) : x \in \mathscr{U}, (N_{R_1}(x)\cap X \neq \emptyset\ and\ N_{R_2}(x)\cap X \neq \emptyset)\}$.

(iii) $B'_{R_1+R_2}(X)$=U'$_{R_1+R_2}(X) - L'_{R_1+R_2}(X)$.

Definition 3.2: Let $\mathscr{U}$ be the universe and R be binary relations on $\mathscr{U}$ and $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset, L'_{R_1+R_2}(X), U'_{R_1+R_2}(X), B'_{R_1+R_2}(X)\}$ where $X \subseteq \mathscr{U}$. Then $\tau'_{R_1+R_2}(X)$ satisfies the following axioms:

(1) $\mathscr{U}$ and $\emptyset \in \tau'_{R_1+R_2}(X)$.

(2) The union of elements of any sub collection of $\tau'_{R_1+R_2}(X)$ is in $\tau'_{R_1+R_2}(X)$.

(3) The intersection of the elements of any finite sub collection of $\tau'_{R_1+R_2}(X)$ is in $\tau'_{R_1+R_2}(X)$.

That is, $\tau'_{R_1+R_2}(X)$ forms a topology on $\mathscr{U}$ called as the multi granular nano topology on $\mathscr{U}$ with respect to X. We call $(\mathscr{U}, \tau'_{R_1+R_2}(X))$ as the multi granular nano topological space induced by Center set.

Example 3.3:Let $\mathscr{U} = \{a,b,c,d,e\}$ and $R_1 = \{(a,c),(a,e),(b,c),(b,e),(c,a),(c,b),(d,a),(d,b),(e,c),(e,e)\}$ and $R_2 = \{(a,a),(a,b),(a,c),(b,a),(b,b),(b,c),(c,c),(c,d),(c,e),(d,c),(d,d),(d,e),(e,c),(e,d),(d,d)\}$. Let $X = \{b,c\} \subseteq \mathscr{U}$.

Neighbourhoods

$x \in \mathscr{U}$	a	b	c	d	e
$N_{R_1}(x)$	$\{c,e\}$	$\{c,e\}$	$\{a,b\}$	$\{a,b\}$	$\{c,e\}$
$N_{R_2}(x)$	$\{a,b,c\}$	$\{a,b,c\}$	$\{c,d,e\}$	$\{c,d,e\}$	$\{c,d,e\}$

Then $L'_{R_1+R_2}(X) = \emptyset, U'_{R_1+R_2}(X) = \{a,b,c,d,e\}, B_R(X^c) = \{a,b,c,d,e\}$.Hence $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset\}$.

Definition 3.4 : Let $\mathscr{U}$ be a non empty finite universe and let $X \subseteq \mathscr{U}$, R_1, R_2 be two defined on $\mathscr{U}$.

Multi Nano Type-1 ($\mathscr{MN}T_1$):

If $L'_{R_1+R_2}(X) \neq$ U'$_{R_1+R_2}(X)$ or $L'_{R_1+R_2}(X)$= U'$_{R_1+R_2}(X)$, where $L'_{R_1+R_2}(X) \neq \emptyset$ and U'$_{R_1+R_2}(X) \neq \mathscr{U}$, then either $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset, L'_{R_1+R_2}(X),$ U'$_{R_1+R_2}(X), B'_{R_1+R_2}(X)\}$ or $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset, L'_{R_1+R_2}(X)\}$.

Multi Nano Type-2 ($\mathscr{MN}T_2$):

If $L'_{R_1+R_2}(X) = \emptyset$ and U'$_{R_1+R_2}(X) \neq \mathscr{U}$, then $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset,$ U'$_{R_1+R_2}(X)\}$.

Multi Nano Type-3 ($\mathscr{MN}T_3$):

If $L'_{R_1+R_2}(X) \neq \emptyset$ and U'$_{R_1+R_2}(X) = \mathscr{U}$, then $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset, L'_{R_1+R_2}(X), B'_{R_1+R_2}(X)\}$.

Multi Nano Type-4 ($\mathscr{MN}T_4$):

If $L'_{R_1+R_2}(X) = \emptyset$ and U'$_{R_1+R_2}(X) = \mathscr{U}$, then $\tau'_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset\}$.

Proposition 3.5: Let $(\mathscr{U}, R)$ be a approximation space, $R_1, R_2 \in R$. For any $X \subseteq \mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1, R_2 satisfy the following properties:

(i) $L'_{R_1+R_2}(\phi) = U'_{R_1+R_2}(\phi) = \phi$

(ii) $L'_{R_1+R_2}(\mathscr{U}) = U'_{R_1+R_2}(\mathscr{U}) = \mathscr{U}$.

Proposition 3.6: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2 \in R$. For any $X \subseteq \mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 may not satisfy the following properties:

(i) $L'_{R_1+R_2}(X) \subseteq X$.

(ii) $U'_{R_1+R_2}(X) \supseteq X$.

Remark 3.7: We can clear that $L'_{R_1+R_2}(X) \subseteq U'_{R_1+R_2}(X)$.

Example 3.8: Verifies the results in the Proposition 3.6 Continued from Example 3.3,We can calculate $X = \{c,e\}$ then $L'_{R_1+R_2}(X) = \{a,b,e\} = U'_{R_1+R_2}(X)$.Therefore we have $L'_{R_1+R_2}(X) = \{a,b,e\} \nsubseteq X = \{c,e\} \nsubseteq U'_{R_1+R_2}(X) = \{a,b,e\}$. But we have that,$L'_{R_1+R_2}(X) = \{a,b,e\} \subseteq U'_{R_1+R_2}(X) = \{a,b,e\}$.

Proposition 3.9: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2 \in R$. For any $X \subseteq \mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 may not satisfy the following properties:

(i) $L'_{R_1+R_2}(L'_{R_1+R_2}(X)) = L'_{R_1+R_2}(X)$

(ii) $\mathrm{U}'_{R_1+R_2}(U'_{R_1+R_2}(X)) = U'_{R_1+R_2}(X)$

Example 3.10: Continued from Example 3.3,We can calculate $X = \{c,e\}$ then $L'_{R_1+R_2}(X) = \{a,b,e\} = U'_{R_1+R_2}(X)$. Therefore we have $L'_{R_1+R_2}(L'_{R_1+R_2}(X)) = \emptyset, U'_{R_1+R_2}(U'_{R_1+R_2}(X))$ $= \{a,b,c,d,e\}$.Also,$L'_{R_1+R_2}(L'_{R_1+R_2}(X)) = \emptyset \neq L'_{R_1+R_2}(X)$ $= \{a,b,e\}$ and $U'_{R_1+R_2}(U'_{R_1+R_2}(X)) = \{a,b,c,d,e\} \neq U'_{R_1+R_2}(X)$ $= \{a,b,e\}$.

Proposition 3.11:: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2 \in R$. For any $X \subseteq \mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 may not satisfy the following properties:

(i) $L'_{R_1+R_2}(X^c) = [U'_{R_1+R_2}(X)]^C$

(ii) $\mathrm{U}'_{R_1+R_2}(X^C) = [L'_{R_1+R_2}(X)]^C$

Example 3.12: Continued from Example 3.3,We can calculate $X^c = \{a,b,d\}$ then $L'_{R_1+R_2}(X^c) = \emptyset, U'_{R_1+R_2}(X^c) = \{c,d\}$. Therefore $L'_{R_1+R_2}(X^c) = \emptyset \neq \{c,d\} = [U'_{R_1+R_2}(X)]^c$. $[L'_{R_1+R_2}(X)]^c = U'_{R_1+R_2}(X^c) = \{c,d\}$.

Theorem 3.13: If $(\mathscr{U}, \tau'_{R_1+R_2})$ is a multi granular nano topological space induced by central set. Then,for arbitrary $X,Y \subseteq \mathscr{U}$, the following properties are hold:

(i) $X \subseteq Y \Longrightarrow L'_{R+S}(X) \subseteq L'_{R+S}(Y)$.

(ii) $X \subseteq Y \Longrightarrow \mathrm{U'}_{R+S}(X) \subseteq \mathrm{U'}_{R+S}(Y)$.

(iii) $L'_{R_1+R_2}(X \cap Y) \subseteq L'_{R+S}(X) \cap L'_{R+S}(Y)$.

(iv) $\mathrm{U'}_{R_1+R_2}(X \cup Y) \supseteq \mathrm{U'}_{R+S}(X) \cup \mathrm{U'}_{R+S}(Y)$.

(v) $L'_{R_1+R_2}(X \cup Y) \supseteq L'_{R+S}(X) \cup L'_{R+S}(Y)$.

(vi) $\mathrm{U'}_{R_1+R_2}(X \cap Y) \supseteq \mathrm{U'}_{R+S}(X) \cap \mathrm{U'}_{R+S}(Y)$.

Proof:

(i) First,we give the proof of (i),By using the definition 3.1,if $X \subseteq Y$,then $L'_{R_1+R_2}(X) = \bigcup_{x \in \mathscr{U}} \{C_{R_1}(x) \cap C_{R_2}(x) : x \in \mathscr{U}, ((N_{R_1}(x) \neq \emptyset, N_{R_1}(x) \subseteq X) \text{ or } N_{R_2}(x) \neq \emptyset, N_{R_2}(x) \subseteq X))\} \subseteq \bigcup\{C_{R_1}(x) \cap C_{R_2}(x) : x \in \mathscr{U}, ((N_{R_1}(x) \neq \emptyset, N_{R_1}(x) \subseteq Y) \text{ or } N_{R_2}(x) \neq \emptyset, N_{R_2}(x) \subseteq Y)\} = L'_{R_1+R_2}(Y)$

(ii) $\mathrm{U'}_{R_1+R_2}(X) = \bigcup_{x \in \mathscr{U}} \{C_{R_1}(x) \cap C_{R_2}(x) : x \in \mathscr{U}, (N_{R_1}(x) \cap X \neq \emptyset \text{ and } N_{R_2}(x) \cap X \neq \emptyset)\} \subseteq \bigcup\{C_{R_1}(x) \cap C_{R_2}(x) : x \in \mathscr{U}, (N_{R_1}(x) \cap Y \neq \emptyset \text{ and } N_{R_2}(x) \cap Y \neq \emptyset)\} = \mathrm{U'}_{R_1+R_2}(Y)$.

(iii) Since $X \subseteq Y$, One can have $X \cap Y \subseteq X$ and $X \cap Y \subseteq Y$.Then,by proof (i),we have $L'_{R_1+R_2}(X \cap Y) \subseteq L'_{R_1+R_2}(X)$ and $L'_{R_1+R_2}(X \cap Y) \subseteq L'_{R_1+R_2}(Y)$. Therefore, $L'_{R_1+R_2}(X \cap Y) \cap L'_{R_1+R_2}(X \cap Y) \subseteq L'_{R_1+R_2}(X) \cap L'_{R_1+R_2}(Y)$. That is, $L_{R_1+R_2}(X \cap Y) \subseteq L'_{R_1+R_2}(X) \cap L'_{R_1+R_2}(Y)$.

(iv) Since $X \subseteq Y$, as we know, $X \subseteq X \cup Y$ and $Y \subseteq X \cup Y$. Then,according to the proof(ii),we have $\mathrm{U'}_{R_1+R_2}(X \cup Y) \supseteq \mathrm{U}_{R_1+R_2}(X)$ and $\mathrm{U'}_{R_1+R_2}(X \cup Y) \supseteq \mathrm{U'}_{R_1+R_2}(Y)$. In addition, it can be found that $\mathrm{U'}_{R_1+R_2}(X \cup Y) \cup \mathrm{U'}_{R_1+R_2}(X \cup Y) \supseteq \mathrm{U'}_{R_1+R_2}(X) \cup \mathrm{U'}_{R_1+R_2}(Y)$. Hence $\mathrm{U'}_{R_1+R_2}(X \cup Y) \supseteq \mathrm{U'}_{R+S}(X) \cup \mathrm{U'}_{R+S}(Y)$.

(v) Obviously,we have $X \subseteq X \cup Y$ and $Y \subseteq X \cup Y$. Then, according to(1), the following are satisfied. We have $L'_{R_1+R_2}(X \cup Y) \supseteq L'_{R+S}(X)$ and $L'_{R_1+R_2}(X \cup Y) \supseteq L'_{R+S}(Y)$. Therefore, $L'_{R_1+R_2}(X \cup Y) \cup L'_{R_1+R_2}(X \cup Y) \supseteq L'_{R+S}(X) \cup L'_{R+S}(Y)$.

(vi) Since $X \supseteq X \cap Y$ and $Y \supseteq X \cap Y$, it can be obtain that $\mathrm{U'}_{R_1+R_2}(X) \supseteq \mathrm{U'}_{R_1+R_2}(X \cap Y)$ and $\mathrm{U'}_{R_1+R_2}(Y) \supseteq \mathrm{U'}_{R_1+R_2}(X \cap Y)$. So we have $\mathrm{U'}_{R_1+R_2}(X) \cap \mathrm{U'}_{R_1+R_2}(Y) \subseteq \mathrm{U'}_{R_1+R_2}(X \cap Y)$.

4. Multi Star Granular Nano Topological Space Based on Central sets (MSGNT)

In this section, we proposes the concepts of multi granular nanotopology on the basis of central sets and investigate some of their properties of the models are disclosed.

Definition 4.1: Let $\mathscr{U}$ be a non empty finite set of objects called the universe and R be a binary relations on $\mathscr{U}$ .The pair $(\mathscr{U},R)$ is said to be approximation space. For any $X \subseteq \mathscr{U}$ and $R_1,R_2 \in R$,the multi star lower ($L^*_{R_1+R_2}(X)$) and multi star upper ($\mathrm{U}^*_{R_1+R_2}(X)$) approximations and multi star boundary regions ($B^*_{R_1+R_2}(X)$) of X based on central sets with respect to R_1,R_2 are defined as follows:

(i) $L^*_{R_1+R_2}(X) = \bigcup_{x\in\mathscr{U}} \{C_{R_1}(x)\cap C_{R_2}(x) : x\in\mathscr{U}, ((N_{R_1}(x)\neq\emptyset, N_{R_1}(x)\subseteq X)$ and $(N_{R_2}(x)\neq\emptyset, N_{R_2}(x)\subseteq X))\}$.

(ii) $U^*_{R_1+R_2}(X) = \bigcup_{x\in\mathscr{U}} \{C_{R_1}(x)\cap C_{R_2}(x) : x\in\mathscr{U}, (N_{R_1}(x)\cap X\neq\emptyset$ or $N_{R_2}(x)\cap X\neq\emptyset)\}$.

(iii) $B^*_{R_1+R_2}(X)$=$U^*_{R_1+R_2}(X) - L^*_{R_1+R_2}(X)$.

Definition 4.2: Let $\mathscr{U}$ be the universe and R be binary relations on $\mathscr{U}$ and $\tau^*_{R_1+R_2}(X) = \{\mathscr{U}, \emptyset, L^*_{R_1+R_2}(X), U^*_{R_1+R_2}(X), B^*_{R_1+R_2}(X)\}$ where $X\subseteq\mathscr{U}$. Then $\tau^*_{R_1+R_2}(X)$ satisfies the following axioms:

(1) $\mathscr{U}$ and $\emptyset\in\tau^*_{R_1+R_2}(X)$.

(2) The union of elements of any sub collection of $\tau^*_{R_1+R_2}(X)$ is in $\tau^*_{R_1+R_2}(X)$.

(3) The intersection of the elements of any finite sub collection of $\tau^*_{R_1+R_2}(X)$ is in $\tau^*_{R_1+R_2}(X)$.

That is, $\tau^*_{R_1+R_2}(X)$ forms a topology on $\mathscr{U}$ called as the multi star granular nano topology on $\mathscr{U}$ with respect to X. We call $(\mathscr{U}, \tau^*_{R_1+R_2}(X))$ as the multi star granular nano topological space induced by Center set.

Example 4.3: Continued from example 3.3 Let $X = \{b,c\}\subseteq\mathscr{U}$. Then $L^*_{R_1+R_2}(X) = \emptyset, U^*_{R_1+R_2}(X) = \{a,b,c,d,e\}$, $B^*_{R_1+R_2}(X) = \{a,b,c,d,e\}$.Hence $\tau^*_{R_1+R_2}(X) = \{\mathscr{U},\emptyset\}$.

Proposition 4.4: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2\in R$. For any $X\subseteq\mathscr{U}$,and its multi star lower,upper approximations based on central sets with respect to R_1,R_2 satisfy the following properties:

(i) $L^*_{R_1+R_2}(\mathscr{U}) = \mathscr{U}$ and $U^*_{R_1+R_2}(\mathscr{U}) = \mathscr{U}$.

(ii) $L^*_{R_1+R_2}(\emptyset) = \emptyset$ and $U^*_{R_1+R_2}(\emptyset) = \emptyset$.

(ii) $L^*_{R_1+R_2}(L^*_{R_1+R_2}(X)) = L^*_{R_1+R_2}(X)$

(iii) $U^*_{R_1+R_2}(U^*_{R_1+R_2}(X)) = U^*_{R_1+R_2}(X)$

Theorem 4.5: If $(\mathscr{U}, \tau'_{R_1+R_2})$ is a multi granular nano topological space induced by central set. Then,for arbitrary $X,Y\subseteq\mathscr{U}$, the following properties are hold:

(i) $X\subseteq Y \Longrightarrow L^*_{R+S}(X)\subseteq L^*_{R+S}(Y)$ and $X\subseteq Y \Longrightarrow U^*_{R+S}(X) \subseteq U^*_{R+S}(Y)$.

(ii) $L^*_{R_1+R_2}(X\cap Y)\subseteq L^*_{R+S}(X)\cap L^*_{R+S}(Y)$ and $U^*_{R_1+R_2}(X\cup Y)\supseteq U^*_{R+S}(X)\cup U^*_{R+S}(Y)$

(iii) $L^*_{R_1+R_2}(X\cup Y)\supseteq L^*_{R+S}(X)\cup L^*_{R+S}(Y)$ and $U^*_{R_1+R_2}(X\cap Y)\supseteq U^*_{R+S}(X)\cap U^*_{R+S}(Y)$.

Proposition 4.6: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2\in R$. For any $X\subseteq\mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 satisfy the following properties:

(i) $L^*_{R_1+R_2}(X)\subseteq X$ and $U^*_{R_1+R_2}(X)\supseteq X$.

Proposition 4.7: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2\in R$. For any $X\subseteq\mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 satisfy the following properties:

(i) $L^*_{R_1+R_2}(L^*_{R_1+R_2}(X)) = L^*_{R_1+R_2}(X)$

(ii) $U^*_{R_1+R_2}(U^*_{R_1+R_2}(X)) = U^*_{R_1+R_2}(X)$

Proposition 4.8: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2\in R$. For any $X\subseteq\mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 satisfy the following properties:

(i) $L^*_{R_1+R_2}(X^c) = [U^*_{R_1+R_2}(X)]^C$

(ii) $U^*_{R_1+R_2}(X^C) = [L^*_{R_1+R_2}(X)]^C$

Proposition 4.9: Let $(\mathscr{U},R)$ be a approximation space, $R_1,R_2\in R$. For any $X\subseteq\mathscr{U}$,and its multi lower,upper approximations based on central sets with respect to R_1,R_2 satisfy the following properties:

$$L^*_{R_1+R_2}(X)\subseteq L'_{R_1+R_2}(X)\subseteq U'_{R_1+R_2}(Y)\subseteq U^*_{R_1+R_2}(Y).$$

Conclusion

In this paper we have studied the properties of multi granular and multi star granular nano topology with respect to central set.In future, I will discuss more applications of MGNT and MSGNT concepts are applied in data mininig.

Acknowledgment

The work of the first author is supported by the "Ministry of Human Resource and Development, India under grant number:MHR-02-23-200-44".

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ISSN(O):2321 − 5666
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