FROM THEORY TO IMPACT: NEW VISIONS ACROSS DISCIPLINES

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Daniel James

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MIC-Wgrα-I-Closed Sets in Micro Ideal Topological Space

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Abstract:

In this article, The main concept of this paper is to discuss the micro topology as an unadorned extension of nano topology. Nano topology offers a wide variety of interesting results and applications. But for some time we have been looking for extended sets in micro topological space. A.Jayalakshmi and C.Janaki have discussed the properties of MIC-Wgrα-Closed and MIC-Wgrα-Open Maps in topological spaces. Also have discussed Wgrα-closures and obtain a characterization of Wgrα-Continuous functions in topological spaces. we present and study the properties of MIC-Wgrα-I-Closed Sets in Micro ideal topological spaces. Their relationships with other existing Micro generalized closed sets in micro Topological and Micro ideal topological spaces are established.

Keywords:

MIC-Wgrα-I-Closed Sets, MIC-Wgrα-I-Open Sets, MIC- ω-closed set, MIC- α-I-closed set, MIC- α-I-closed set, MIC-*closed set, MIC- α-closed set.

Introduction:

Taha.H.Jasim, Saja S.Mohan, Kanajo S.Eke [3] initiated On Micro generalized closed sets and Micro generalized continuity in Micro Topological Spaces in 2021.R.Bhavani [4] proposed On Strong Forms of Generalized Closed Sets in Micro Topological Spaces in 2021.S.Ganesan [1] has proposed a new concept of Micro topological space through small systems, M.Josephine Rani and R.Bhavani [2] introduced MIC-αIg and MIC-Igα Closed Sets in Micro Ideal Topological Spaces in 2022. In 2014 C.Janaki, A.Jayalakshmi [5] proposed Wgrα-I-Closed Sets in ideal topological spaces. The methodology proposed in this paper MIC-Wgrα-I-Closed Sets, MIC-Wgrα-I-Open Sets in Micro ideal topological spaces and Some of their features will also be investigated.

Preliminaries:

Definition 2.1[2,3]

Start U as a set of horizontal instruments called the Universe and R as the equivalent relationship with U, which is called the relation of ignorance.

This couple (U,R) is said to be the space of enterprise. Enable X⊆U.

i) The minimum X relative to R is the set of all the details, which is set for the object divided by X relative to R and denoted by L_R(X).That is,

$L_R(X) = {}_{x\in U}^{U}\{R(x): R(x) \subseteq X\}$ where R(x) represents the equivalent class determined by X.

ii) The maximum X value relative to R is U_R(X) = ${}_{x\in U}^{U}\{R(x): R(x) \cap X \neq \phi\}$.

iii) The boundary area of X with respect to R is a set of all objects which is intermediate or non-X with respect to R and is defined as B_R(X).That is, B_R(X) = U_R(X)- L_R(X) and their complement is called micro closed sets.

Definition 2.2[2,3]

(U, τ_R(X)) is a Nano topological space then μ_R(X) = $\{N \cup (N' \cap \mu) : N, N' \in \tau_R(X)\}$ and called it Micro topology of τ_R(X) by μ where $\mu \notin \tau_R$(X).

Definition 2.3[2,3]

Micro topology μ_R (X) satisfies the following theories

(i)U, ϕ ∈ μ_R(X)

(ii) A combination of any of the elements the group is μ_R(X) in μ_R(X)

(iii) The intersection of parcels of any finite subdivision of μ_R(X) in μ_R(X). Also μ_R(X) is called the micro topology in relation to X in U. Triplets (U, τ_R(X), μ_R(X)) are called micro topological spaces and the bases of μ_R(X) are called micro open sets and their complements are called micro closed sets.

Definition 2.4

A subset S of a space (X,τ) is called

1. regular open if S=int(cl(S))
2. regular α-open if there is a regular open set U⊂S⊂ αcl(U).
3. α-open if S⊆int(cl(int(S)))

4.Semi-open if S⊆cl(int(S))

Definition 2.5

A subset S of a space (X,τ) is said to be

1.g-closed, if cl(S) ⊆ U,whenever S⊆ U and S is open in(X,τ).

2.wgrα-closed,if cl(int(S)) ⊆ U, whenever S⊆ U and U is regular α-open in (X,τ).

3.ω-cosed,if cl(S) ⊆ U, U,whenever S⊆ U and U is regular semi-open in (X,τ).

4.rg α-closed, if αcl(S) ⊆ U,whenever S⊆ U and U is regular α-open in (X,τ).

5.swg-closed,if cl(int(S)) ⊆U, whenever S⊆ U and U is regular semi-open in (X,τ).

Definition 2.5

A subset S of a space (X,τ, I) is said to be

1. α-I-closed,if cl(int*(cl(S))) ⊆S
2. $*$-closed,if S* ⊆S
3. I-open,if S ⊆int(S*)
4. I-R closed,if S=cl*(int(S))
5. rps-I-closed,if splcl(S) ⊆U, whenever S⊆ U and U is regular rg-I-open in (X,τ).

3. MIC-wgrα-I-closed sets

Definition 3.1

A subset S of a Micro ideal space (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) is said to be MIC-wgrα-I-closed if MIC-cl*(MIC-int(S)) ⊆ U whenever S⊆ U and U is MIC-regular α-open.

Definition 3.2

A subset S of a Micro ideal space (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) is said to be MIC-wgrα-I-open if Ω-S is MIC-wgrα-I-closed.

Theorem 3.3

1.Every MIC-closed set is MIC-wgrα-I-closed.

2.Every MIC- α-closed set is MIC-wgrα-I-closed.

3. Every MIC-*closed set is MIC-wgrα-I-closed.

4.Every MIC- ω-closed set is MIC-wgrα-I-closed.

5. Every MIC- α-I-closed set is MIC-wgrα-I-closed.

6. Every MIC-swg-closed set is MIC-wgrα-I-closed.

Remark 3.4

Converse of the above theorem need not be true as shown in the following examples 3.5 and 3.6.

Example 3.5

Let Ω={1,2,3,4} with $\frac{\Omega}{R}$(X)={{1},{2},{3,4}, X={1,3}⊂ Ω, $\widetilde{\tau_R(X)}$ ={ φ, Ω ,{1},{1,3,4},{3,4}} and μ={2} and ideal I={∅,{3}}, Micro topology $\widetilde{\mu_R(X)}$ ={φ, Ω ,{1},{2},{1,2},{1,3,4},{3,4}, {2,3,4}}, $\widetilde{\mu_R{}'(X)}$ ={φ, Ω ,{2,3,4},{1,3,4},{3,4},{2},{1,2},{1}} MIC-wgrα-I-closed={{φ, Ω , {1},{2},{3},{4},{1,2},{1,3},{1,4},{2,3},{2,4},{3,4},{1,2,3},{1,3,4}{1,2,4}{2,3,4}}

i){3} is MIC-wgrα-I-closed,but not MIC-closed

ii){2,4} is MIC-wgrα-I-closed but not MIC- α-closed set

iii){1,3} is MIC-wgrα-I-closed but not MIC-*closed set

Example 3.6

Let Ω={n,o,p,q} with $\frac{\Omega}{R}$(X)={{n,q},{o},{p}, X={o,p}⊂ Ω, $\widetilde{\tau_R(X)}$ ={ φ, Ω ,{o,p}} and μ={q} and ideal I={∅,{o},{p,q}},Micro topology $\widetilde{\mu_R(X)}$ ={φ, Ω ,{q},{o,p},{o,p,q}}, $\widetilde{\mu_R{}'(X)}$ ={φ, Ω , {n,o,p},{n,q},{n}} MIC-wgrα-I-closed={power set}

iv){o} is MIC-wgrα-I-closed but not MIC- ω-closed

v){o,p}is MIC-wgrα-I-closed but not MIC- α-I-closed

vi){q} is MIC-wgrα-I-closed but not MIC-swg-closed set

Remark 3.7

Every MIC-semi-closed is MIC-wgrα-I-closed

Example 3.8

Let Ω ={p,q,r,s} with $\frac{\Omega}{R}$(X)={{p,s},{q},{r}, X={q,r}⊂ Ω, $\widetilde{\tau_R(X)}$ ={ φ, Ω ,{q,r}} and μ={s} and ideal I={∅,{q},{r,s}},Micro topology $\widetilde{\mu_R(X)}$ ={φ, Ω ,{o},{q,r},{q,r,s}}, $\widetilde{\mu_R{}'(X)}$ ={φ, Ω , {p,q,r},{p,s},{p}},MIC-wgrα-I-closed={power set}.Let S={p,q} is MIC-wgrα-I-closed but not MIC-semi-closed.

Remark 3.9

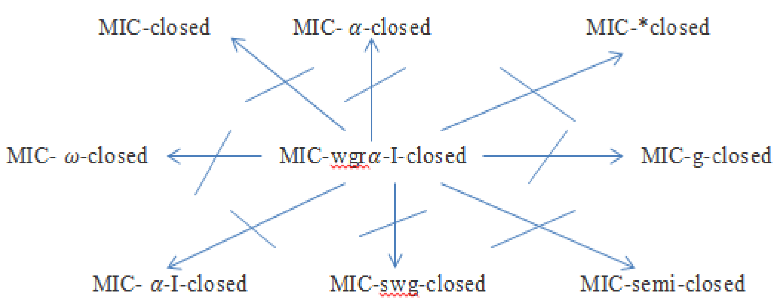
Every MIC-g-closed set is MIC-wgrα-I-closed

Example 3.10

Let Ω={n,o,p,q} with $\frac{\Omega}{R}$(X)={{n,q},{o},{p}, X={o,p}⊂ Ω, $\widetilde{\tau_R(X)}$ ={ φ, Ω ,{o,p}} and μ={q} and ideal I={∅,{o},{p,q}},Micro topology $\widetilde{\mu_R(X)}$ ={φ, Ω ,{q},{o,p},{o,p,q}}, $\widetilde{\mu_R{}'(X)}$ ={ φ, Ω , {n,o,p},{n,q},{n}},MIC-wgrα-I-closed={power set}.Let S={p} is MIC-wgrα-I-closed but not MIC-g-closed.

Remark 3.11

In the theorems above, we find the ensuing diagram. A → B (resp. A ↮ B) A implies B but not conversely (resp A and B are independent of each other).



Theorem 3.12

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space S⊆ Ω.If S is MIC-wgrα-I-closed, then MIC-cl*(MIC-int(S))-S contains no non-empty MIC-regularα-open set.

Proof

Let S be a MIC-wgrα-I-closed set in Ω and U be a MIC-regular-α-open subset of MIC-cl*(MIC-int(S))-S.Then S ⊆ Ω-U and Ω-U is MIC-regular-α-open. Since S is MIC-wgrα-I-closed MIC-cl*(MIC-int(S)) ⊆ Ω-U. Which implies that U ⊆ Ω- MIC-cl*(MIC-int(S)).Thus U ⊆(MIC-cl*(MIC-int(S))∩ (Ω-MIC-cl*(MIC-int(S)))=∅.Hence MIC-cl*(MIC-int(S))-S contains no non-empty MIC-regular-α-open set.

Theorem 3.13

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space S⊆ Ω.If S is MIC-wgrα-I-closed, then MIC-cl*(MIC-int(S))-S contains no non-empty MIC-regularα-closed set.

Proof

Let S be a MIC-wgrα-I-closed set in Ω and U be a MIC-regular-α-closed subset of MIC-cl*(MIC-int(S))-S.Then Ω-U ⊆ S and Ω-U is MIC-regular-α-closed. Since S is MIC-wgrα-I-closed Ω-U ⊆ MIC-cl*(MIC-int(S)). Which implies that Ω- MIC-cl*(MIC-int(S)) ⊆ U.Thus (MIC-cl*(MIC-int(S))∩ (Ω-MIC-cl*(MIC-int(S))) ⊆ U =∅.Hence MIC-cl*(MIC-int(S))-S contains no non-empty MIC-regular-α-closed set.

Theorem 3.14

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space S⊆ Ω.If S is MIC-wgrα-I-closed, then MIC-cl*(MIC-int(S))-S contains no non-empty MIC-regular-open set.

Proof

Let S be a MIC-wgrα-I-closed set in Ω and U be a MIC-regular-open subset of MIC-cl*(MIC-int(S))-S.Then S ⊆ Ω-U and Ω-U is MIC-regular-open. Since S is MIC-wgrα-I-closed MIC-cl*(MIC-int(S)) ⊆ Ω-U. Which implies that U ⊆ Ω- MIC-cl*(MIC-int(S)).Thus U ⊆(MIC-cl*(MIC-int(S))∩ (Ω-MIC-cl*(MIC-int(S)))=∅.Hence MIC-cl*(MIC-int(S))-S Contains no non-empty MIC-regular-open set.

Theorem 3.15

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space S⊆ Ω.If S is MIC-wgrα-I-closed, then MIC-(int(S))*-S contains no non-empty MIC-regularα-open set.

Proof

Let S be a MIC-wgrα-I-closed set in Ω.Suppose that U is a MIC-regular-α-open set Such that MIC-cl*(MIC-int(S)) ⊆ Ω-U. Which implies that MIC-(int(S))* ⊆ Ω-U,thus, MIC-(int(S))*-S contains no non-empty MIC-regular- α -open set.

Theorem 3.16

Let S be a MIC-wgrα-I-closed set of a Micro ideal topological space Ω.Then the following are equivalent.

i)S is MIC-I-R-closed

ii)MIC-cl*(MIC-int(S))-S is a MIC-regular-α-closed set

iii)MIC-(int(S))*-S is a MIC-regular-α-closed set

Proof

(i)⇒(ii)Let S be MIC-I-R-closed.We have MIC-cl*(MIC-int(S))=S, then MIC-cl*(MIC-int(S))-S=∅ .Thus, MIC-cl*(MIC-int(S))-S is a MIC-regular-α-closed set.
(ii) ⇒(iii) Let MIC-cl*(MIC-int(S))-S be MIC-regular-α-closed. MIC-cl*(MIC-int(S))-S= MIC-(int(S))*-S. Therefore MIC-(int(S))*-S is a MIC-regular-α-closed set.
(iii) ⇒(i) Let MIC-(int(S))*-S be a MIC-regular-α-closed set, MIC-cl*(MIC-int(S))-S = MIC-(int(S))*-S =∅ .Thus MIC-cl*(MIC-int(S))=S. Hence S is MIC-I-R-closed.

Theorem 3.17

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space S⊆ Ω.If S is MIC-regular-open and MIC-wgrα-I-closed, then S is MIC-*closed set.

Proof

Let S⊆ S and S be MIC-regular-open. Since S is MIC-wgrα-I-closed in Ω, MIC-cl*(MIC-int(S))⊆ S,which implies that,MIC-cl*(S)= MIC-cl*(MIC-int(S)) ⊆ S. Therefore S is MIC-*closed in Ω.

Theorem 3.18

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space. Then either{ Ω} is MIC-regular-closed (or) Ω-{ Ω}is MIC-wgrα-I-closed for every Ω ∈ Ω.

Proof

Suppose { Ω} is not MIC-regular-open and the only MIC-regular-open set containing Ω-{ Ω} is Ω and MIC-cl*(MIC-int(Ω-{ Ω}))⊆ Ω.Hence Ω-{ Ω} is MIC-wgrα-I-closed set in Ω.

Theorem 3.19

Let (Ω, NA($\widetilde{\tau_R(X)}$), MICR($\widetilde{\mu_R(X)}$), ID) a Micro ideal space, S is MIC-regular-open and S⊆ Ω.

Then the following properties are equivalent.

(i)S is MIC-*closed
(ii)S is MIC-I-R-closed
(iii)S is MIC-wgrα-I-closed

Proof

(i)⇒(ii)Let S be MIC-*closed and MIC-regular-open, MIC-cl*(MIC-int(S))=MIC- cl*(S)=S. Thus,S is MIC-I-R-closed.

(ii)⇒(iii)Let S ⊆ S and S be MIC-regular-open. Since S is MIC-I-R-closed and every MIC-regular-open set is MIC-regular-α-open, MIC-cl*(MIC-int(S))⊆ S.Thus S is MIC-wgrα-I-closed.

(iii)⇒(i) Let S⊆ S and S be MIC-regular-open. Since S is MIC-wgrα-I-closed in Ω, MIC-cl*(MIC-int(S))⊆ S,which implies that,MIC-cl*(S)= MIC-cl*(MIC-int(S)) ⊆ S. Therefore S is MIC-*closed in Ω.

Theorem 3.20

Let S_1 be a MIC-wgrα-I-closed set in a Micro ideal space Ω such that $S_1 \subseteq S_2 \subseteq$ MIC-cl*(MIC-int(S_1)),then S_2 is also a MIC-wgrα-I-closed set.

Proof

Let U be a MIC-regular α-open set of Ω , such that S_2⊆ U. Then S_1⊆ S_2 ⊆ U. Since S_1 is MIC-wgrα-I-closed,cl*(int(S_1)) ⊆ U.Now cl*(int(S_2))⊆cl*(int(cl*(int(S_1))))=cl*(int(S_1))⊆U.Therefore S_2 is MIC-wgrα-I-closed.

Theorem 3.21

Let S be a MIC-wgrα-I-closed set in an ideal space X. Then S ∪(Ω–cl*(int(S))) is MIC-wgrα-I-closed if and only if (MIC-int(S))* –S is MIC-wgrα-I-open.

Proof

Let (MIC-int(S))*−S be MIC-wgrα-I-open in Ω ⇔ Ω–((MIC-int(S))*–S) is MIC-wgrα-I-closed. Ω–((MIC-int(S))*–S) ⇔ Ω ∩ $(MIC - int\ (S^* \cap S^C)^C$ ⇔ S∪(Ω–MIC-cl*(MIC-int(S))).

Hence the proof.

Conclusion

This paper was presented with MIC-Wgrα-I-Closed Sets, MIC-Wgrα-I-Open Sets, MIC-I-R-closed and MIC-swg-closed set in Micro ideal topological spaces and investigated some of the key frameworks in the Micro ideal topological spaces. A variety of interesting problems identified in the analysis.

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