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Research paper

On W-R_0 Spaces in Supra Topological Ordered Spaces

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Abstract

In this chapter we define some new separation axioms of type W^{μ}-R_0 We also discuss the inter-relationships among these separation properties along with several counter the manuscript should contain an abstract.

***Keywords**: weakly-i^{μ}-α-R_0, weakly-i^{μ}-β-R_0, weakly b^{μ}-semi-R_0, weakly d^{μ}-β-R_0*

1. Introduction

Definition1.1 [1, 2] A sub family μ of Ý is called a Supra topology on Y if

(i) Ý,Φ∈μ

(ii) If $B_ï$∈μ for all ï∈j, then ∪$B_ï$∈μ. (Ý,μ) is call a STS. Supra open sets in (Ý,μ) are the elements of μ and their complements call supra closed sets and it is denote by μ^c.

Definition 1.2[1,3]

(a). For any set P, cl^{μ}(P) denotes the supra closure and defined as cl^{μ}(P) = ∩{Q:Q is supra closed and P⊆Q}

(b). For any set P, int^{μ}(P) denotes the supra interior and defined as int^{μ}(P) = ∪{Q:Q is supra open and P ⊇ Q}

Definition 1.3

A STOS [**6**] is (Ý,μ, ≤), where μ is a STS on Ý and ≤ is a partial order on Ý.

Let (Ý,μ) be a STS and Å be a subset of Ý. The interior of Å (denoted by int^{μ} (Å)) is the union of all open subsets of Å and cl^{μ} (Å) is the intersection of all closed super sets of Å that is closure of Å. C(Å) denotes the complement of Å.

Let (Ý,μ,≤) be a supra topological ordered space[6]. For any a∈ Å, [ä,→] = {b∈Å /b ≤ ä} [→, ä] = {b∈Å/b ≥ ä} [7]. A subset Å of a supra topological ordered space (Y, μ, ≤) is said to be increasing [7] if Å = i^{μ}(Å) and decreasing [7] if Å = d^{μ}(Å), where i(Å) = $\cup_{ä\in A}$[ä,→] and d^{μ} (Å) = $\cup_{ä\in A}$[←,ä]. A subset of a supra topological ordered space (Ý,μ,≤) is said to be balanced [7] if it is both increasing and decreasing.

NOTE: Throughout this paper STS means Supra Topological space and STOS means Supra Topological Ordered space.

Definitions 1.4

Any subset Å of a STOS(Ý,μ,≤) is called a semi-open [**3**] (resp. a semi-closed [**3**], a pre-open [**4**], a pre-closed, an α-open [**3,4**], an α-closed [**3,4**], a β-open [**5**] (or a semi-pre-open), a β-closed [**5**] (or a semi-pre-closed) if Å⊆ (int^{μ} (cl^{μ} (Å)) (resp. int^{μ} (cl^{μ} (Å)) ⊆ Å, Å ⊆int^{μ} (cl^{μ} (Å)), cl^{μ} (int^{μ} (Å)) ⊆ Å, Å⊆int^{μ} (cl^{μ} (int^{μ} (Å))), cl^{μ} (int^{μ} (cl^{μ} (Å))) ⊆ Å, Å ⊆cl^{μ} (int^{μ} (cl^{μ} (Å))), int^{μ} (cl^{μ} (int^{μ} (Å))) ⊆ Å).

We have used the following supra *topological spaces in this paper.*

Examples 1.5

1. Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_1 = {ϕ, Ý, {η_1}, {χ_1}, {χ_1,ε_1}}. **;** **2.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_2 = {ϕ, Ý, {η_1,χ_1}, {η_1,ε_1}}. **; 3.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_3 = {ϕ,Ý, {η_1,ε_1}, {χ_1,ε_1}}. **; 4.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_4 = {ϕ, Ý, {η_1,χ_1}, {χ_1,ε_1}}. **; 5.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_5 = {ϕ, Ý, {χ_1}, {η_1,χ_1}, {η_1,ε_1}}. **; 6.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_6 = {ϕ, Ý, {ε_1}, {η_1,χ_1}, {χ_1,ε_1}}. **; 7.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_7 = {ϕ, Ý, {χ_1}, {ε_1}, {η_1, χ_1}, {η_1,ε_1}, {χ_1,ε_1}}. **; 8.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_8 = {ϕ, Ý, {η_1}, {χ_1}, {η_1,χ_1}, {χ_1, ε_1}, {ε_1,η_1}}. **; 9.** Let Ý = {$\eta_1, \chi_1, \varepsilon_1$} and μ_9 = {ϕ, Ý, {η_1}, {η_1,ε_1}, {χ_1,ε_1}}.

Increasing, Decreasing, And Balanced Type Sets

We obtain increasing, decreasing, and balanced type sets from the below partial orders

Example 1.6 Let Ý= {$\eta_1, \chi_1, \varepsilon_1$}, $\le_1$ = {η_1, η_1), (χ_1, χ_1), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\chi_1, \varepsilon_1$), ($\eta_1, \varepsilon_1$)}.
Increasing sets are {ϕ, Ý, {ε_1}, {χ_1, ε_1}}.
Decreasing sets are {ϕ, Ý, {η_1}, {η_1,χ_1}}.
Balanced sets are {ϕ, Ý}.

Example 1.7 Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, $\le_2$ = {η_1, η_1), (χ_1, χ_1), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}.
Increasing sets are {ϕ, Ý, {χ_1}, {η_1,χ_1}, {χ_1,ε_1}}.
Decreasing sets are {ϕ, Ý, {η_1}, {ε_1}, {η_1,ε_1}}.
Balanced sets are {ϕ, Ý}.

Example 1.8 Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, $\le_3$ = {(η_1,η_1), (χ_1,χ_1), ($\varepsilon_1,\varepsilon_1$), ($\eta_1,\chi_1$), ($\eta_1,\varepsilon_1$)}.
Increasing sets are {ϕ, Ý, {χ_1}, {ε_1}, {χ_1,ε_1}}.
Decreasing sets are {ϕ, Ý, {η_1}, {η_1,χ_1}, {η_1,ε_1}}.
Balanced sets are {ϕ, Ý}.

Definitions 1.9(1).[7] IO(Ý) (resp. DO(Ý), BO(Ý)) denotes the range of all increasing (resp. decreasing, balanced) open subsets of a topological ordered space (Ý,μ,≤). $I^{\mu}C(Ý)$ (resp. $D^{\mu}C(Ý)$, $B^{\mu}C(Ý)$) denotes the set of all increasing (resp. decreasing, balanced) closed subsets of a Supra topological ordered space (Ý,μ,≤).

For some of the following definitions please refer to [**3**], [**4**], [**5**] and [**7**].

Definitions1.10. Let 'A' be a subset of a STOS (Ý,μ,≤) is called an increasing semi-open set (resp. a decreasing semi-open set, a balanced semi-open set) if it is both an increasing and a semi open (resp. a decreasing and a semi open, a balanced and a semi open).Similarly we define for pre-open set, semi- pre-open set and β-open set and their closed sets also.

Notations1.11. For a Supra topological ordered space (Ý,μ,≤), the following symbols for different types of collections of subsets of Ý are used.
$I^{\mu}S(Ý)$ (resp. $D^{\mu}SO(Ý)$, $B^{\mu}SO(Ý)$) denotes the collection of all increasing (resp. decreasing, balanced) semi-open subsets. Similarly we denote $I^{\mu}SC(Ý)$ (resp. $D^{\mu}SC(Ý)$, $B^{\mu}SC(Ý)$) , $I^{\mu}PO(Ý)$ (resp. $D^{\mu}PO(Ý)$, $B^{\mu}PO(Ý)$) ,$I^{\mu}PC(Ý)$ (resp. $D^{\mu}PC$ (Ý),$B^{\mu}PC$ (Ý)) denotes $I^{\mu}O(Ý)$ (resp. $D^{\mu}\alpha O(Ý)$, $B^{\mu}\alpha O(Ý)$) for pre-open, α-open and β-open sets. $I^{\mu}\alpha C(Ý)$ (resp. $D^{\mu}\alpha C(Ý)$, $B^{\mu}\alpha C(Ý)$)α-closed subsets. Similarly we denote for pre-closed, α-closed and β-closed sets.

Definitions 1.12.A space (Ý,μ) is called a
1. R_0 [8]cl^{μ} { Ý }⊆G whenever Ý ∈G∈μ
2. Semi- R_0 [8] if for Ý ∈G∈SO(y), scl{y}⊆G
3. Weakly- R_0[8] if$\bigcap_{y\in Ý} cl^{\mu}\{y\} = \phi$.
4. Weakly- semi- R_0 [8] if $\bigcap_{y\in Ý} scl^{\mu}\{y\} = \phi$
5. Weakly -α-R_0 [8] if$\bigcap_{y\in Ý} \alpha cl^{\mu}\{y\} = \phi$.
6. Weakly -β- R_0[8]if $\bigcap_{y\in Ý} \beta cl^{\mu}\{y\} = \phi$
7. Weakly -Pre- R_0[8] if $\bigcap_{y\in Ý} pcl^{\mu}\{y\} = \phi$

3. W-R_0 Type Spaces in Stos:

Definition 2.1.A space (Y, μ, ≤) is called a
1. Weakly-i^{μ}-α-R_0 if $\bigcap_{y\in Ý} i^{\mu}\alpha cl\{y\} = \phi$
2. Weakly-i^{μ}-pre-R_0 if $\bigcap_{y\in Ý} i^{\mu}pcl\{y\} = \phi$
3. Weakly-i^{μ}-semi-R_0 if $\bigcap_{y\in Ý} i^{\mu}scl\{y\} = \phi$
4. Weakly-i^{μ}-R_0 if $\bigcap_{y\in Ý} i^{\mu}cl\{y\} = \phi$
5. Weakly-d^{μ}-R_0 if $\bigcap_{y\in Ý} d^{\mu}cl\{y\} = \phi$
6. Weakly-b^{μ}-R_0 if$\bigcap_{y\in Ý} b^{\mu}cl\{y\} = \phi$.
7. Weakly-d^{μ}-α-R_0 if $\bigcap_{y\in Ý} d^{\mu}\alpha cl\{y\} = \phi$
8. Weakly-d^{μ}-pre-R_0 if $\bigcap_{y\in Ý} d^{\mu}pcl\{y\} = \phi$
9. Weakly-d^{μ}-semi-R_0 if $\bigcap_{y\in Ý} d^{\mu}scl\{y\} = \phi$
10. Weakly-d^{μ}-β-R_0 if $\bigcap_{y\in Ý} d^{\mu}\beta cl\{y\} = \phi$
11. Weakly-b^{μ}-α-R_0 if $\bigcap_{y\in Ý} b^{\mu}\alpha cl\{y\} = \phi$
12. Weakly-b^{μ}-β-R_0 if$\bigcap_{y\in Ý} b^{\mu}\beta cl\{y\} = \phi$.
13. Weakly-b^{μ}-semi-R_0 if$\bigcap_{y\in Ý} b^{\mu}scl\{y\} = \phi$.
14. Weakly-b^{μ}-pre-R_0 if$\bigcap_{y\in Ý} b^{\mu}pcl\{y\} = \phi$.

Theorem 2.2: Every weakly i^{μ}-R_0 space is a weakly R_0 space.
Every weakly R_0 space is need not be a weakly i^{μ}-R_0 space.

Example 2.3: Let Ý = $\{\eta_1,\chi_1,\varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1\}$, $\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}
≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\chi_1, \eta_1), (\varepsilon_1, \eta_1), (\chi_1, \varepsilon_1)\}$.

Theorem 2.4: Every weakly i^{μ}-α-R_0 space is a weakly i^{μ}-pre-R_0 space.
Every weakly i^{μ}-pre-R_0 space is need not be a weakly i^{μ}-α-R_0 space.

Example 2.5: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1\}$, $\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$.

Theorem 2.6: Every weakly i^{μ}-α-R_0 space is a weakly i^{μ}-β-R_0 space.
Every weakly i^{μ}-β-R_0 space is need not be a weakly i^{μ}-α-R_0 space.

Example 2.7: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1\}$, $\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤= $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$.

Theorem 2.8: Every weakly i^{μ}-semi-R_0space is independent of weakly i^{μ}-pre-R_0 space.
Proof: It follows from the following examples

Example 2.9: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1\}$, $\{\chi_1\}$, $\{\eta_1, \chi_1\}$}≤= $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1,\chi_1), (\eta_1, \varepsilon_1)\}$.

Example 2.10: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \varepsilon_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\chi_1, \eta_1)\}$.

Theorem 2.11: Every weakly i^{μ}-R_0space is independent of weakly d^{μ}-R_0 space.
Proof: It follows from the following examples
Example 2.12: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

Example 2.13: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \chi_1\}$, $\{\chi_1, c_1\}$}≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.14: Every weakly d^{μ}-R_0 space is a weakly R_0 space.
Every weakly R_0 space is need not be a weakly d^{μ} -R_0 space.

Example 2.15: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \varepsilon_1\}$, $\{\chi_1, \varepsilon_1\}$} ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1), (\chi_1, \varepsilon_1)\}$.

Theorem 2.16: Every weakly i^{μ}-α-R_0 space is a weakly α-R_0 space.
Every weakly α-R_0 space is need not be a weakly i^{μ} -α-R_0 space.

Example 2.17: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$} ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.18: Every weakly b^{μ}-R_0 space is a weakly i^{μ}-R_0 space.

Every weakly i^{μ}-R_0 space is need not be a weakly b^{μ}-R_0 space.
Example 2.19: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Y, $\{\chi_1\}$, $\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$.

Theorem 2.20: Every weakly b^{μ}-R_0 space is a weakly d^{μ}-R_0 space.

Every weaklyd^{μ}-R_0 space is need not be a weakly b^{μ}-R_0 space.

Example 2.21: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$} ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.22: Every weakly i^{μ}-α-R_0 space is a weekly semi-R_0 space.

Every weakly semi-R_0 space is need not be a weakly i^{μ}-α-R_0 space.

Example 2.23: Let Ý ={$\eta_1, \chi_1, \varepsilon_1$}, μ={ϕ, Ý, {$\eta_1$}, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem 2.24: Every weakly i^μ-α-R_0 space is a weakly pre-R_0 space.

Every weakly pre-R_0 space is need not be a weakly i^μ-α-R_0 space.

Example 2.25: Let Ý ={$\eta_1, \chi_1, \varepsilon_1$}, μ={ϕ, Ý, {$\eta_1$}, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \eta_1$) ,($\varepsilon_1, \chi_1$)}.

Theorem 2.26: Every weakly i^μ-α-R_0 space is a weakly β-R_0 space.

Every weakly β-R_0 space is need not be a weakly i^μ-α-R_0 space.

Example 2.27: Let Ý ={$\eta_1, \chi_1, \varepsilon_1$}, μ={ϕ, Ý, {$\eta_1$}, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \eta_1$) ,($\varepsilon_1, \chi_1$)}.

Theorem: 2.28: Every weakly i^μ-β-R_0 space is a weakly β-R_0 space.

Every weakly β-R_0 space is need not be a weakly i^μ-β-R_0 space.

Example 2.29: Let Ý ={$\eta_1, \chi_1, \varepsilon_1$}, μ={ϕ, Ý, {$\eta_1$}, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$) ,($\chi_1, \varepsilon_1$)}.

Theorem 2.30: Every weakly i^μ-semi-R_0 space is a weakly semi-R_0 space.

Every weakly semi-R_0 space is need not be a weakly i^μ-semi-R_0 space.

Example 2.31: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\eta_1, \varepsilon_1$}} ≤ = {$\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$), ($\chi_1, \varepsilon_1$)}.

Theorem 2.32: Every weakly d^μ-semi-R_0 space is a weekly semi-R_0 space

Every weakly semi-R_0 space is need not be a weakly d^μ-semi-R_0 space

Example 2.33: Let Ý = {η_1, χ_1, c_1}, μ= {ϕ, Ý, {η_1, ε_1}, {χ_1, ε_1}} ≤ = {(η_1, η_1), (χ_1, χ_1), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1$ ε_1,)}

Theorem 2.34: Every weakly i^μ-pre-R_0 space is a weakly pre-R_0 space.

Every weakly pre-R_0 space is need not be a weakly i^μ-pre-R_0 space.

Example 2.35: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \varepsilon_1$}, {$\chi_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem 2.36: Every weakly b^μ-α-R_0 space is a weakly d^μ-α-R_0 space.

Every weakly d^μ-α-R_0 space is need not be a weakly b^μ-α-R_0 space.

Example 2.37: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem 2.38: Every weakly i^μ-α-R_0 space is independent of weakly d^μ-α-R_0 space.
Proof: It follows from the following examples

Example 2.39: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Example 2.40: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\chi_1, \eta_1$)}.

Theorem 2.41: Every weakly b^μ-pre-R_0 space is a weakly i^μ-pre-R_0 space.

Every weakly i^μ-pre-R_0 space is need not be a weakly b^μ -pre-R_0 space.

Example 2.42: Let Ý = {η_1, χ_1, c_1}, μ= {ϕ, Ý, {η_1, ε_1}, {χ_1, ε_1}} ≤ = {(η_1, η_1), (χ_1, χ_1), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$)}.

Theorem 2.43: Every weakly b^μ -pre-R_0 space is a weakly d^μ-pre-R_0 space

Every weaklyd^μ -pre-R_0 space is need not be a weakly b^μ -pre-R_0 space

Example 2.44: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \varepsilon_1$}, {$\chi_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem 2.45: Every weakly b^μ -semi-R_0 space is a weakly i^μ-semi-R_0 space.

Every weakly i^μ -semi-R_0 space is need not be a weakly b^μ -semi-R_0 space.

Example 2.46: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\eta_1, \varepsilon_1$}} ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$)}

Theorem 2.47: Every weakly b^μ -semi-R_0 space is a weakly d^μ-semi-R_0 space

Every weakly d^μ-semi-R_0 space is need not be a weaklyb^μ-semi-R_0 space

Example 2.48: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem 2.49: Every weakly b^μ -β-R_0 space is a weakly i^μ-β-R_0 space.

Every weaklyi^μ -β-R_0 space is need not be a weakly b^μ -β-R_0 space.

Example 2.50: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$)}

Theorem 2.51: Every weakly b^μ -β-R_0 space is a weakly d^μ-β-R_0 space

Every weakly d^μ-β-R_0 space is need not be a weakly b^μ -β-R_0 space

Example 2.52: Let Ý = {$\eta_1, \chi_1, \varepsilon_1$}, μ= {ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\varepsilon_1, \chi_1$)}

Theorem2.53: Every weakly i^μ-β-R_0space is independent of weakly d^μ-β-R_0 space.
Proof: It follows from the following examples

Example:2.54: Let Ý ={$\eta_1, \chi_1, \varepsilon_1$}, μ={ϕ, Ý, {$\eta_1, \chi_1$}, {$\chi_1, \varepsilon_1$}}, ≤ = {($\eta_1, \eta_1$), ($\chi_1, \chi_1$), ($\varepsilon_1, \varepsilon_1$), ($\eta_1, \chi_1$), ($\eta_1, \varepsilon_1$)}

Example 2.55: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.56: Every weakly i^{μ}-pre-R_0 space is independent of weakly d^{μ}-pre-R_0 space.
Proof: It follows from the following examples

Example: 2.57: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Y, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

Example 2.58: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.59: Every weakly i^{μ}-semi-R_0space is independent of weakly d^{μ}-semi-R_0 space.
Proof: It follows from the following examples

Example: 2.60: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

Example 2.61: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\varepsilon_1\}$,$\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.62: Every weakly d^{μ}-pre-R_0 space is a weakly pre-R_0 space.

Every weakly pre-R_0 space is need not be a weakly d^{μ}- pre-R_0 space.

EXAMPLE 2.63: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1), (\chi_1, \varepsilon_1)\}$

Theorem 2.64: Every weakly d^{μ}-α-R_0 space is a weakly α-R_0 space.

Every weakly α-R_0 space is need not be a weakly d^{μ}-α-R_0 space.

EXAMPLE 2.65: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ = {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1), (\chi_1, \varepsilon_1)\}$

Theorem 2.66: Every weakly d^{μ}-β-R_0 space is a weakly β-R_0 space.

Every weakly β-R_0 space is need not be a weakly d^{μ}-β-R_0 space.

EXAMPLE 2.67: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1), (\chi_1, \varepsilon_1)\}$

Theorem 2.68: Every weakly b^{μ}-α-R_0 space is a weakly i^{μ}-α-R_0 space.
Every weakly i^{μ}-α-R_0 space is need not be a weakly b^{μ}-α-R_0 space.

Example 2.69: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

Theorem 2.70: Every weakly b^{μ}-pre-R_0 space is a weakly i^{μ}-β-R_0 space.
Every weakly i^{μ}-pre-R_0 space I need not be a weakly b^{μ} -β-R_0 space.

Example 2.71: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

Theorem 2.72: Every weakly b^{μ} -pre-R_0 space is a weakly β-R_0 space.

Every weakly β -R_0 space is need not be a weakly b^{μ} -pre -R_0 space.

Example 2.73: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\chi_1\}$,$\{\eta_1, \chi_1\}$, $\{\eta_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\varepsilon_1, \chi_1)\}$

Theorem 2.74: Every weakly b^{μ} -α-R_0 space is a weakly i^{μ}-pre-R_0 space.
Every weakly i^{μ}-α-R_0 space is need not be a weakly b^{μ} -α-R_0 space.

Example 2.75: Let Ý = $\{\eta_1, \chi_1, \varepsilon_1\}$, μ= {ϕ, Ý, $\{\varepsilon_1\}$,$\{\eta_1, \chi_1\}$, $\{\chi_1, \varepsilon_1\}$}, ≤ = $\{(\eta_1, \eta_1), (\chi_1, \chi_1), (\varepsilon_1, \varepsilon_1), (\eta_1, \chi_1), (\eta_1, \varepsilon_1)\}$

3. Conclusion

In this paper we establish the relation
Among increasing pre -R_0 space with other type of spaces
Semi - R_0, α-R_0 space, β -R_0 space that may be decreasing, balanced type in supra topological ordered spaces.

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