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Signal Soft Sets for Atoms Modeling and Signal Soft Topology

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Abstract
In this paper we define a signal soft set as a mathematical tool to represent and study atoms, anti-atoms, electrons, anti-electrons, protons, and anti-protons, and generate a signal soft topology, with an example of signal soft topology on H_2O.

Keywords: Atom, Anti-atom, Soft set, Signal soft set, Operations on signal soft set, Signal soft topology .

مجموعات الاشارة الميسرة لنمذجة الذرات وتبولوجيا الاشارة الميسرة

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قسم الرياضيات ، كلية التربية ، الجامعة المستنصرية ، بغداد ، العراق

الخلاصة
في هذا البحث، عرفنا مجموعة الإشارة الميسرة، كأداة رياضية لتمثيل ودراسة الذرات، والذرات المضادة، الإلكترون، والإلكترون المضاد، البروتون، و البروتون المضاد، كونا تبولوجيا الاشارة الميسرة، مع مثال تبولوجيا الاشارة الميسرة على H_2O.

I- Introduction

In this paper we use the soft set [1-3] to generate a signal soft set to represent atoms, electrons, protons, neutrons, and anti - atoms. We define operations on signal soft sets to study the construction of some chemical compounds, such as water and hydrochloric acid. Many new topological structures appears in [4, 5] as a new tool to deal with some real life applications . Thus, we define a signal soft topology to study atoms as open sets in this new topological structure .

II- Basics on soft sets and atoms

In this section, we define the signal soft element and signal soft set to make a model for the atom and define $\oplus$ and $\ominus$ between signal soft sets, with examples.

Definition 2.1

Let X be a universal set contain elements in $\mathcal{R}^+$ denoted by "h", E is a set of parameters contain elements denoted by "e" .Then, the signal soft element χ defined by:

χ ={ $(e_i , h_j^{\delta ij}) = (e_i , \text{Ƒ}(ei))$: Ƒ : E $\rightarrow h_j^{\delta ij}$, $h_j \in$ P(X) , δ_{ij} take + , – , $\pm$ or $\mp$ signal $\forall$i, j$\in \Omega$, Ω is indexed set of natural numbers}.

Definition 2.2

Let X be a universal set of "h" elements in $\mathcal{R}^+$, E is a set of parameters of "e" elements .

Then, the signal soft set defined by : $\mathcal{N}$ = (Ƒ,E) = { χ : $\chi = (e_i, h_j^{\delta ij})$, δ_{ij} take ("+" for proton and anti-electron , " – " for electron and anti - proton , " $\pm$ " for neutron , "$\mp$" for anti-neutron) ,$\forall$ i , j$\in \Omega$,

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Ω is indexed set of natural numbers }.

Model 2.3

Let N be the atom name; η , ρ, ε denoted respectively to neutron , proton , electron and δ for signal. Then, atom as a signal soft set model is defined by : $\mathcal{N}$= (N , η^{δ} , ρ^{δ}, ε^{δ}).

Coding 2.4

As a special cases of atom, we have the followings:

1- Neutron = η = ($\emptyset$, $1^{\pm}$, 0^{+} , 0^{-}) .
2- Proton = ρ = ($\emptyset$, $0^{\pm}$, 1^{+} , 0^{-}) .
3- Electron = ε = ($\emptyset$, $0^{\pm}$, 0^{+} , 1^{-}) .
4- Energy = ξ = ($\emptyset$, $0^{\pm}$, 0^{+} , 0^{-}) = Φ .

Examples 2.5

1- Zinc = (Zn , $35^{\pm}$, 30^{+} , 30^{-}) .
2- Sodium = (Na , $12^{\pm}$, 11^{+} , 11^{-}) .
3- Carbon = (C , $6^{\pm}$, 6^{+} , 6^{-}) .

Definition 2.6

Let X be a universal set of "h" elements in $\mathcal{R}^{+}$,E be a set of parameters of "e" elements.
Then, the null-signal soft set denoted by: $\Phi = \{\chi : \chi = (e_i, h_j^{\delta ij})$, $\forall$ i , j $\in \Omega$, Ω is indexed set of natural numbers, $e_i = \emptyset$ and $h_j = 0$, δ ij take + , – , $\pm$ or $\mp$ signal }.

Examples 2.7

1- X = { $h_1 = h_2 = h_3 = 0$ }, E = { $e_1 = \emptyset$ } , Φ = ($\emptyset$, $0^{\pm}$, 0^{+} , 0^{-}) is a null-signal soft set, there are three signal soft elements χ_1, χ_2 , χ_3 :
$\chi_1 = (e_1, h_1^{\delta 11}) = (\emptyset , 0^{\pm})$, $\chi_2 = (e_1, h_2^{\delta 12}) = (\emptyset , 0^{+})$, $\chi_3 = (e_1, h_3^{\delta 13}) = (\emptyset , 0^{-})$.
2- ε = ($\emptyset$, $0^{\pm}$, 0^{+} , 1^{-}) = Electron is not null-signal soft set .

Definition 2.8

Let X be a universal set of "h" elements in $\mathcal{R}^{+}$, E be a set of parameters of "e" elements and (F,E) be a soft set .Then, the universal signal soft set denoted by : $\mathcal{U} = \{\chi : \chi = (e_i, h_j^{\delta ij})$,$\forall$ i , j $\in \Omega$, Ω is indexed set of natural numbers, e_i = X and $h_j = \infty$, ∞ is the most large number in X}.

Examples 2.9

1- X = { $h_1 = h_2 = h_3 = \infty$ } , E = { e_1 = X } , $\mathcal{U}$ = (X , $\infty^{\pm}$, ∞^{+} , ∞^{-}) is a universal signal soft set there are three signal soft elements χ_1, χ_2 , χ_3 :
$\chi_1 = (e_1, h_1^{\delta 11}) = (X, \infty^{\pm})$, $\chi_2 = (e_1, h_2^{\delta 12}) = (X , \infty^{+})$, $\chi_3 = (e_1, h_3^{\delta 13}) = (X , \infty^{-})$.
2- Proton = ρ = ($\emptyset$, $0^{\pm}$, 1^{+},0^{-}) and Neutron = η = ($\emptyset$, $1^{\pm}$, 0^{+} , 0^{-}) are signal soft sets but not universal signal soft sets in general.
3- (Se , $45^{\pm}$, 34^{+} , 34^{-}) is a signal soft set but not universal signal soft set in general.

Remark 2.10

The null-signal soft set and the universal signal soft set are virtual sets .

Definition 2.11

Let $\mathcal{N}$= { $\chi : \chi = (e_i, hj^{\delta ij})$ } .The complement of the signal soft set $\mathcal{N}$denoted by**:** $\mathcal{N}^{c}$ ={ $\chi^{c} : \chi^{c} = (e_i, hj^{-\delta ij})$ } .

Definition 2.12

Let $\mathcal{N}_1$, $\mathcal{N}_2$ be two signal soft sets .Then, $\mathcal{N}_1$ is subset of $\mathcal{N}_2$, if each $\chi_\alpha \in \mathcal{N}_1$ we have $\chi_\alpha \in \mathcal{N}_2$ and denoted by $\mathcal{N}_1 \subseteq \mathcal{N}_2$.

Definition 2.13

The two signal soft sets $\mathcal{N}_1$, $\mathcal{N}_2$ are equal if $\mathcal{N}_1 \subseteq \mathcal{N}_2 \wedge \mathcal{N}_2 \subseteq \mathcal{N}_1$, denoted by $\mathcal{N}_1 = \mathcal{N}_2$ otherwise $\mathcal{N}_1 \neq \mathcal{N}_2$.

Definition 2. 14

Let $\mathcal{N}_1$ = (N_1, $\eta_1^{\delta 1}$, $\rho_1^{\delta 2}$, $\varepsilon_1^{\delta 3}$), $\mathcal{N}_2$ = (N_2 , $\eta_2^{\sigma 1}$, $\rho_2^{\sigma 2}$, $\varepsilon_2^{\sigma 3}$) be two signal soft sets .
Then, the summation is defined as follow :$\mathcal{N}_1 \oplus \mathcal{N}_2$ = (N_1 , $\eta_1^{\delta 1}$, $\rho_1^{\delta 2}$, $\varepsilon_1^{\delta 3}$) $\oplus$ (N_2 , $\eta_2^{\sigma 1}$,$\rho_2^{\sigma 2}$, $\varepsilon_2^{\sigma 3}$) = $\mathcal{N}_3$ = (N_3 , $\eta_1^{\delta 1} + \eta_2^{\sigma 1}$, $\rho_1^{\delta 2} + \rho_2^{\sigma 2}$, $\varepsilon_1^{\delta 3} + \varepsilon_2^{\sigma 3}$) .

Definition 2.15
Let $\mathcal{N}_1 = (N_1 , \eta_1^{\delta 1}, \rho_1^{\delta 2}, \varepsilon_1^{\delta 3})$, $\mathcal{N}_2 = (N_2 , \eta_2^{\sigma 1}, \rho_2^{\sigma 2} , \varepsilon_2^{\sigma 3})$ be two signal soft sets .
Then, the difference is defined as follow: $\mathcal{N}_1 \ominus \mathcal{N}_2 = (N_1 , \eta_1^{\delta 1} , \rho_1^{\delta 2}, \varepsilon_1^{\delta 3}) \ominus (N_2 , \eta_2^{\sigma 1} , \rho_2^{\sigma 2} , \varepsilon_2^{\sigma 3}) = \mathcal{N}_3 = (N_3 , \eta_1^{\delta 1} - \eta_2^{\sigma 1} , \rho_1^{\delta 2} - \rho_2^{\sigma 2} , \varepsilon_1^{\delta 3} - \varepsilon_2^{\sigma 3})$.

Notice 2.16
In general
$(N_1 , \eta_1^{\delta 1} , \rho_1^{\delta 2}, \varepsilon_1^{\delta 3}) \oplus (N_2 , \eta_2^{\sigma 1} , \rho_2^{\sigma 2} , \varepsilon_2^{\sigma 3}) = (N_3 , \eta_3^{\kappa 1} , \rho_3^{\kappa 2} , \varepsilon_3^{\kappa 3}) \circleddash\!\!\!\!+ \ \xi$
$(N_1, \eta_1^{\delta 1} , \rho_1^{\delta 2}, \varepsilon_1^{\delta 3}) \ominus (N_2 , \eta_2^{\sigma 1} , \rho_2^{\sigma 2} , \varepsilon_2^{\sigma 3}) = (N_3 , \eta_3^{\kappa 1} , \rho_3^{\kappa 2} , \varepsilon_3^{\kappa 3}) \circleddash\!\!\!\!+ \ \xi$
where $\xi = (N_4 , \eta_4^{\gamma 1} , \rho_4^{\gamma 2} , \varepsilon_4^{\gamma 3})$ could be an atom , neutron , proton , electron , Φ , anti-atom , anti-energy , or PE (as seen in the next sections).

III- Chemical compounds modeled by signal soft set
In this section, we will study some chemical compounds represented as a signal soft set.

Examples 3.1
1- $(Se , 45^{\pm} , 34^{+} , 34^{-}) \oplus (\emptyset , 0^{\pm} , 1^{+} , 2^{-}) = (Br , 45^{\pm} , 35^{+} , 35^{-}) \oplus (\emptyset , 0^{\pm} , 0^{+} , 1^{-})$.
2- $(Ca , 20^{\pm} , 20^{+} , 20^{-}) = (Ar , 21^{\pm} , 18^{+} , 18^{-}) \oplus (He , 2^{\pm} , 2^{+} , 2^{-}) \ominus (\emptyset , 3^{\pm} , 0^{+} , 0^{-})$.
3- $(V , 28^{\pm} , 23^{+} , 23^{-}) \ominus (\emptyset , 2^{\pm} , 0^{+} , 0^{-}) = (Sc , 24^{\pm} , 21^{+} , 21^{-}) \oplus (He , 2^{\pm} , 2^{+} , 2^{-})$.
4- $(V , 28^{\pm} , 23^{+} , 23^{-}) = (Sc , 24^{\pm} , 21^{+}, 21^{-}) \oplus (He , 2^{\pm} , 2^{+} , 2^{-}) \oplus (\emptyset , 2^{\pm} , 0^{+} , 0^{-})$.
5- $(Nd , 84^{\pm} , 60^{+} , 60^{-}) = (Ce , 82^{\pm} , 58^{+}, 58^{-}) \oplus (He , 2^{\pm} , 2^{+} , 2^{-})$.

Example 3.2
Let the Hydrogen = $(H,0^{\pm},1^{+},1^{-})$, $(H,0^{\pm},1^{+},1^{-}) \oplus (H,0^{\pm},1^{+},1^{-}) = (H_2,0^{\pm},2^{+},2^{-})$
and Oxygen = $(O,8^{\pm},8^{+},8^{-})$ .Then,
2Hydrogen $\oplus$ Oxygen = $(H_2,0^{\pm},2^{+},2^{-}) \oplus (O,8^{\pm},8^{+},8^{-}) = (H_2O ,8^{\pm},10^{+},10^{-})$ = water .

Example 3.3
Let the Hydrogen = $(H,0^{\pm},1^{+},1^{-})$, Chlorine = $(Cl,19^{\pm},17^{+},17^{-})$
$(H_2O ,8^{\pm},10^{+},10^{-}) \oplus (H,0^{\pm},1^{+},1^{-}) = (H_3O ,8^{\pm},11^{+},11^{-})$.
Then, $(H, 0^{\pm},1^{+},1^{-}) \oplus (Cl ,19^{\pm},17^{+},17^{-}) = (HCl ,19^{\pm},18^{+},18^{-})$ = Hydrochloric
Now $(H_2O ,8^{\pm},10^{+},10^{-}) \oplus (HCl ,19^{\pm},18^{+},18^{-}) = (H_3O ,8^{\pm},11^{+},11^{-}) \oplus (Cl,19^{\pm},17^{+},17^{-})$
$= (H_3OCl ,27^{\pm},28^{+},28^{-})$

Remarks 3.4
1 - The atom $\mathcal{N}_k$ is subset of some compound $\mathcal{C}$ if $\mathcal{C}$ is a summation of atoms ; one of them is $\mathcal{N}_k$, i.e. $\mathcal{N}_k \subset \mathcal{C} \Leftrightarrow \forall\ \mathcal{C} = \mathcal{N}_1 \oplus \mathcal{N}_2 \oplus \cdots \oplus \mathcal{N}_n$, $\exists\ i \in I = 1 , 2 , \ldots , n$ s.t. $\mathcal{N}_k = \mathcal{N}_i$.
2 - The sub compound $\mathcal{C}_\alpha$ is a sub collection of some compound set $\mathcal{C}$ if $\mathcal{C}_\alpha$ is a summation of arbitrary many atoms in $\mathcal{C}$,
i.e. $\mathcal{C}_\alpha \subset \mathcal{C} \Leftrightarrow \forall\ \mathcal{C} = \mathcal{N}_1 \oplus \mathcal{N}_2 \oplus \cdots \oplus \mathcal{N}_n$, $\mathcal{C}_\alpha = \oplus\, \mathcal{N}_\alpha : \alpha \subset I$, $I = 1 , 2 , \ldots , n$.

Examples 3.5
From example 3.3 , Hydrogen $\subset$ water , Chlorine $\subset$ Hydrochloric .

IV-Anti-atoms modeled by signal soft set
In this section, we will introduce the anti-atom as anti-signal soft set model we will use the symbol $\breve{\mathcal{H}}$ for anti-signal soft set to study atoms with anti-atom, electron with anti-electron etc. , show mathematically that the summation of atom and its anti-atom will give a pure energy .

Model 4.1
Let $\mathcal{N} = (N , \eta^{\delta}, \rho^{\delta}, \varepsilon^{\delta})$ be a signal soft set model of some atom .Then, the anti-signal soft set model of $\mathcal{N}$ is defined by : $\breve{\mathcal{H}} = (\overline{N} , \overline{\eta}^{\lambda} , \overline{\rho}^{\lambda}, \overline{\varepsilon}^{\lambda})$, where $\lambda = - \delta$ (which represent the anti-atom in general).

Coding 4.2
1- Anti- Neutron = $\overline{\eta} = (\emptyset , 1^{\mp}, 0^{-} , 0^{+})$.
2- Anti- Proton = $\overline{\rho} = (\emptyset , 0^{\mp} , 1^{-} , 0^{+})$.
3- Anti- Electron = $\overline{\varepsilon} = (\emptyset , 0^{\mp} , 0^{-}, 1^{+})$.
4- Anti- Energy = $\overline{\xi} = (\overline{\emptyset} , 0^{\mp} , 0^{-} , 0^{+}) = \overline{\Phi}$.
5- Pure - energy = PE = $(\varnothing , 0^{\varphi} , 0^{\varphi} , 0^{\varphi})$.
6- $\overline{N}$ is the anti-name , $N + \overline{N} = \varnothing = \overline{N} + N$
$\eta^{\delta} + \overline{\eta}^{\lambda} = \overline{\eta}^{\lambda} + \eta^{\delta} = \phi^{\varphi}$

$\rho^{\delta} + \overline{\rho}^{\lambda} = \overline{\rho}^{\lambda} + \rho^{\delta} = \phi^{\varphi}$

$\varepsilon^{\delta} + \overline{\varepsilon}^{\lambda} = \overline{\varepsilon}^{\lambda} + \varepsilon^{\delta} = \phi^{\varphi}$.

Remarks 4.3

1- 0^{φ} , η^{δ} , ρ^{δ}, ε^{δ} does not mean powered by.

2- The anti-signal soft set operation will be treated similarly as signal soft set operations.

Examples 4.4

1- Helium = (He , $2^{\pm}$, 2^{+} , 2^{-}) , Anti -Helium = ($\overline{\text{He}}$, $2^{\mp}$, 2^{-} , 2^{+}).

2- Argon = (Ar , $21^{\pm}$, 18^{+} , 18^{-}) , Anti -Argon = ($\overline{\text{Ar}}$, $21^{\mp}$, 18^{-} , 18^{+}).

Example 4.5

Let $\xi = (\emptyset , 0^{\pm} , 0^{+} , 0^{-})$, $\overline{\xi} = (\overline{\emptyset} , 0^{\mp} , 0^{-} , 0^{+})$ be an energy and anti-energy signal soft sets . Then, the summation is defined as follow :

$\xi \oplus \overline{\xi} = (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) \oplus (\overline{\emptyset} , 0^{\mp} , 0^{-} , 0^{+}) = (\emptyset + \overline{\emptyset} , 0^{\pm} + 0^{\mp} , 0^{+} + 0^{-} , 0^{-} + 0^{+})$

$= (\emptyset , \phi^{\varphi}, \phi^{\varphi} , \phi^{\varphi})$ = PE , Similarly $\overline{\xi} \oplus \xi$ = PE .

Remark 4.6

Any atom with anti-atom equals pure energy PE.

Example 4.7

Let $\mathcal{N} = (\text{N} , \eta^{\delta} , \rho^{\delta}, \varepsilon^{\delta})$, $\breve{\mathcal{H}} = (\overline{\text{N}} , \overline{\eta}^{\lambda} , \overline{\rho}^{\lambda}, \overline{\varepsilon}^{\lambda})$ be an atom and anti- atom respectively .

Then, their summation is defined as follow :

$\mathcal{N} \oplus \breve{\mathcal{H}} = (\text{N} , \eta^{\delta} , \rho^{\delta}, \varepsilon^{\delta}) \oplus (\overline{\text{N}} , \overline{\eta}^{\lambda} , \overline{\rho}^{\lambda}, \overline{\varepsilon}^{\lambda})$

$= (\text{N} + \overline{\text{N}} , \eta^{\delta} + \overline{\eta}^{\lambda} , \rho^{\delta} + \overline{\rho}^{\lambda} , \varepsilon^{\delta} + , \overline{\varepsilon}^{\lambda}) = (\emptyset , \phi^{\varphi}, \phi^{\varphi} , \phi^{\varphi})$ = PE . Similarly $\breve{\mathcal{H}} \oplus \mathcal{N}$ = PE .

VI- Signal soft topological space

In this section, we will use signal soft sets to define signal soft topology.

Definition 5.1

Let $\mathcal{N}_1 = (\text{N}_1 , \eta_1 , \rho_1 , \varepsilon_1)$, $\mathcal{N}_2 = (\text{N}_2 , \eta_2 , \rho_2 , \varepsilon_2)$ be two atoms .

Then, the union of two atoms $\mathcal{N}_1 \Cup \mathcal{N}_2 = \mathcal{N}_3$; $\mathcal{N}_3 = (\text{N}_3 , \eta_3 , \rho_3 , \varepsilon_3)$,

$$\eta_3 = \begin{cases} \text{if } \eta_1 \neq \eta_2 \Rightarrow [\, \eta_3 = max\{\eta_1, \eta_2\}\,] \\ \quad \text{if } \eta_1 = \eta_2 \Rightarrow [\, \eta_3 = \eta_1 \vee \eta_2 \,] \end{cases}$$

and similarly for ρ_3 , ε_3 .

Definition 5.2

Let $\mathcal{N}_1 = (\text{N}_1 , \eta_1 , \rho_1 , \varepsilon_1)$, $\mathcal{N}_2 = (\text{N}_2 , \eta_2 , \rho_2 , \varepsilon_2)$ be two atoms .

Then, the intersection of two atoms $\mathcal{N}_1 \Cap \mathcal{N}_2 = \mathcal{N}_3$; $\mathcal{N}_3 = (\text{N}_3 , \eta_3 , \rho_3 , \varepsilon_3)$,

$$\eta_3 = \begin{cases} \text{if } \eta_1 \neq \eta_2 \Rightarrow [\, \eta_3 = min\{\eta_1, \eta_2\}\,] \\ \quad \text{if } \eta_1 = \eta_2 \Rightarrow [\, \eta_3 = \eta_1 \vee \eta_2 \,] \end{cases}$$

and similarly for ρ_3 , ε_3 .

Remarks 5.3

In generally, may

(1) $\mathcal{N} \Cap \mathcal{N}^{c} \neq \Phi$

(2) $\mathcal{N} \Cup \mathcal{N}^{c} \neq \mathcal{U}$.

Example 5.4

$\mathcal{N} = (\text{H} , 0^{\pm}, 1^{+}, 1^{-})$, $\mathcal{N}^{c} = (\text{H}^{c} , 0^{\mp} , 1^{-} , 1^{+})$

$\mathcal{N} \Cap \mathcal{N}^{c} = (\text{H} , 0^{\pm}, 1^{+}, 1^{-}) \Cap (\text{H}^{c} , 0^{\mp} , 1^{-} , 1^{+}) = (\text{H} \Cap \text{H}^{c} , 0^{\pm} , 1^{-} , 1^{-}) = (\text{H} \Cap \text{H}^{c} , 0^{\mp} , 1^{-} , 1^{-}) \neq \Phi$

$\mathcal{N} \Cup \mathcal{N}^{c} = (\text{H} , 0^{\pm}, 1^{+}, 1^{-}) \Cup (\text{H}^{c} , 0^{\mp} , 1^{-} , 1^{+}) = (\text{H} \Cup \text{H}^{c} , 0^{\pm} , 1^{+} , 1^{+}) = (\text{H} \Cup \text{H}^{c} , 0^{\mp}, 1^{+} , 1^{+}) \neq \mathcal{U}$.

Definition 5.5

Let X be non-empty set, E be a set of parameters, (X , E could be finite or infinite),$\mathcal{T}$ be the collection of signal soft sets generated by the non-null signal soft set $\mathcal{U}$, if $\mathcal{T}$ satisfies the following axioms:

(1) Φ, $\mathcal{U}$ are in $\mathcal{T}$.

(2) $\Cup$ of any members of signal soft sets in $\mathcal{T}$ belongs to $\mathcal{T}$.

(3) $\Cap$ of any two signal soft sets in $\mathcal{T}$ belong to $\mathcal{T}$.

Then, $\mathcal{T}$ is called signal soft topology on $\mathcal{U}$

(simply $\mathcal{T}$ is $S_{\mathcal{U}}$ - topology), the triple ($\mathcal{U}$,$\mathcal{T}$, E) is called signal soft topological space on $\mathcal{U}$ (simply $S_{\mathcal{U}}$ - space) , the signal soft sets of $\mathcal{T}$ are called $S_{\mathcal{U}}$ - open sets and their complements are called $S_{\mathcal{U}}$ - closed sets .

Examples 5.6

1- Let $\Phi = (\emptyset , 0^{\pm} , 0^{+} , 0^{-})$, $\mathcal{U} = (X , \infty^{\pm} , \infty^{+} , \infty^{-})$.

Then, $\mathcal{T} = \{\Phi , \mathcal{U}\}$ is the $S_{\mathcal{U}}$ - Indiscrete topology.

2- Let $\mathcal{N} = (H , 0^{\pm} , 1^{+} , 1^{-})$, $\Phi = (\emptyset , 0^{\pm} , 0^{+} , 0^{-})$

$\mathcal{U} = (X , \infty^{\pm} , \infty^{+} , \infty^{-})$, ∞ is arbitrary large number belongs to $\mathcal{R}^{+}$.

Then, $\mathcal{T} = \{\Phi ,\mathcal{U} , \mathcal{N}\}$ is $S_{\mathcal{U}}$ - topology since

$\mathcal{N} \Cap \Phi = (H,0^{\pm},1^{+},1^{-}) \Cap (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \Phi$

$\mathcal{N} \Cap \mathcal{U} = (H,0^{\pm},1^{+},1^{-}) \Cap (X , \infty^{\pm} , \infty^{+} , \infty^{-}) = \mathcal{N}$

$\mathcal{U} \Cap \Phi = (X , \infty^{\pm} , \infty^{+} , \infty^{-}) \Cap (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \Phi$

$\mathcal{N} \Cup \Phi = (H,0^{\pm},1^{+},1^{-}) \Cup (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \mathcal{N}$

$\mathcal{N} \Cup \mathcal{U} = (H,0^{\pm},1^{+},1^{-}) \Cup (X , \infty^{\pm} , \infty^{+} , \infty^{-}) = \mathcal{U}$

$\mathcal{U} \Cup \Phi = (X , \infty^{\pm} , \infty^{+} , \infty^{-}) \Cup (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \mathcal{U}$

and ($\mathcal{U}$,$\mathcal{T}$, E) is $S_{\mathcal{U}}$ - space .

Remark 5.7

In real life we usually deal with finite elements so we will need to define signal soft topology use finite signal soft sets also it is not necessary to generate signal soft topology by using the universal signal soft set .

Definition 5.8

Let X be a non- empty set , E be a set of parameters (X , E are finite), $\mathcal{T}$ be a collection of finite signal soft sets generated by non-null finite signal soft set $\mathcal{N}$, $\mathcal{N} \neq \mathcal{U}$, if $\mathcal{T}$ satisfies the following axioms :

(1) Φ, $\mathcal{N}$ are in $\mathcal{T}$.

(2) $\Cup$ of any members of signal soft sets in $\mathcal{T}$ belongs to $\mathcal{T}$.

(3) $\Cap$ of any two signal soft sets in $\mathcal{T}$ belong to $\mathcal{T}$.

Then, $\mathcal{T}$ is called signal soft topology on $\mathcal{N}$

(simply $\mathcal{T}$ is $S_{\mathcal{N}}$ - topology), the triple ($\mathcal{N}$,$\mathcal{T}$, E) is called signal soft topological space on $\mathcal{N}$

(simply $S_{\mathcal{N}}$ - space) , the signal soft sets of $\mathcal{T}$ are called $S_{\mathcal{N}}$ - open sets and their complements are called $S_{\mathcal{N}}$ - closed sets.

Example 5.9

Let $\Phi = (\emptyset , 0^{\pm} , 0^{+} , 0^{-})$, $\mathcal{N}_1 = (H , 0^{\pm},1^{+},1^{-})$, $\mathcal{N}_2 = (H_2O ,8^{\pm}, 10^{+},10^{-})$.

Then, $\mathcal{T} = \{ \Phi , \mathcal{N}_1 , \mathcal{N}_2 \}$ is $S_{\mathcal{N}2}$ - Topology on $\mathcal{N}_2$ since

$\mathcal{N}_1 \Cap \Phi = (H,0^{\pm},1^{+},1^{-}) \Cap (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \Phi$

$\mathcal{N}_1 \Cap \mathcal{N}_2 = (H,0^{\pm},1^{+},1^{-}) \Cap (H_2O , 8^{\pm}, 10^{+},10^{-}) = \mathcal{N}_1$

$\mathcal{N}_2 \Cap \Phi = (H_2O, 8^{\pm}, 10^{+},10^{-}) \Cap (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \Phi$

$\mathcal{N}_1 \Cup \Phi = (H, 0^{\pm},1^{+},1^{-}) \Cup (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \mathcal{N}_1$

$\mathcal{N}_1 \Cup \mathcal{N}_2 = (H, 0^{\pm},1^{+},1^{-}) \Cup (H_2O, 8^{\pm}, 10^{+},10^{-}) = \mathcal{N}_2$

$\mathcal{N}_2 \Cup \Phi = (H_2O ,8^{\pm}, 10^{+},10^{-}) \Cup (\emptyset , 0^{\pm} , 0^{+} , 0^{-}) = \mathcal{N}_2$

and ($\mathcal{N}_2$, $\mathcal{T}$, E) is $S_{\mathcal{N}2}$ - space .

Definition 5.10

Let ($\mathcal{N}$, $\mathcal{T}$, E) be $S_{\mathcal{N}}$ - space , $x \in \mathcal{N}_2$ .Then, $\mathcal{N}_2$ is said to be $S_{\mathcal{N}}$ - neighborhood of x if there exist an $S_{\mathcal{N}}$ - open set $\mathcal{N}_1$ such that $x \in \mathcal{N}_1 \subseteq \mathcal{N}_2$.

Remark 5.11

Every $S_{\mathcal{N}}$ - open set is $S_{\mathcal{N}}$ - neighborhood but the converse is not necessary true .

Example 5.12

Let $\mathcal{N}_1 = (H ,0^{\pm},1^{+},1^{-})$, $\mathcal{N}_2 = (H_2O ,8^{\pm}, 10^{+},10^{-})$

$\Phi = (\emptyset , 0^{\pm} , 0^{+} , 0^{-})$, $\mathcal{T} = \{ \Phi , \mathcal{N}_2 , \mathcal{N}_1 \}$ is $S_{\mathcal{N}2}$ - topology .

Then, $\mathcal{N}_2 = (H, 0^{\pm},1^{+},1^{-}) \oplus (H, 0^{\pm},1^{+},1^{-}) \oplus (O,8^{\pm},8^{+},8^{-})$

$\mathcal{N}_2$ is $S_{\mathcal{N}2}$ - open since $\mathcal{N}_2 \in \mathcal{T}$
also $\mathcal{N}_2$ is $S_{\mathcal{N}2}$ - neighborhood of χ_1= (H , $0^{\pm}$) , since $\chi_1 \in \mathcal{N}_1 \subset \mathcal{N}_2$
and $\mathcal{N}_3$ = (HCl ,$19^{\pm}$,18^{+},18^{-}) = (H, $0^{\pm}$,1^{+},1^{-}) $\oplus$ (Cl ,$19^{\pm}$,17^{+},17^{-})
is $S_{\mathcal{N}2}$ - neighborhood of χ_1 = (H , $0^{\pm}$) , since $\chi_1 \in \mathcal{N}_1 \subset \mathcal{N}_3$
but $\mathcal{N}_3$ is not $S_{\mathcal{N}2}$ - open since $\mathcal{N}_3 \notin \mathcal{T}$.

Conclusions

In this paper we show that water can be represented as a signal soft set, from a signal soft set of water we generate a signal soft topology so the water, atoms, electron, chemical compounds and others, can be treated as a signal soft open sets, also we introduce the anti - atom in new mathematical way (we show that the anti-atom is a complement of a signal soft set of an atom) and show that the atom with anti - atom will generate a pure energy.

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