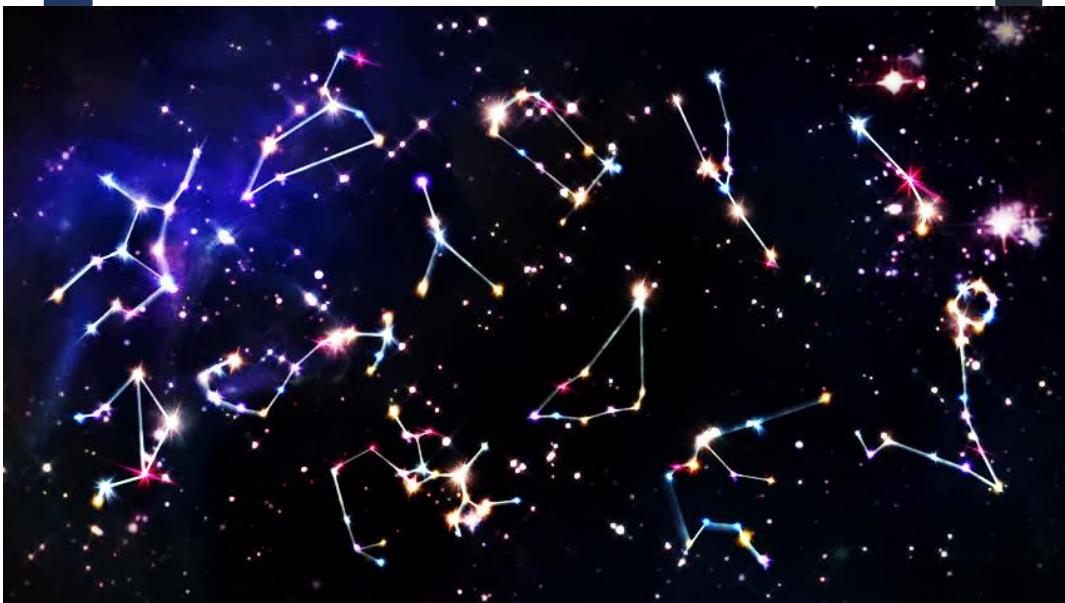florentin smarandache

NiduS ideaRuM

joining the dots

Theory of possibility, indeterminacy, and impossibility
Refined Neutrosophic Sentiment
Neutrosophic Triplet Structures
Neutrosophic Syllogistic Systems
Neutrosophic Maps
Neutrosophic Manifold
Neutrosophic Codes
Neutrosophic Crisp Set
Neutrosophic Probability Distributions
Yin - Yang and Neutrosophy
Neutrosophic Physics
Dynamic Neutrosophic Set
Spherical Neutrosophic Sets
Strategic Vision of the a Math Coordinator
Neutrosophic Overset/Underset/Offset Graphs

Florentin Smarandache

NIDUS IDEARUM.

Scilogs, V: *joining the dots*

Brussels, 2019

Exchanging ideas with Mohamed Abdel-Basset, Akeem Adesina A. Agboola, Yaman Akbulut, Anas Al-Masarwah, Mohammed A. Alshumrani, Saima Anis, Şule Bayazit Bedirhanoğlu, Said Broumi, Robert Neil Boyd, Vic Christianto, Stephen Crothers, Narmada Devi, Jean Dezert, Hojjatollah Fara-hani, Kawther Fawzi, Yanhui Guo, Minghu Ha, Bill Harrington, Qingqing Hu, Kul Hur, Saeid Jafari, Tèmítópé Gbóláhàn Jaíyéolá, Liviu Jianu, Young Bae Jun, Dinko Juric, Madad Khan, Cengiz Kahraman, Akira Kanda, Ilanthenral Kandasamy, W. B. Vasantha Kandasamy, Abdullah Kargın, Hee Sik Kim, Xingliang Liang, Feng Liu, Xiaowei Liu, Francisco Gallego Lupiañez, Dat Luu, Yingcang Ma, Adnan Mathm, Linfan Mao, Mumtaz Ali, Cenap Ozel, Choonkil Park, Surapati Pramanik, Dmitri Rabounski, Nouran Radwan, Abdolreza Rashno, Waldyr Rodrigues, Margaret Rouse, Abdulkadir Sengur, Ajay Sharma, Le Hoang Son, Mehmet Şahin, Ridvan Şahin, Alireza Tasdighi, Ferhat Taş, Nguyễn Xuân Thảo, Selçuk Topal, Amin Vafadarnikjoo, Maikel Leyva-Vázquez, Andrușa Vătuiu, Chao Wang, George Weissmann, Jun Ye, Peng Yu, Xiaohong Zhang

Florentin Smarandache

Nidus idearum

Scilogs, V:
joining the dots

[third version]

FOREWORD

Welcome into my scientific lab!

My **lab**[oratory] is a virtual facility with non-controlled conditions in which I mostly perform scientific meditation and chats: *a nest of ideas* (**nidus idearum**, in Latin). I called the jottings herein *scilogs* (truncations of the words *scientific*, and gr. Λόγος – appealing rather to its original meanings "ground", "opinion", "expectation"), combining the welly of both science and informal (via internet) talks (in English, French, and Romanian).

<div align="center">*</div>

In this *fifth book of scilogs* collected from my nest of ideas, one may find new and old questions and solutions, mostly referring to topics on NEUTROSOPHY – email messages to research colleagues, or replies, notes about authors, articles, or books, so on. Feel free to budge in or just use the *scilogs* as open source for your own ideas!

Special thanks to all my peer colleagues for exciting and pertinent instances of discussing.

CONTENTS

Peer colleagues / Mohamed Abdel-Basset, Akeem Adesina A. Agboola, Yaman Akbulut, Anas Al-Masarwah, Mohammed A. Alshumrani, Saima Anis, Şule Bayazit Bedirhanoğlu, Said Broumi, Robert Neil Boyd, Vic Christianto, Stephen Crothers, Narmada Devi, Jean Dezert, Hojjatollah Fara-hani, Kawther Fawzi, Yanhui Guo, Minghu Ha, Bill Harrington, Qingqing Hu, Kul Hur, Saeid Jafari, Tèmítópé Gbóláhàn Jaíyéolá, Liviu Jianu, Young Bae Jun, Dinko Juric, Madad Khan, Cengiz Kahraman, Akira Kanda, Ilanthenral Kanda-samy, W. B. Vasantha Kandasamy, Abdullah Kargın, Hee Sik Kim, Xingliang Liang, Feng Liu, Xiaowei Liu, Francisco Gallego Lupiañez, Dat Luu, Yingcang Ma, Adnan Mathm, Linfan Mao, Mumtaz Ali, Cenap Ozel, Choonkil Park, Surapati Pramanik, Dmitri Rabounski, Nouran Radwan, Abdolreza Rashno, Waldyr Rodrigues, Margaret Rouse, Abdulkadir Sengur, Ajay Sharma, Le Hoang Son, Mehmet Şahin, Ridvan Şahin, Alireza Tasdighi, Ferhat Taş,

Nguyễn Xuân Thảo, Selçuk Topal, Amin Vafadarnikjoo, Maikel Leyva-Vázquez, Andruşa Vătuiu, Chao Wang, George Weiss-mann, Jun Ye, Peng Yu, Xiaohong Zhang / **17-125**

TOPICS

Strategic Vision of the Math Coordinator

Excerpts from a report to the University of New Mexico

- ✓ Focusing on Deep Learning, which is the most current strategy.
- ✓ Increase the dual credit enrolment.
- ✓ Have math topics contribute to the AS/Science (Math/Physics/Engineering Concentration) Cur-riculum General Education Core.
- ✓ Teaching more mathematical classes online.
- ✓ The UNMG mathematics curriculum is to be aligned with the state standards.
- ✓ Assess the math students, besides the CAL (Center of Academic Learning) math placement tests taken by students when they first enroll at UNMG: assess the math students by doing quizzes or assessment tests from the required prerequisites.
- ✓ In order to determine the students' mastery of required standards benchmark assessments should be conducted.
- ✓ And students experiencing difficulties in mastering math concepts should be required to frequent instructor's office hours, and be referred to ask for help from CAL.

- ✓ The students should learn the mathematical language/vocabulary (or meta-mathematics).
- ✓ The instructor should reteach forgotten math concepts.
- ✓ Teaching logically in an ordered sequence of mathematical concepts and their properties, theorems and examples.
- ✓ Teaching from simple to complex, from easy to medium and hard problems.
- ✓ Connecting math with other fields of knowledge.
- ✓ Focusing on problem solving.
- ✓ Using teaching strategies.
- ✓ Teaching and learning in groups.
- ✓ Encouraging students to do extra homework and class participation by giving them extra-points towards the final grade.
- ✓ Do an active teaching (permanent dialogue with the students), instead of passive teaching (simple lecture).
- ✓ Giving the students bonus-problems for a deeper learning.
- ✓ Using technology in the class room (calculators and smart phones with installed computing apps, Wolfram Mathematica and Apple mathematical software that graph and show

mathematical concepts (especially in geometry) in 3D, manipulatives, geometrical instruments, computer software etc.

- ✓ Keep in touch with UNM-Albuquerque Math Department in order to adjust our math curricula with theirs.
- ✓ Keep a strong cooperation with tutorial (Center of Academic Learning - CAL) through Mr. John White, CAL Director, by recommending to him every semester or year math tutors (the math tutors come mostly from my math classes, since I teach the highest level math classes in the campus).
- ✓ Monitor the math progress of TRIO and Middle High School students.
- ✓ Administrative and scientific support provided to foreign students and attracting them to come to UNM-Gallup and/or UNM-Albuquerque to do math and applied math presentations as guest speakers and math research guided by UNM math instructors.
- ✓ Computer competence is needed too for the Math Coordinator.
- ✓ Teach mathematical and statistics online-classes.
- ✓ Create websites at UNM just for students.

- ✓ Advise/Monitor the Mathematics Club for Students, the only one in campus. The club shows to the students applications of math in our everyday life (including today's Artificial Intelligence, Cybernetics, Robotics etc.), and solves recreational problems for better attracting students to do math. Encourage students to participate in math clubs.
- ✓ Website created for the Math Club:

http://fs.unm.edu/Stud/MathClub.htm

- ✓ Students develop mathematical skills needed in lives.
- ✓ Chair the AMATYC (American Mathematical Association for Two-Year Colleges) Math Competition for Students, which is nationwide over all USA and Canada, and UNM-Gallup as a team of best five math students got awards such as 1st, 2nd, or 3rd place in the State of New Mexico many times receiving diplomas, and several of our students got individual financial awards.
- ✓ Do a teamwork of four math faculty, mobilize about 400 UNM math students every semester, grading the tests, selecting the first five best students in the campus that form the campus math team, and reporting the result to a U.S.

Eastern College that centralize the results all over USA and Canada two-year colleges.

✓ Create a website for the AMATYC (American Mathematical Association of Two-Year Colleagues) competition and committee was created:

http://fs.unm.edu/Stud/AMATYC-committee.htm

Make math books with solved problems for all UNM math level students, from Beginning Algebra to Calculus III for Science, with easy, medium, and hard problems. They can be downloaded as open sources from my UNM website below:

http://fs.unm.edu/students.htm.

The books also contain theories that explain various math concepts and procedures for solving mathematical problems, plus formulas, and 2-dimensional and 3-dimensional geometrical figures.

1. *Algebraic Problems and Exercises (Sets, Sets Operations, Relations, Functions, Aspects of Combinatorics)* (for Math 120, Math 121, Math 150)

   http://fs.unm.edu/AlgebraicProblemsExercises.pdf

2. *Possible Subjects for High School Examination* (for Math 99, Math 100, Math 120)

   http://fs.unm.edu/PossibleSubjects.pdf

3. *My High School Math NoteBooks* (mathematical formulas, equations, and geometrical figures for all classed) (mathematical formulas, equations, and geometrical figures for all UNM math classes)

   http://fs.unm.edu/MyHighSchoolMathNotebook1.pdf

   http://fs.unm.edu/MyHighSchoolMathNotebook2.pdf

4-5. *Compiled and Solved Problems in Geometry and Trigonometry* (for Math 123)

   http://fs.unm.edu/ProblemsGeomTrig-en.pdf

   http://fs.unm.edu/VariancePlaneGeometry.pdf

6-7. *Proposed Problems of Mathematics, Vol. I and Vol. II* (for Math 100, Math 120, Math 121, Math 150)

   http://fs.unm.edu/Paesp-en.pdf

   http://fs.unm.edu/ProposedProblems2.pdf

8. *Calculus I, II and III* for UNM-Gallup Students [for Calculus for Science (Math 162, Math 163, Math 264), and for Calculus for Business (Math 180, Math 181)]

   http://fs.unm.edu/Calculus-I-II-III.pdf

Creating online resources for math students:

- ✓ Create 12 websites for all math classes, where to include flyers with math formulas and solving problems methods and strategies, and pre-tests and pre-final (which are guide tests and guide final) in order to help the students to repaper for their exams. These websites save a lot of paper since we do not need to print the

flyers and guide tests. Continuously update these websites:

http://fs.unm.edu/Stud/Math100.htm
http://fs.unm.edu/Stud/Math118.htm
http://fs.unm.edu/Stud/Math119.htm
http://fs.unm.edu/Stud/Math120.htm
http://fs.unm.edu/Stud/Math121.htm
http://fs.unm.edu/Stud/Math123.htm
http://fs.unm.edu/Stud/Math150.htm
http://fs.unm.edu/Stud/Math162.htm
http://fs.unm.edu/Stud/Math163.htm
http://fs.unm.edu/Stud/Math180.htm
http://fs.unm.edu/Stud/Math245.htm
http://fs.unm.edu/Stud/Math264.htm

Therefore the math instructors should enhance the teaching with online materials created by themselves.

Theory of possibility, indeterminacy, and impossibility

as particular case of theory of neutrosophy (<A>, <neutA>, <antiA>).

Neutrosophic Probability Distributions

To Kawther Fawzi

You have a good idea to consider classical probability distributions, and then insert indeterminacy into them

(either making them thick neutrosophic functions, or unclear values of the functions etc.).

Refined Neutrosophic Sentiment Analysis on Sexual Harassment

To Ilanthenral Kandasamy

What about if we refine "positive" into: strong positive (70-100% positive], middle positive (40-70% positive],

low positive (10-40% positive]; and similarly for "negative" as:

strong negative (70-100% positive], middle negative (40-70% positive],

low negative (10-40% negative],

then [10% positive - 10% negative] as indeterminacy.

As Indeterminacy we can also include: false allegations of sexual harassment, and true allegations of sexual harassment but unreported...

Three-Way Decision is actually a Neutrosophication of the Universe

The Three-Ways Decision, which means to split the universe into three regions: two opposite regions (*positive*, *negative*), and the boundary (*indeterminate*) region, is just the process of NEUTROSOPHICATION of the universe, i.e. split the universe into three parts as in neutrosophy:

<div align="center">

<A>, *<antiA>*, and *<neutA>*.

</div>

Similarly (accept, reject, and noncommit) in decision making, and the same as:

(*accept*, *reject*, *undecided*)

used in *neutrosophic multi-criteria decision making*.

Yin - Yang and Neutrosophy

Feng Liu

Logic acts only as some belief, because different consciousness creates different beliefs. As we cannot regard which is absolutely correct, or which is absolutely wrong - they are all reasonable, based on their consciousness, neutrosophic logic might fail to explain <anti-A> is also correct while A is correct.

Florentin Smarandache

But this is incorrect with respect to neutrosophic logic, since in neutrosophic logic, (T, I, F), the degrees of truth, indeterminacy and falsehood respectively, are independent; which means that <A> and <antiA> can be both true in the same time if you assign the values: T = 1 and F = 1; or both false if you want in the same time (T = F = 0).

In fuzzy logic and in intuitionistic fuzzy logic you may NOT have T = F = 1.

So, you confuse the neutrosophic logic with fuzzy and intuitionistic fuzzy logic.

Feng Liu

It might turn to look for <neutA> for mathematically reasonable solutions. It is not correct in knowledge. For example, crescent, full moon and no moon are all correct regarding to the existence of moon. Form and emptiness are both correct regarding to matter (Buddhism, e.g. Heart Sutra).

Florentin Smarandache

With respect to Indeterminacy/Neutrality, it may also be zero, i.e. <neutA> = 0, so it is not a contradiction in your above example if you use neutrosophic logic.

Feng Liu

The truth is variable in terms of time and other factors: yes, it is right. You can denote $T(v_1, v_2, ...)$ meaning the truth depending on the variables $v_1, v_2, ...$.

Florentin Smarandache

The distinction between Yin - Yang and Neutrosophy is that neutrosophy adds the <neutA> (the neutral / indeterminate part between the Chinese opposites Yin and Yang).

Neutrosophic Logic vs. Intuitionistic Fuzzy Logic

To Said Broumi

In the example you sent me with: 7 red balls, 2 blue balls, and 1 ball black:

$$T(red) = 0.7.$$

If "blue" color is considered the opposite of "red" color, then we may say:

$$F(red) = 0.2, \text{ and } I(red) = 0.1.$$

But let's change a little this example:

One has 7 red balls, 2 yellow balls, and 1 black ball.

Now, "yellow" is not the opposite of "red", therefore one has:

$T(red) = 0.7$, $I_1(red) = 0.2$, $I_1(red) = 0.1$, and $F(red) = 0.0$.

This example does not work in IFL, since there is no opposite of "red", and in addition in IFL you cannot refine (split) the Indeterminacy (I) as we do in NL.

When the sum of single-valued neutrosophic components T+I+F =1, the Neutrosophic Logic (NL) representation is the same as in Intuitionistic Fuzzy Logic (IFL), yet the aggregation operators are still different, since in NL you apply AND, OR etc. on all three neutrosophic components T, I, F, while in IFL you apply AND, OR etc. on T, F only (so "I" is ignored, which is not correct).

Quantum Logic vs Many-Valued Logics

To George Weissmann

There are no quantum logic operators (negation, union, intersection, implication), as we have in fuzzy, intuitionistic fuzzy, and neutrosophic logics; mostly abstract theorems in abstract spaces in quantum logic...

Not clear explanations...

The failure of the distributive law { "*p* and *q* (*q* or *r*) = (*p* and *q*) or (*p* and *r*)" } that occurs in quantum logic, occurs in most of many-valued logics, and this depends on the class of many-valued operators used.

Actually even the field of quantum physics is in same degree controversial...

Applied Logic vs. Pure Logic

Florentin Smarandache

Those journals that censorship fuzzy and intuitionistic fuzzy and neutrosophic papers are too theoretical... Pure theory without applications brings nothing [just *art pour l'art*… playing with math symbols in imaginary spaces]!

Applications are most important in our everyday life.

Selçuk Topal

I (and Lawrence S. Moss, is my unofficial advisor from Indiana University) agree with you and others. Applied Logic is Applied Mathematics and most of the ideas without any application base are pure fantasy (not fantastic).

<drought, moderate, rainy> as a trivial Neutrosophic Triplet

To Mumtaz Ali

You may think at applications of *Neutrosophic Triplets* into the agriculture research in Australia:

> the triad: *<drought, moderate, rainy>*,

that you work with, may be used as a neutrosophic triplet.
It's trivial, ignorable, but a big research starts from a small idea.

Possibility and Necessity

Anas Al-Masarwah

If $A = (T_A, I_A, F_A)$ is a neutrosophic set, is it true that: the possibility (@) the necessity (#) defined as follows:

$$@A = (1 - F_A, I_A, F_A)$$
$$\#A = (T_A, I_A, 1 - T_A)$$

Florentin Smarandache

In general, the I_A and F_A are defined in the same way, while T_A is defined differently from them.

See *http://fs.unm.edu/neutrosophy.htm*.

Your definitions are still good.

Other definitions may work too, mostly based on min / max / max for necessity, and max / min / min for possibility.

For examples:

$$\#A = (\min\{T_A, 1 - F_A\}, \max\{I_A, 1 - I_A\}, \max\{F_A, 1 - T_A\})$$
$$@A = (\max\{T_A, 1 - F_A\}, \min\{I_A, 1 - I_A\}, \min\{F_A, 1 - T_A\}).$$

Depending on the applications and experts, more possibility and necessity operators may be defined.

If T_A, I_A, F_A are intervals (or in general subsets) of [0, 1] I have simply used:

$$\#A=(\inf\{T_A\}, \sup\{I_A\}, \sup\{F_A\})$$
$$@A=(\sup\{T_A\}, \inf\{I_A\}, \inf\{F_A\})$$

but they do not work well for T_A, I_A, F_A as single-valued numbers in [0, 1] because they give $\#A = @A$.

Yet, even for subsets of [0, 1] we can adjust your definitions and my previous definitions by doing operations on real subsets.

Neutrosophic Syllogistic Systems

Florentin Smarandache

For the <neutrosophic syllogistic systems> that you developed with Dr. Schumann, maybe they might be connected with the <neutrosophic dynamic systems>.

Selçuk Topal

I am a computer scientist. So, if you need a computer implementation dealing with any neutrosophic study, please let me know.

Florentin Smarandache

Wow, this is wonderful. You might be able to implement *neutrosophic operators*, or other things from the *neutrosophic environment*.

Refined Neutrosophic Linguistic Lattice

To Selçuk Topal

The idea would be to refine our *Neutrosophic Linguistic Lattice*, and we get a *Refined Neutrosophic Linguistic Lattice*.

We have used <A>, <neutA> and <antiA>.

But, if we refined, we get:

<A> is refined to <A$_1$>, <A$_2$>, ...;

then <neutA> is refined to <neutA$_1$>, <neutA$_2$>, ...;

and <antiA> is refined to <antiA$_1$>, <antiA$_2$>, ...

For example, <A> = white, while <A$_1$>, <A$_2$>, … are nuances of white;

<antiA> = black, while <antiA$_1$>, <antiA$_2$>, ... are nuances of black,

while <neutA> = neither white nor black, hence <neutA$_1$> = blue, <neutA$_2$> = red, ...

Another example: <A> = U.S. Republican Party, then <A1> is The Republican Party from Arizona, <A2> The Republican Party from California, ...;

<antiA> = U. S. Democratic Party, then <antiA$_1$> is The Democratic Party from Arizona, <antiA$_2$> The Democratic Party from California, ...;

while <neutA> = U. S. people who belong to no party, with <neutA$_1$> = people from Arizona who belong to no party, <neutA$_2$> people from California who belong to no party etc.

Neutrosophic Statistics

To Nouran Radwan

You can do in a neutrosophic way, replacing the Likert scale of 1 to 10 by (t,i,f) values for each criteria:

t = degree of truth of each criteria,

i = degree of indeterminacy of each criteria,

f = degree of falsehood of each criteria.

Then you compute the Mean (doing the mean of t's, then mean of i's, and then mean of f's).

Then compute the Standard Deviation of t's, standard deviation of i's, and standard deviation of f's.

You can do in the same way the following:

for the Skew and Kurt: you use the classical formulas of the Skew and Kurt, but you compute:

- o the Skew separately for "t", then for for "i", and then for "f";
- o and the Kurt separately for "t", then for "i", and then for "f".

This way was never done before.

Neutrosophic Manifold

Maybe we should also investigate a *Neutrosophic Manifold* based on N_n, where N_n is the set of neutrosophic numbers.

Also, moving to neutrosophic topology.

Neutrosophic Codes

Can't we introduce an indeterminacy into coding and have a different coding strategy, that was not done before? Or a character could be either determinate or indeterminate?

We may consider "I" inside with a specific signification. You may pass it to Dr. R. Sujatha and Dr. R.S. Raja Durai.

It would be a completely new approach to the coding theory if we use neutrosophic numbers. Nobody before has done it.

Coding Theory

To Mumtaz Ali, W. B. Vasantha Kandasamy:

Would be possible to consider a coding theory which has an infinite number of symbols?

At the beginning the alphabet of symbols can be finite, but it may reproduce itself and generate new symbols, so it would be harder to be decoded by eavesdroppers.

I also think that it is possible to extend the *soft code* to *neutrosophic soft code*.

Neutrosophic Code Theory

To Alireza Tasdighi

The code books I sent you are more theoretical. We talked about the possibility of designing bicodes, set codes, MRD codes, super special codes - and their counterpart neutrosophic bicodes and neutrosophic set codes etc.

No implementation application and no industrial project have been done so far.

If you're interested in such things, please go ahead and do them - you will be the first such-doing researcher.

Neutrosophic Tolerance

To Şule Bayazit Bedirhanoğlu

How are acceptance tolerance, indeterminacy tolerance, rejection tolerance values determined ?

Florentin Smarandache

There are some possibilities to work on them.

You may consider the interval-valued neutrosophic set {i.e. T, I, F are intervals in [0, 1]}.

If the value of the acceptance let's say T = 0.7 and the acceptance tolerance is 0.1, then you take T = [0.6, 0.8] or T + or - 0.1.

Similarly for indeterminacy tolerance, and rejection tolerance.

The value of the tolerance depends on the expert and on the application, I do not think it is the same always.

See the book about interval-valued neutrosophic set.

Another method will be to refine: T into T_1 and T_2, I into I_1 and I_2, F into F_1 and F_2.

T_1 = acceptance without tolerance, T_2 = acceptance with tolerance; etc.

Infinite Graphs

The book of *fuzzy cognitive maps* and *neutrosophic cognitive maps* has been very much read online - among the most math read from my UNM website.

Is there any study on infinite graphs? Is it possible to have applications of infinite fuzzy/cognitive maps?

Neutrosophic Maps

To Maikel Leyva-Vázquez

Fuzzy Neutrosophic Cognitive Map [Numerical + Literal]

A *Fuzzy Neutrosophic Cognitive Map* is a graph whose edges' and vertexes' values or several of the them have degrees of membership as subsets included in [0, 1], and others are indeterminate (i.e. I = literal indeterminacy).

Intuitionistic Fuzzy Neutrosophic Cognitive Map [Numerical + Literal]

A *Intuitionistic Fuzzy Neutrosophic Cognitive Map* is a graph whose edges' and vertexes' values or some of the them have degrees of membership and degrees of nonmembership as subsets included in [0, 1], and others are indeterminate (i.e. I = literal indeterminacy).

There may also be hybrids of all three categories:

Fuzzy + Intuitionistic Fuzzy + Neutrosophic Graphs
[Numerical + Numerical + Numerical], when the graph
edges' and vertexes' values or some of them have
degrees of membership as subsets of [0, 1], others have
degrees of membership and nonmembership as
subsets of [0, 1], and the last ones have degrees of
membership and indeterminacy and nonmembership
as subsets of [0, 1].

Neutrosophic Cognitive Maps

To Hojjatollah Farahani, W. B. Vasantha Kandasamy, Said
Broumi, Mumtaz Ali

So far one has used {-1, 0, 1, I} in neutrosophic graphs in
Cognitive Neutrosophic Maps.

Meaning, the relation (or edge) between two vertexes A
and B into a directed graph, or A → B, can be: -1
(strongly negative), 0 (no relation), 1 (strongly
positive), I (indeterminate relation).

But we might also consider that a vertex A influences
vertex B, or A → B in a (T, I, F) percentage, i.e. A
influences B in the following way: T% positively, F%
negatively, and I% indeterminately (or neutrally, i.e.
neither positive nor negative) influence.

We can use this in psychology too defining *(t,i,f)-*
neutrosophic psychological graphs.

Therefore, we can define and apply a new type of *Neutrosophic Cognitive Maps*.

Neutrosophic Megagraph

To Said Broumi

In a general way, we can consider a *megagraph*, which is a graph that has *megavertices* and *megaedges*: a megavertex is formed by a group of vertices, and between any two megavertices there is a megaedge (i.e. many edges connecting them).

And then extended to a *Neutrosophic Megagraph*.

Neutrosophic Refinement

To Said Broumi

For the first one we can extend the *Intuitionistic Fuzzy Set* to *Refined Neutrosophic Set*, by refining the indeterminacy "I" into I_1 = percentage of people who casted back votes (cutting all candidates), I_2 = percentage of people who casted blank votes (not choosing any candidate), and I_3 = percentage of people who did not come to vote.

When we apply the *Intuitionistic Fuzzy Set* operators (intersection, union, negation, implication, etc.), we only apply them on T and on F (i.e. indeterminacy "I" is ignored, which is not fear), but when we apply the neutrosophic operators (intersection, union, negation,

implication, etc.) we apply them on all T, F, and I (so indeterminacy "I" is taken into consideration.

The degree of a neutrosophic variable is formed by three sub-degrees: for T, for F, and for I, while the fuzzy variable does not have a degree of indeterminacy.

Neutrosophic Overset/Underset/Offset Graphs

To Said Broumi

We can do some work on the *neutrosophic overset / underset / offset GRAPHS* (never done before). You can consider single-valued or interval-valued cases.

Neutrosophic overset/underset/offset are thus [*Single Valued Neutrosophic Soft Over / Under / Offsets*, done by P. Geetha, K. Anitha, International Journal of Science and Research (IJSR), Volume 5 Issue 11, November 2016, 1352-1356] getting momentum since they reflect our reality (people working overtime [for overset, when membership degree > 1], people not working and doing more damage to the company by destroying machinery etc. [for underset, when membership degree < 0] etc.

Refined Neutrosophic Set in Image Processing

To Abdolreza Rashno

I saw that you use the general definition of neutrosophic set, i.e. when T, I, F are subsets of [0, 1]. If this definition might be difficult to use, you can consider:

1) either the simplest case when T, I, F are just single numbers in [0, 1]; it is called Single-Valued Neutrosophic Set (SVNS);

2) or T, I, F may be intervals in [0, 1], which is called Interval Neutrosophic Set (INS);

3) there are also cases when T, I, F are discrete finite subsets of [0, 1], which is called Hesitant Neutrosophic Set (HNS);

for example: T = {0,2, 0,5, 0.9}, I = {0.1, 0.8}, F = {0.0. 0.2, 0.6, 0.8}.

In your last paper you already did a refinement, which is very good; I feel nobody previously has done neutrosophic refinement in image analysis; that's why your work is remarkable.

You considered, T split (refined) as T_R, T_G, T_B, and similarly I split as I_R, I_G, I_B.

F could be considered empty-set (ϕ), as you did).

- You used as "white" (T), "grey" (I), and "black" (F).

Again, if needed in the application, you can refine;

for example "white" as "white red" [*light red*], "white green" [*light green*], "white blue" [*light blue*], etc.;

similarly refine "black" as "black red" [*dark red*], "black green" [*dark green*], "black blue" [*dark blue*] etc.;

and similarly for "grey".

The Inverse of Single-Valued Neutrosophic Number

To Amin Vafadarnikjoo

The inverse of *single-valued neutrosophic number* $N = <t, i, f>$ is a particular case of neutrosophic division of single-valued neutrosophic numbers, i.e. the inverse N^{-1} of N:

$$N^{-1} = <1, 0, 0> / N = <1, 0, 0> / <t, i, f>$$
$$= < 1/t, i/(i-1), f/(f-1) >,$$

where, if a component result is less than *0* (zero) then it is replaced by *0*, and if a component result is over *1* (one) then it is replaced by *1*.

Neutrosophic Crisp Set

To Tèmítópé Gbóláhàn Jaíyéolá

Here it is the point of this *Neutrosophic Crisp Set* book [*http://fs.unm.edu/NeutrosophicCrispSetTheory.pdf*]:

Instead of (<A>, <neutA>, <antiA>), where each of <A>, <neutA>, <antiA> is a single element, we may consider each of <A>, <neutA>, <antiA> as being a set.

{ In the book the notations are (A_1, A_2, A_3), or (A, B, C) for simplification. }

This is because in our everyday life, we have:

<A> = a set of friends;

<antiA> = a set of their enemies;

<neutA> = a set of neutrals, i.e. neither friends nor enemies.

If some of the above three sets is empty, it is still okay.

For example,

<A> can be a country, which is a set of its citizens;

<antiA> is the enemy country of this country;

<neutA> is a neutral country.

Now, the intersections between <A>, <neutA>, and <antiA> can be any (i.e. empty, or nonempty).

Dr. A. Salama and I have studied several intersection cases, resulting in several types of neutrosophic crisp sets. But more cases can be defined.

We can have all possible intersections nonempty, *for example*:

<A> $\cap$ <neutA> = nonempty set, since for example some elements from <neutA> may be sympathizers (or hidden spies) working for <A>, or some elements from <A> may not care about their country i.e. they are mostly neutral.

Similarly <neutA> $\cap$ <antiA> = nonempty set, since for example some elements from <neutA> may be sympathizers (or hidden spies) working for <antiA>, or similarly some elements from <antiA> may not care about their country i.e. they are mostly neutral.

Even <A> $\cap$ <antiA> = nonempty set, since for example some elements from <A> may be sympathizers (or hidden spies) working for <antiA>, and/or reciprocally.

We may also have:

<A> $\cap$ <neutA> $\cap$ <antiA> = nonempty set, since for example there may be a double spy in <neutA> that works for both <A> and <antiA>, and other situations.

But we may consider the cases when some (or all intersections) are empty, depending on applications and experts.

For example, let <A> be a small family, <antiA> another small enemy family, and <neutA> a neutral family, and we choose all intersections be empty.

We may connect somehow the neutrosophic triplet sets with the neutrosophic crisp sets.

What about such paper, but getting some applications? You had a good intuition to ask about NCS.

Complex Neutrosophic Cubic Set

To Said Broumi, Surapati Pramanik, Young Bae Jun

Dr. Surapati Pramanik is right, the *Neutrosophic Cubic Set* is a combination (hybrid) of *Interval-Valued Neutrosophic Set* and *Single-Valued Neutrosophic Set*.

By the way, we can extend the *Complex Neutrosophic Set* to *Complex Neutrosophic Cubic Set* - as a combination

(hybridization) of *Interval-Valued Complex Neutrosophic Set* and *Single-Valued Complex Neutrosophic Set*.

There are several published articles about NCS. Prof. Dr. Young Bae Jun from South Korea was the first I think who proposed the NCS.

Some idea of applications would be, for example, when we know that the degree of truth is between [0.2, 0.5] according to a source of information, but another source of information says that the degree of truth is mostly closer to 0.3.

Similarly for the degrees of indeterminacy and falsehood.

Therefore, we may have two (sometimes even more) independent sources of information providing information about the same thing.

Another interpretation could be using classical statistics:

For example, the degree of truth is 0.4, with a standard deviation (approximation) of 0.1 { meaning that the degree of truth is between [0.3, 0.5], also meaning that it is a higher chance that the degree of truth be close to the mean 0.4, and lower chance for the degree of truth be further from 0.4 }.

Similarly for the degrees of indeterminacy and falsehood.

Y. B. Jun has used NCSs especially in *neutrosophic algebraic structures*.

Neutrosophic Hypercubic Set

We can think and find more applications of NCS, i.e. when the degrees of truth/indeterminacy/falsehood have two or more values each of them.

Look at something from our everyday life.

For example, the degree of truth changes from time t_1 to time t_2 and so on, and we get a sequence of truths.

One simple example:

There is a soccer game between Morocco and Algeria.

You say before the game that it is between [0.7, 0.8] chance that Morocco will win (truth).

But the game starts and after the first half the score is still 0-0. Then you commence to dough and will say that there is a smaller chance between [0.3, 0.4] that Morocco will win.

Then in the second half, Algeria marks a goal, 0-1... Wow, you say, the chance of Morocco for wining is much lower, maybe [0.1, 0.3]. Then Morocco marks a goal too, 1-1. Your hope increases, [0.2, 0.5]... and so on.

Therefore you have a sequence of subjective degrees of truth (winning) at different times:

[0.7. 0.8], [0.3, 0.4], [0.1, 0.3], [0.2, 0.5], ...

And similarly for the degrees of tie game (indeterminacy), and degrees of losing (falsehood).

Therefore, it is possible to extend the Neutrosophic Cubic Set to the Neutrosophic Hypercubic Set, where there is

a sequence of n ≥ 2 degrees of truths, a sequence of n ≥ 2 degrees of indeterminacy, and a sequence of n ≥ 2 degrees of falsehood – using time sequences.

Therefore, the degrees of T, I, F of the same element x with respect to the same set A, may change because of various parameters that affect x and A (such as: time, economy, weather, politics, emotions, etc.).

Neutrosophic Triplets

To Kul Hur

The *Neutrosophic Triplets* were introduced for the first time in 2016 by Smarandache and Ali [1].

They are derived from neutrosophy [2], founded in 1998, which is a generalization of dialectics, and it is a new branch of philosophy that studies the origin, nature, and scope of neutralities, as well as their interactions with different ideational spectra.

Neutrosophy is also the basis of *neutrosophic logic, neutrosophic probability, neutrosophic set, neutrosophic statistics, neutrosophic algebraic structures* and so on.

Neutrosophy and its neutrosophic derivatives are based on triads of the form

(<A>, <neutA>, <antiA>),

where <A> is an entity, <antiA> is the opposite of <A>, while <neutA> is the neutral between <A> and <antiA>.

The set of neutrosophic triplets, embedded with a well-defined law * that satisfies some axioms, form the neutrosophic triplet algebraic structures.The first studied one was the neutrosophic triplet group [1].

We introduce another structure, the neutrosophic triplet subgroup, and we study several of its properties.

The *Neutrosophic Triplet Algebraic Structures* follow on the steps of classical algebraic structures, with two distinctions:

- the classical unit element is replaced by the neutrosophic elements neut(a)'s;

- and the classical inverse element is replaced by the neutrosophic elements anti(a)'s.

I tried defining a new neutrosophic triplet equivalence relationship (NTER):

$$a R b \text{ iff anti}(a) R \text{anti}(b),$$

but I could not get an example that has more than one element in each class.

You might try finding one using Cayley's Tables?

If we take the subgroupoid of all idempotent elements ($a^2 = a$) of a groupoid, then we have only neutrosophic triplets of the form (a, a, a), then the relationship

$$a R b \text{ iff } b = \text{neut}(a)$$

maybe an equivalence.

References:

[1] Florentin Smarandache, Mumtaz Ali, *Neutrosophic Triplet Group*, Neural Comput. & Applic., 2016, DOI: 10.1007/s00521-016-2535-x

[2] Florentin Smarandache, *Neutrosophy. Neutrosophic Probability, Set, and Logic*, ProQuest Information & Learning, Ann Arbor, Michigan, USA, 105 p., 1998; *http://fs.unm.edu/eBook-neutrosophics6.pdf*.

Neutrosophic Triplet Ring or Field

To Mehmet Şahin, Abdullah Kargın

In a *Neutrosophic Triplet Ring or Field* (M, *, #) one has two types of neutrosophic triplets: first type is with respect to the law *, and second type with respect to the law #.

I mean, the neutrosophic triplets, in general, are different from a law to another law.

Talking about your Example { (φ, {1}, {2}, {1,2}), ∪, ∩ }:

Neutrosophic Triplets with respect to ∪, whose classical neutral element is the empty set φ:

<{1}, {1}, {1}>, <{1}, {1}, φ >;

<{2}, {2}, {2}>, <{2}, {2}, φ >;

<{1,2}, {1,2}, {1,2}>, <{1,2}, {1,2}, φ >, <{1,2}, {1,2}, {1}>, <{1,2}, {1,2}, {2}>.

Neutrosophic Triplets with respect to ∩, whose classical neutral element is {1, 2}:

< φ, φ, φ >, < φ, φ, {1}>, < φ, φ, {2}>, < φ, φ, {1, 2}>;

<{1}, {1}, {1}>, <{1}, {1}, {1, 2}>;

<{2}, {2}, {2}>, <{2}, {2}, {1, 2}>.

In general, let X be a universe of discourse and $P(X)$ the power set of X. Then:

$(P(X), \cup, \cap)$ is a neutrosophic extended triplet commutative field.

The neutrosophic extended triplets with respect to the union of sets $\cup$ are: $<A, A, B>_\cup$, where $A, B \in P(X)$, with $B \subseteq A$.

If $A = \varphi$, then its only neutrosophic extended triplet is

$< \varphi, \varphi, \varphi >_\cup$.

And the neutrosophic extended triplets with respect to the intersection of sets $\cap$ are: $<A, A, C>_\cap$, where $A, C \in P(X)$, with $C \supseteq A$.

If $A = X$, then its only neutrosophic extended triplet is

$< X, X, X >_\cap$.

Neutrosophic Triplet Group vs. Classical Group and Molaei General Group

To Tèmítópé Gbóláhàn Jaíyéolá

We have proved that when all elements of *Neutrosophic Triplet Group* (NTG) are cancellable, then NTG becomes a *Classical Group* (CG). Also, there are cases when NTG reduces to a *Molaei General Group* (MGG) as you observed, but deeper research herein is required.

Generalized Group vs. Neutrosophic Triplet Group

To Tèmítópé Gbóláhàn Jaíyéolá, Akeem Adesina A. Agboola

The distinction between *Generalized Group* (GG) and *Neutrosophic Triplet Group* (NTG) is that in NTG for each x there may exist more neut(x)'s and/or more anti(x)'s, while in the GG - as you said - for each x there is only one neutral and only one inverse for each x.

Similarity between GG and NTG is that the neutral is different from an element to another, unlike in the classical group where there is a single neutral, the same, for all elements x into the classical group.

Example 1.

I give you below an example of Neutrosophic Triplet Set (not necessarily group, since the law * is non-associative - actually what is given below is a Neutrosophic Triplet Loop).

Let the set L = {a, b, c, d}, endowed with the law * defined according to the Cayley Table below:

*	a	b	c	d
a	a	a	b	b
b	a	d	b	c
c	b	b	c	d
d	b	c	d	c

With the following neutrosophic triplets:

<a, a, a>, <a, b, c>, <a, b, d> {therefore "a" has 2 neutrals: a, b; and 3 anti's: a, c, d}

<b, c, d>

<c, c, c>

<d, c, b>, <d, c, d> {therefore "d" has 2 anti's}.

Please see *Example 2*, where the law is associative and commutative, but an element x has many anti(x)'s:

In Z_{10} = {0, 1, 2, ..., 9}, with the classical multiplication modulo 10 (*), one has:

<0, 0, 0>, <0, 0, 1>, <0, 0, 2>, ..., <0, 0, 9>

so for 0 one has: neut(0) = 0, but ten anti(0)'s = 0, 1, 2, ..., 9;

<2, 6, 3>, <2, 6, 8>; so two anti(2)'s = 3, 8;

<4, 6, 4>, <4, 6, 9>; so two anti(4)'s = 4, 9;

<5, 5, 1>, <5, 5, 3>, <5, 5, 5>, <5, 5, 7>, <5, 5, 9>, so four anti(5)'s = 1, 3, 5, 7, 9;

<6, 6, 1>, <6, 6, 6>, so two anti(6)'s = 1, 6;

<8, 6, 2>, <8, 6, 7>, so two anti(8)'s = 2, 7.

Types of Neutrosophic Triplet Sets

To Xiaohong Zhang

I have two definitions for NTS (*Neutrosophic Triplet Set*):

Let (S, *) be a set, where the law * is well-defined.

1) S is a NTS if, for any x in S, there is a neut(x) and anti(x) in S, that are the neutral (different from the unitary element) and respectively the opposite of x.

2) S is a NTS if, for any x in S, there is a neutrosophic triplet (a, b, c) included in S, such that x is in {a, b, c}.

For example:

Z_5 = {0, 1, 2, 3, 4}, with × as multiplication modulo 5, is a NTS of second type since:

(0,0,0), (0,0,1), (0,0,2), (0,0,3), (0,0,4)

are trivial neutrosophic triplets.

To Xiaohong Zhang, Mumtaz Ali, Tèmítópé Gbóláhàn Jaíyéolá

Actually we have two types of NT Sets.

1) S is a NTS1 if for any x in S there exist a neut(x) and anti(x).

2) S is a NTS2 if for any x in S there exist a triplet (a,b,c) in S such that x = a or x = b or x = c.

This second definition is more general (extends the first), and includes cases when an element has more neutrals.

Neutrosophic Set-Triplet

To Xiaohong Zhang

In a *Neutrosophic Triplet* <a, neut(a), anti(a)> "a" is a single element.

But we may extend the single element "a" to a set "A".

So, we may have <A, neut(A), anti(A)>, as in neutrosophy, where all A, neut(A), anti(A) are sets. Why did I extended from a single element "a" to a set of elements "A"?

Because in our everyday life, we may have a group of people (may be an association, a country, etc.) A, their enemies anti(A), and their neutrals neut(A).

Now, the interesting part is that the intersections among A, neut(A), anti(A) may be empty or non-empty (depending on the application to solve) - because some elements from neut(A) or from anti(A) may be spies for or against A, or some elements from any of these three sets may be spies, or double or triple spying agents, for the others.

m-Valued Refined Neutrosophic Triplet

We can go further and extend our *Neutrosophic Triplet* (a, neut(a), anti(a)) to a *m-valued refined neutrosophic triplet*, in a similar way as it was done for T_1, T_2, ...; I_1, I_2, ...; F_1, F_2, ... (i.e. the refinement of neutrosophic components).

Instead of single refined neutrosophic set, we can extend it to interval refined neutrosophic set, which means that each T_1, T_2, ..., I_1, I_2, ..., F_1, F_2, ... can be intervals (or at least one of them to be an interval of [0, 1]).

It will work in some cases, depending on the composition law *. It depends on each * how many neutrals and anti's there is for each element "a".

Neutrosophic Extended Triplet Group & General Group

To Tèmítópé Gbóláhàn Jaíyéolá

For example a paper on *Neutrosophic Extended Triplets* {*htttp://fs.unm.edu/NeutrosophicTriplets.htm*}, when the neut(x) is allowed to also be equal to the classical algebraic unit element.

We'll get a richer structure of a NET Group.

What now will be the connection between the *Neutrosophic Extended Triplet Group* and the *General Group*?

Neutrosophic Extended Triplets & Neutrosophic Extended Duplets

To Xiaohong Zhang, Xingliang Liang

I have extended the *Neutrosophic Triplets*, by including the classical unit element among the neutrals, and I called them neutrosophic extended triplets:

http://fs.unm.edu/NeutrosophicTriplets.htm,

and the neutrosophic duplets to neutrosophic extended duplets (in the same way, having included the classical unit element among neutrals):

http://fs.unm.edu/NeutrosophicDuplets.htm

Let's see an example.

Z_5 = {0, 1, 2, 3, 4}, with multiplication, modulo 5.

It is a classical group, with classical unit = 1, and each element (except 0) has an inverse.

a) From a classical group point of view, we arrange the elements as:

<element, classical neutral element,
  classical inverse of the element>,

and we get:

<1,1,1>, <2,1,3>, <3,1,2>, <4,1,4>.

b) Let's consider the 'neutrosophic triplets' (meaning that the neutral is not allowed to be equal to 1):

<0,0,0>, <0,0,1>, <0,0,2>, <0,0,3>, <0,0,4>.

c) Now let's consider the 'neutrosophic extended triplets' (meaning that the neutral is allowed to be equal to 1):

<1,1,1>, <2,1,3>, <3,1,2>, <4,1,4>;
<0,0,0>, <0,0,1>, <0,0,2>, <0,0,3>, <0,0,4>.

The *Neutrosophic Extended Triplet Group* enriches the classical group, since the elements have more neutrals and more opposites besides.

Neutrosophic Extended Triplets

To W. B. Vasantha Kandasamy, Tèmítópé Gbóláhàn Jaíyéolá, Mumtaz Ali, Mehmet Şahin, Abdullah Kargin

I have thought at generalizing the *Neutrosophic Triplets* to *Neutrosophic Extended Triplets* (NETs), by allowing the classical unitary element to be a *neut(x)*, so enriching the structure of a classical group.

See below the UNM website and the definition of NETs:

http://fs.unm.edu/neutrosophicTriplets.htm.

Definition of Neutrosophic Extended Triplet (NET).

A neutrosophic extended triplet is a neutrosophic triplet, defined as above, but where the *neutral* of *x* {denoted by *eneut(x)* and called "extended neutral"} is allowed to also be equal to the classical algebraic unitary element (if any). Therefore, the restriction "different from the classical algebraic unitary element if any" is released.

As a consequence, the "extended opposite" of *x*, denoted by *eanti(x)*, is also allowed to be equal to the classical inverse element from a classical group.

Thus, a neutrosophic extended triplet is an object of the form <*x*, *eneut(x)*, *eanti(x)*>, for *x*∈N, where *eneut(x)*∈N is the *extended neutral* of *x*, which can be equal or different from the classical algebraic unitary element if any, such that:

$$x *_e neut(x) = _e neut(x) * x = x$$

and anti(x)∈N is the extended opposite of x such that:

$$x *_e anti(x) = _e anti(x) * x = _e neut(x).$$

In general, for each *x*∈N there are may exist many *eneut*'s and *eanti*'s.

Neutrosophic Picard Modular Group

To Saima Anis

We can extend the *Picard Modular Group* to *Neutrosophic Picard Modular Group*, by using numbers of the form

a + bI, where *a, b* are real numbers and *I* = literal indeterminacy, where $I^2 = I$.

Dynamic Neutrosophic Set

It is a set where one has a dynamicity of the neutrosophic components with respect to time (*t*) or to any other hidden or not-hidden parameter (*p*).

Meaning the degree of appurtenance of an element to a neutrosophic set changes with time or other parameter (and this is a real aspect in our everyday life).

Cylindrical Neutrosophic Coordinates

T, I, F ∈ [0, 1] are Cartesian coordinates, and on the *Neutrosophic Cube* T, I, F are along the axes *Oxyz*.

a) If two coordinates, for example T and I, are 100% dependent, then $0 \le T + I \le 1$, and F is 100% independent from T and from I, then $0 \le F \le 1$. Whence $0 \le T + I + F \le 2$.

Then, taking $0 \le T^2 + I^2 \le 1$ and $0 \le F \le 1$, we get Cylindrical Neutrosophic Coordinates, since T, I, F form a ¼ of cylinder.

b) Similarly, if we consider T and F 100% dependent, and I 100% independent from each of them, then $0 \le T + F \le 1$ and $0 \le I \le 1$. Whence $0 \le T + I + F \le 2$.

Then, by taking $0 \leq T^2 + F^2 \leq 1$ and $0 \leq I \leq 1$, we get again Cylindrical Neutrosophic Coordinates, since T, I, F form a ¼ of cylinder.

c) Again, if we consider I and F 100% dependent, and T 100% independent from each of them, then $0 \leq I + F \leq 1$ and $0 \leq T \leq 1$. Whence $0 \leq T + I + F \leq 2$.

Then, by taking $0 \leq I^2 + F^2 \leq 1$ and $0 \leq F \leq 1$, we get again Cylindrical Neutrosophic Coordinates, since T, I, F form a ¼ of cylinder.

d) Let x, y, z be the neutrosophic coordinates T, I, F. In general, if the degree of dependence between two neutrosophic components x and y is $d°(x, y) \in [0, 1]$, then $0 \leq x + y \leq 2 - d°(x, y)$. See:

http://fs.unm.edu/NSS/DegreeOfDependence AndIndependence.pdf.

Let the third component z be 100% independent from x and from y, thus $0 \leq z \leq 1$.

Then, by taking $0 \leq x^2 + y^2 \leq 2 - d°(x, y)$ and $0 \leq z \leq 1$, we get now Cylindrical Neutrosophic Coordinates, where x, y, z are only a part of the ¼ of cylinder.

Spherical Neutrosophic Coordinates

To Cengiz Kahraman

I read with interest your paper:

Present Worth Analysis Using Pythagorean Fuzzy Sets, by Cengiz Kahraman, Sezi Cevik Onar, Basar Oztaysi, Advances in Intelligent Systems and Computing book series (AISC, volume 642), 30 August 2017.

I think it is possible to extend it from *Pythagorean Fuzzy Sets* to *Spherical Neutrosophic Sets*.

See pages 20-21 in my book [*Neutrosophic Perspectives: Triplets, Duplets, Multisets, Hybrid Operators, Modal Logic, Hedge Algebras. And Applications*. Pons Editions, Bruxelles, 2017; *http://fs.unm.edu/NeutrosophicPerspectives.pdf*], about *Spherical Neutrosophic Numbers*, where the neutrosophic coordinates T, I, F are in the relationship:

$$T^2 + I^2 + F^2 \leq 3,$$

therefore T, I, F belong to $[0, \sqrt{3}]$.

To Said Broumi

There is no paper on *Pythagorean neutrosophic sets*, because the Pythagorean fuzzy and intuitionistic fuzzy sets [based on one or two components respectively] were extended to *Spherical Neutrosophic Sets*, where we have 3 neutrosophic components, so we are in 3D (or R^3). See my *Neutrosophic Perspectives* book:

$$t^2 + i^2 + f^2 \leq 3,$$

where t, i, f are inside of or onto the sphere centered in the Cartesian origin and of radius $\sqrt{3}$.

t, i, f are in [0, $\sqrt{3}$], and if they are bigger than 1, we consider them as *neutrosophic overnumbers*.

Neutrosophic Differential Equations and Neutrosophic Integral Equations

To Jun Ye

I tried a little in my book on *neutrosophic measure* and on *neutrosophic integral*, but you can approach the *neutrosophic differential equations* and *neutrosophic integral equations* from a different perspective and in a deeper study and applications.

Continuous Neutrosophic Operators

To Le Hoang Son, Mumtaz Ali, Dat Luu

I do not remember in the fuzzy or intuitionistic fuzzy environments to have been done publications when the components T (or respectively T, F) were continuous functions (of time, or of other variables), but of course there is a vast literature that I could not check all of it.

The neutrosophic operators using T(t), I(t), F(t) as functions of time (t) are the same as in the case when T, I, F are constant crisp numbers and we did before.

Myself, I straightforwardly extended from crisp numbers to continuous functions for the neutrosophic operators.

But there might be a different possibility to design (new) 'continuous neutrosophic operators', instead of 'discrete neutrosophic operators' as used previously.

The fact, that the degree of membership of the same element x with respect to the same set S varies, is real.

For example, a worker can be hired to work 50% (part-timer), then later he can be changed to work 75%, and so on.

We need some good practical possible example, where the neutrosophic degree of the membership of an element x with respect to a set S changes continuously upon time.

For example the quality degree of a product: very high at the beginning, but little by little it degrades over time.

t-norms and *t*-conorms in Neutrosophic Operators

To Mumtaz Ali

About the proposal with t-norms and t-conorms used in neutrosophic operators { let's say: $\langle t_1, i_1, f_1 \rangle \wedge \langle t_2, i_2, f_2 \rangle = \langle t_1 \wedge t_2, i_1 \vee i_2, f_1 \vee f_2 \rangle$, where $\wedge$ and $\vee$ are any fuzzy t-norm and respectively any fuzzy t-conorm, not necessarily only min / max respectively}.

I have defined directly the N-norm/pseudonorm and N-conorm/pseudoconorm that do not depend on fuzzy t-norm/conorm, herein:

http://fs.unm.edu/N-normN-conorm.pdf .

See if you like to use them or not. It would be a different way of using neutrosophic aggregation operations, in order to avoid self-plagiarism.

Another idea is in the paper about the fuzzy and neutrosophic logics treated from a different perspective - trying to change the style, so we do not repeat.

Applications of Complex Neutrosophic Numbers

Narmada Devi

I have doubt in complex neutrosophic set theory, where the complex grade values play role in our real life situation and how?

Please give some examples about the complex neutrosophic set in our real life situation?

Florentin Smarandache

With the *Neutrosophic Complex Set* we have: <u>amplitude</u> (the real part), and <u>phase</u> (the imaginary part) – as in wave's physics.

Amplitude may be, for example, the 'number of hours' an employee works, while phase is the 'quality' of his work.

Two employees may work the same number of hours, but the quality of one of them may be higher that the quality of the other.

The phase can be any attribute of the amplitude.

Applications of over-/under-/off-set/logic/probability/statistics

To Narmada Devi

Real life applications of over-/under-/off- set / logic / probability / statistics are many.

Normally there is a NORM to do, but some people do extra-work above that norm:

- for example in a factory the norm of a worker is to make 100 pieces per month; but he produces 110 pieces; so his effectivity is 110/100 = 1.1 > 1;

- the maximum grade for a student is "A"; but some students who do extra-study may get "A$^+$";

- the normal working time for a worker is 40 hours/week; but some work overtime, for example 42 hours per week; so 42/40 = 1.05 > 1;

- or a worker misses the whole week of work {so his contribution is 0 (zero)}, and in addition to absences he destroys several machineries into the factory, so now his contribution to the factory is NEGATIVE}.

And so on.

See:

http://fs.unm.edu/SVNeutrosophicOverset-JMI.pdf
http://fs.unm.edu/IV-Neutrosophic-Overset-Underset-Offset.pdf
http://fs.unm.edu/NSS/DegreesOf-Over-Under-Off-Membership.pdf
http://fs.unm.edu/NeutrosophicOversetUndersetOffset.pdf

Nonstandard Neutrosophic Topology, Neutrosophic Triplet Topology, and several Exotic Topologies

To Mohammed A. Alshumrani, Cenap Ozel

There are several types of *Neutrosophic Topologies*, every author with his/her initiative. I was opened to all.

The first one I defined in 1998, following the classical topology definition, but adjusting it to the neutrosophic sets (see page 122 into the book: *http://fs.unm.edu/eBook-Neutrosophics6.pdf*). Yes, I am open-mind and think out of box. So, I am waiting for your approach. If you define a new type of neutrosophic topology, from a different perspective with respect to other authors, it is welcome.

There is no paper and no study on Nonstandard Neutrosophic Topology (NNT), which is a neutrosophic topology defined on the non-standard interval $]^-0, 1^+[$ }, except my little definition in the above book, p. 122, called "An alternative version of Neutrosophic Topology".

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And there is no paper on Neutrosophic Triplet Topology (NTT).

I and Mumtaz Ali (2017) published a paper on the definition and properties of neutrosophic triplets, neutrosophic triplet sets and neutrosophic triplet groups.

In addition, one may develop: *intuitionistic topology* [different from intuitionistic fuzzy topology], *paraconsistent topology, faillibilist topology, paradoxist topology, pseudo-paradoxist topology, tautological topology, nihilist topology, dialetheist topology, and trivialist topology* (*http://fs.unm.edu/DefinitionsDerivedFromNeutrosophics.pdf*); or *neutrosophic overtopology* (topology on neutrosophic overset, when degrees are strictly greater than 1), or *neutrosophic undertopology* (topology on neutrosophic underset, when degrees are strictly less than 0), or *neutrosophic offtopology* (topology on neutrosophic offset, when some degrees are strictly greater than 1, and other degrees are strictly less than 0):
  http://fs.unm.edu/NSS/DegreesOf-Over-Under-Off-Membership.pdf .

Neutrosophic Soft Ditopological Space, and Neutrosophic Soft Cotopological Space

We have straightforwardly extended the fuzzy soft ditopological and cotopological spaces to *neutrosophic soft ditopological* and *cotopological spaces* respectively.

Neutrosophic Soft Ditopological and Cotopological Space

A Francisco Gallego Lupiañez

Yo creo que se puede extender: de "fuzzy soft topological space" a "neutrosophic soft topological space", de "fuzzy soft ditopological space" a "neutrosophic soft ditopological space", y de "fuzzy soft cotopological space" a "neutrosophic soft cotopological space", y escribir otros articulos.

Continuous Neutrosophic Components

We need some interpretations of "x" and "y" since both have neutrosophic components T(t), I(t), F(t) that vary continuously upon the time t.

For example: T = degree of youth of the product, I = indeterminate degree of youth of the product, F = degree of oldness of the product (or something else).

Neutrosophic Multiset Graphs

To Said Broumi

Some people confuse the "neutroosphic hesitant fuzzy sets", actually "neutrosophic hesitant sets" (that have the form, for example: T = {0.1, 0.3, 0.7}, I = {0.8, 0.9}, F = {0.3, 0.6, 0.7, 0.8}, i.e. T, I, F are finite discrete sets included in [0,1]), with "neutrosophic multisets".

But the real neutrosophic multiset, that follows and extends the classical multiset (i.e. a set that has at least an element that is repeated, for example: M = {a, b, b}), are defined herein:

http://fs.unm.edu/NeutrosophicMultisets.htm,

i.e. an element is repeated, either with the same neutrosophic components, or with different neutrosophic components.

For example: M_1 = {a(0.1, 0.2, 0.3), b(0.2, 0.4, 0.7), b(0.2, 0.4, 0.7)}: an element "b" is repeated with the same neutrosophic components (0.2, 0.4, 0.7),

or M_2 = {a(0.1, 0.2, 0.3), b(0.2, 0.4, 0.7), b(0.3, 0.8, 0.9)}: an element "b" is repeated with different neutrosophic components: (0.2, 0.4, 0.7) and respectively (0.3, 0.8, 0.9).

These are real neutrosophic multisets - see a special chapter into the book:

http://fs.unm.edu/NeutrosophicPerspectives-ed2.pdf.

You can study the *neutrosophic multiset graphs*.

Neutrosophic Choquet Integral

To Xiaohong Zhang

By the way, since you are a specialist in *Choquet integral*, please one of my books that introduced the neutrosophic measure:

[*http://fs.unm.edu/NeutrosophicMeasureIntegralProbability.pdf*,

so you may connect the neutrosophic measure with Choquet integral and get a *Neutrosophic Choquet Integral*.

Neutrosophic Triplet Set

In a *Neutrosophic Triplet Set* (not group), there are elements that have more neutrals. See an example below:

```
* a  b  c
a a  c  a
b c  b  b
c a  b  c
```

Therefore, in the neutrosophic triplet set NTS = {a, b, c} one has the following neutrosophic triplets:

<a, a, a>, <a, c, b>, <b, b, b>, <b, c, a>, <c, c, c>,

so "a" has two neutrals: a and c, and two anti's: a and b;

"b" has two neutrals: b and c, and two anti's: a and b.

NTS = {a, b, c}, endowed with the law * is a commutative neutrosophic triplet loop.

The law * is not associative since, for example:

(a*a)*b = a*(a*b) gives a*b = a*c, or c = a,

which is false.

Neutrosophic Triplet Group

Tèmítópé Gbóláhàn Jaíyéolá

We already know that a *Commutative Generalized Group* is a *Classical Group*. Am like to know if the same is true or not for *Neutrosophic Triplet Group*.

Looking through your paper 'Neutrosophic triplet group', I observed that you proved some results (Theorems 3.13-3.15) on commutative Neutrosophic Triplet Group. But none talks about whether or not commutative Neutrosophic Triplet Group is a Classical Group or not.

From the examples you gave in that same paper, I want to be sure that we have a commutative Neutrosophic triplet group that is not a classical group. Example 3.2 with table 1 seems to be such! Correct?

Florentin Smarandache

Interesting to hear about the commutative general group to be a commutative classical group.

Can you please send me a such paper proving it?

But, the commutative neutrosophic triplet group in general is not a (commutative) classical group.

In Example 3.2, the set $(Z_{10}, \#)$, with $a\#b = 3ab$ is not a classical group, since not all elements are inversable.

The classical unitary element is 7 since $a\#7 = 7\#a = 3a7 = 21a = a \pmod{10}$.

But, for example, element 2 is not inversable since:

$$2\#x = x\#2 = 3(2)x = 6x = 7 \ (mod \ 10),$$

but $6x$ = even, while 7 = odd, so there is no inverse for 2 (actually all even numbers in Z_{10} are non-inversable).

As you observed in Table 1, Ex. 3.2, the set (Z_{10}, #), with *a#b = 3ab*, does not have a unit element for all *a* in Z_{10}.

$$neut(8) = 5, \ neut(5) = 0,2,4,6,8; \ etc.$$

If we try to find the neutral element for a classical group (Z_{10},#) with a#b = 5ab, we get:

$$a\#e = e\#a = 5ae = a \ (mod \ 10);$$
$$5ae = a \ or \ 5ae - a = 0$$
$$or \ a(5e\text{-}1) = 0 \ (mod \ 10).$$

But, if a = 3 then there is no *e*.

Neutrosophic Triplets/Duplets/Multisets

To Xiaohong Zhang, Yingcang Ma

I think we can go further connecting the neutrosophic triplets/duplets/multisets and introduce and study:

- the neutrosophic triplet BCI-algebras and neutrosophic triplet pseudo-BCI algebras; see the site:
  http://fs.unm.edu/NeutrosophicTriplets.htm
- the neutrosophic duplet BCI-algebras and neutrosophic duplet pseudo-BCI algebras; see also the site:
  http://fs.unm.edu/NeutrosophicDuplets.htm
- the neutrosophic multiset BCI-algebras and neutrosophic multiset pseudo-BCI algebras; see also the site:

http://fs.unm.edu/NeutrosophicMultisets.htm

Or approach the *Quadratic Neutrosophic BCI Algebras*.

NTG-strong vs. NTG-weak vs NETG vs GG

Let Z_3 = {0, 1, 2}, under modulo 3 multiplication, where 1 = classical identity element.

Z_3 is a NETG-strong, as follows: (0,0,0), (1,1,1), (2,1,2).

But Z_3 is not a NTG (for strong NT Set), since it has only one neutrosophic triplet (0,0,0), and no neutrosophic triplet corresponding to 1 nor to 2.

Yet, Z_3 is a NETG-weak (for weak NT Set), since each element 0, 1, or 2 belongs to a triplet.

Number of Neutrosophic Triplet Neutrals

To Xiaohong Zhang

On the first hand, you proved for the case when $(S_1,*)$ is a neutrosophic triplet set of first type {i.e. for each x in S_1, there are a neut(x) in S_1 and an anti(x) in S_1} that in a Neutrosophic Triplet Group each element has only one neutral.

But what about the second type of neutrosophic triplet set $(S_2,*)$ { i.e. for each x in S_2, there is a neutrosophic triplet (a, neut(a), anti(a)) in S_2, such that x = a, or x = neut(a), or x = anti(a) } ?

I expect herein we may have elements with more neutrals.

On the third hand I think that *NExtendedTG* has elements with at least two neutrals (classical neutral, and another neutral, etc.)?

Divergence Measure vs. Distance Measure for Neutrosophic Sets

To Nguyễn Xuân Thảo

What is the distinction between divergence measure D(. , .) and distance measure between two neutrosophic sets?

{Besides their different axioms.}

The minimum value D(A,B) = 0, when A = B.

But, what is the maximum value of a divergence measure?

That one between D(empty set, universe of discourse) ?

Neutrosophic Triplet Loops

To Xiaohong Zhang, Qingqing Hu, Xinliang Liang

By the way, at least we have *neutrosophic triplet loops* (groups without associativity) whose elements have many neutrals and many anti's.

Refined Complex Neutrosophic Set

To Mumtaz Ali, Dat Luu, Le Hoang Son

What about extending the *Complex Neutrosophic Set* (CNS) to *Refined Complex Neutrosophic Set*?

A paper on 'refined neutrosophic set' has been published in 2013, but a 'refined COMPLEX neutrosophic set' was never done – upon the best of my knowledge.

In refined neutrosophic set, T is split into T_1, T_2, ...; and I is split into I_1, I_2, ...; and F is split into F_1, F_2, ... [*http://fs.unm.edu/n-ValuedNeutrosophicLogic-PiP.pdf*].

We can either refine only the amplitude part of the CNS, or only the phase part of CNS, or both.

Refined Labels

To Le Hoang Son

On the paper:

F. Smarandache, J. Dezert, Xinde Li, *Refined Labels for Qualitative Information Fusion in Decision-Making Support System*, 12th International Conference on Information Fusion, Seattle, WA, USA, July 6-9, 1203-1210, 2009 [*http://fs.unm.edu/FLARL.pdf*].

It is shown that we can approximate the addition, subtraction, multiplication, power of labels s_i and s_j by similar operations of their indexes i and j.

Since we do not need a linear algebra of labels in the label neutrosophic set, because we need to limit the labels' values to [0, 1], when we add, subtract etc. we can set such restrictions (not above 1, nor below 0).

Commutativity & Associativity

If a law * is commutative, it does not involve that the law * is associative, nor reciprocally.

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Linguistic Cayley Tables

By the way, another way of considering operators with labels, avoiding additions / subtractions / multiplications etc. is simply using Linguistic Cayley Tables for each example.

For example:

V	S_1	S_2	S_3
S_1	S_1	S_2	S_3
S_2	S_2	S_3	S_3
S_3	S_3	S_3	S_3

{We fill in the table approximately.}

Refined Neutrosophic Clustering

To Yingcang Ma

We can extend the neutrosophic clustering to REFINED neutrosophic clustering, i.e. when T is split/refined into T_1, T_2, ...; I is split into I_1, I_2, ...; F is split into F_1, F_2, ...

Neutrosophic Non-Linear Programming

To Mohamed Abel-Baset, Jun Ye

What about *Neutrosophic Non-Linear Programming*, or:

- the neutrosophic objective function is non-linear;

- the neutrosophic equations and inequalities are non-linear too.

Any such concrete example? Such study?

Interval-Valued Neutrosophic Sets

Mohamed Abdel-Basset

What are the motivations to employ interval-valued neutrosophic sets in sustainable supplier selection?

Florentin Smarandache

Since in many situations the experts are not able to find (exact) crisp numbers in [0, 1] that represent the neutrosophic components T, I, F, they approximate these components by intervals that comprise the real values of T, I, and F respectively.

Mohamed Abdel-Basset

The authors mentioned interval-valued neutrosophic scale for representing pair-wise comparisons in Table 1. According to Table 1, for linguistic term 'Evenly important', the interval-valued neutrosophic number is ([0.5, 0.5], [0.5, 0.5], [0.5, 0.5]), while ([0.4, 0.5], [0.1, 0.2], [0.2, 0.3]) to 'Low important'. Why?

Florentin Smarandache

"Evenly important" since in (0.5, 0.5, 0.5) each component 0.5 = [0.5, 0.5] is just in the middle of the interval [0, 1], so no component makes any distinction between important (1) and unimportant (0).

For values less than 0.5 one has "Low important", since the intervals [0.4, 0.5], [0.1, 0.2], [0.2, 0.3] are in the first half of [0, 1], i.e. they are included in [0, 0.5].

Interval Neutrosophic Set Analytical Network Process

To Mohamed Abdel-Basset

The scale from 0 to 1, that you introduced, is indeed better than Saaty's scale from 0 to 9, because yours can be related to the percentages (from 0% to 100%).

It is possible to use the *Interval Neutrosophic Sets* with *Analytical Network Process in Group Multi-Criteria Decision Making*, instead of *Single-Valued Neutrosophic Sets*.

Interval-Valued Linguistic Complex Neutrosophic Set

In a company the employees' work quantity is labeled as: A = {*none, little, medium, high*}, and the employers' work quality as B = {*bad, poor, good, excellent*}.

There is a total order on each linguistic set: *none < little < medium < high* on A, and respectively *bad < poor < good < excellent* on B, therefore one can use the min/max classical operators on these linguistic sets.

But since the linguistic measures using single label does not exactly catch the quantity and quality of the employees, we use linguistic intervals:

[none, little], [little, medium], [medium, high],
[none, medium], [none, high], etc.

respectively:

[bad, poor], [poor, good], [good, excellent],
[bad, good], [poor, excellent], etc.

Then, the employees' work quantity will be the real part of the complex neutrosophic set, while the employees' work quality will be its imaginary part.

The company has two sections, Production and Manufacturing. Each of them has been evaluated as:

$P($ *[little, medium]* $\times e^{[poor,\ excellent]}$, *[none, little]* $\times$
$\times e^{[poor,\ good]}$, *[medium, high]* $\times e^{[good,\ excellent]}$ $)$

and

$M($ *[medium, high]* $\times e^{[poor,\ good]}$, *[none, medium]* $\times$
$\times e^{[bad,\ good]}$, *[little, high]* $\times e^{[poor,\ excellent]}$ $)$.

In order to obtain the whole company's quantitative and qualitative performance, one uses the intersection of the linguistic-interval complex neutrosophic sets P and M.

$P \wedge M = ($ *[little, medium]* $\times e^{[poor,\ good]}$, *[none, medum]* $\times e^{[poor,\ good]}$, *[medium, high]* $\times e^{[good,\ excellent]}$ $)$.

Interval-Valued Linguistic Neutrosophic Operators

Afterwards, we define the *interval-valued linguistic neutrosophic operators*, as follows:

Let $T_1, T_2, I_1, I_2, F_1, F_2$ and $T_3, T_4, I_3, I_4, F_3, F_4$ be labels.

Linguistic-Interval Neutrosophic Union:

$([T_1, T_2], [I_1, I_2], [F_1, F_2]) \vee_L ([T_3, T_4], [I_3, I_4], [F_3, F_4]) =$

$= ([T_1, T_2] \vee [T_3, T_4], [I_1, I_2] \wedge [I_3, I_4], [F_1, F_2] \wedge [F_3, F_4]) =$

$$= (\ [\max\{T_1, T_3\}, \max\{T_2, T_4\}], [\min\{I_1, I_3\}, \min\{I_2, I_4\}],$$
$$[\min\{F_1, F_3\}, \min\{F_2, F_4\}]\ ).$$

Linguistic-Interval Neutrosophic Intersection:

$$(\ [T_1, T_2], [I_1, I_2], [F_1, F_2]) \wedge {}_L\ ([T_3, T_4], [I_3, I_4], [F_3, F_4]\ ) =$$
$$= (\ [T_1, T_2] \wedge [T_3, T_4], [I_1, I_2] \vee [I_3, I_4], [F_1, F_2] \vee [F_3, F_4]\ ) =$$
$$= (\ [\min\{T_1, T_3\}, \min\{T_2, T_4\}], [\max\{I_1, I_3\}, \max\{I_2, I_4\}\ ],$$
$$[\max\{F_1, F_3\}, \max\{F_2, F_4\}]\ ).$$

Linguistic-Interval Neutrosophic Complement of
([T_1, T_2], [I_1, I_2], [F_1, F_2]) is:

$$(\ [F_1, F_2], [1\text{-}I_2, 1\text{-}I_1], [T_1, T_2]\ ).$$

And we extend them for interval-valued linguistic complex neutrosophic operators.

Ternary Fuzzy Number as a special case of neutrosophic number

What Chao Wang, Minghu Ha and Xiaowei Liu call a *ternary fuzzy number* is a special case of *neutrosophic number*.

In neutrosophic set, the sum of the components is not necessarily 3, but up to 3, i.e. $T + I + F \le 3$.

See the article *Degree of Dependence and Independence of the (Sub)Components of Fuzzy Set and Neutrosophic Set*, by F. Smarandache, Neutrosophic Sets and Systems, Vol. 11, 95-97, 2016;
http://fs.unm.edu/NSS/DegreeOfDependenceAndIndependence.pdf .

If all three components T, I, F are independent two by two and the information is complete, then T + I + F = 3,

however if all three components T, I, F are independent two by two but the information is incomplete (missing information), then T + I + F < 3.

If all components T, I, F are dependent and information is complete, then T + I + F = 1,

but if all components T, I, F are dependent and the information is incomplete (missing information), then T + I + F < 1.

Aggregating the interval-valued and single-valued neutrosophic numbers

Ridvan Şahin

Is there any technique to aggregate interval neutrosophic number and single-valued neutrosophic number into interval number?

Florentin Smarandache

You can aggregate the interval-valued and single-valued neutrosophic numbers by transforming the single-valued neutrosophic numbers into interval-valued neutrosophic numbers, simply: for example (0.6, 0.1, 0.7) = ([0.6, 0.6], [0.1, 0.1], [0.7, 0.7]) and afterwards use the interval-valued aggregation operators.

Examples of Total Indeterminacy and Total Falsehood

To Said Broumi

For (0,1,0), which means totally indeterminate:

Two points, diametrically opposed, on the margins of a marsh have to be connected by a route; it may be a total indeterminacy not knowing in what way to build the route.

For (0,1,1), with total indeterminacy and total falsehood.

The two points, diametrically opposed, on the margins of a marsh having to be connected by a route; the route construction company builds the route on the wrong trajectory that the route sinks into the marsh!

A coin is dropped by accident in the sea.

Or a coin is dropped by accident in a marsh.

So we have a total indeterminacy (I = 1) if one gets Tale of Head.

Example of Independent Sources

Three different people, without communicating with each other, talk about a soccer game:

Morocco - Algeria.

That from Morocco will say that his team will win, since he is patriotic, for example T = 0.7;

the guy from Algeria, who is also patriotic, will say that Algeria will win, for example F = 0.6;

but a guy from Tunisia, who does not care about any team may believe that the match will be maybe tight, for example I = 0.9.

Therefore T+I+F is getting close to 3.

Example of Dependent Sources

The same person, a mathematician, has to present his opinion about the game Morocco - Algeria. Such person knows that the sum of the components has to be 1. So, he will say for example T = 0.6, I = 0.1, F = 0.3.

Or, there may be more sources, but all considering the same mathematical procedure to compute T, I, and F.

Linear Independence & Dependence on Neutrosophic Triplet Set

To Adnan Mathm

Your research on weak linear independence and full linear dependence on *Neutrosophic Triplet Set* was never studied before.

Neutrosophic Triplet Topology

To Saeid Jafari

There are some published papers on *Neutrosophic Topology*, especially by Prof. Francisco Gallego Lupiañez from Universidad Complutese de Madrid, yet not much work on *Neutrosophic Triplet Topology*.

Neutrosophic Triplet Filters and Refined Neutrosophic Filters

To Xiaohong Zhang, Peng Yu, Choonkil Park

It is possible to extend the *Neutrosophic Filters* to *Neutrosophic Triplet Filters* or to *Refined Neutrosophic Filters* (when T, I, F are refined into T_1, T_2, ...; I_1, I_2, ...; F_1, F_2, ...) in BE-Algebras or in other algebras.

Neutrosophic Quadruple Number

A *Neutrosophic Quadruple Number* is a number of the form:
$$NQ = a + bT + cI + dF,$$

where *a, b, c, d* are real or complex numbers, while T = truth, I = indeterminacy, and F = falsehood. For each NQ, *a* is called the determinate part of NQ, while *bT+cI+dE* the indeterminate part of NQ.

A Preference Law, with respect to T, I, F, we may define on the set of neutrosophic quadruple numbers. For example, let's say T < I < F.

With respect to this preference law, we define the Absorbance Law for the multiplications of T, I, and F, in the sense that the bigger one absorbs the smaller one (or the big fish eats the small fish); for example: TT = T (T absorbs itself), TI = I (because I is bigger), FT = F (because F is bigger), and so on.

The addition and subtraction of neutrosophic quadruple numbers are defined as:

$$(a_1+b_1T+c_1I+d_1F) + (a_2+b_2T+c_2I+d_2F) =$$
$$= (a_1+a_2) + (b_1+b_2)T+(c_1+c_2)I+(d_1+d_2)F;$$
$$(a_1+b_1T+c_1I+d_1F) - (a_2+b_2T+c_2I+d_2F) =$$
$$= (a_1-a_2) + (b_1-b_2)T+(c_1-c_2)I+(d_1-d_2)F.$$

While multiplication $(a_1+b_1T+c_1I+d_1F)(a_2+b_2T+c_2I+d_2F)$ is defined as in classical multiplication of polynomials, but taking into consideration the above absorbance law when multiplying the T, I, F among themselves.

Various neutrosophic quadruple algebraic structures are studied on the set of NQs.

How come (1, 1, 1) and (0, 0, 0)?

Mohammed Akram

How will we explain <0, 0, 0> and <1, 1, 1> in SVNS ?

How one expert may have three his different opinions at a time in decision making?

Florentin Smarandache

You consider that there are three different experts that are independent (i.e. they do not communicate with each other, and they use different criteria of evaluation), so each one focuses on one attribute only (because each one is the best specialist in evaluating a single attribute). Therefore each expert can assign 1 to his attribute value { for (1,1,1) }.

Or each expert can assign 0 to his attribute value { for (0,0,0) respectively }.

If you consider a single expert for evaluating all three attributes, then he evaluates each attribute from a different point of view (i.e. using a different parameter) and arrives to (1,1,1) or (0,0,0) respectively.

For example, you examine a student Mohamed: for his research in neutrosophic graphs he deserves 1, for his research in analytical mathematics he also deserves 1, and for his research in physics he deserves 1.

Type 2 Neutrosophic Set

To Said Broumi

Let's define the "type 2 neutrsophic set" as an extension of "type 2 fuzzy set". Some applications may be needed.

n-ary Algebraic Structures

To Hee Sik Kim

Did you do any work on algebraic structures with n-ary (not binary) laws ?

Smarandache disjoint

To Hee Sik Kim

I think the notion of "Smarandache disjoint" is one of the interesting idea. If we add an axiom(or more) on an algebraic structure, then it becomes a trivial case, i.e., called an ``anti-axiom" that will be useful in the study of general algebraic structures.

Algebraic Structures based on partial negation

To W. B. Vasantha Kandasamy

I have defined long ago "the degree of negation of an axiom" and in the same time the "multi-space with its multi-structure", which also applies to "the degree of negation of a law, of a theorem, of a theory, of a notion, etc.".

Therefore, we can consider "the degree of negation of the axiom of inverse element with respect with the multiplication".

In our cases (neutrosophic group and neutrosophic field) we have partial negation of the inverse element law (some elements are invertible, others are not).

We can also design various algebraic structures based on this partial negation.

And in general, "degree of negation of a rule" and the system resulted from using it in a given space.

A neutrosophic group is not in general a group.

Also in some examples it is said that a neutrosophic field is not a field.

Algebraic Structures on a set whose elements do not completely belong to the set

To Akeem Adesina A. Agboola

There are cases in our everyday life when an element does not completely belong to a set.

For example, a part-time faculty only partially belong to the university he works for. And so on.

Therefore, one can define algebraic structures on a set whose elements do not completely belong to the set (or at list some of its elements do not completely belong to the set). We call them *(t,i,f)-elements* (t = membership degree, i = indeterminacy degree, and f = nonmembership degree).

And the structures on these sets are called *(t,i,f)-structures*.

I gave some small examples in the book *Symbolic Neutrosophic Theory* (2015), Ch. 4, [*http://fs.unm.edu/SymbolicNeutrosophicTheory.pdf*] of such structures.

Numerical & Literal Indeterminacies

To Madad Khan

There are two types of indeterminacies: *numerical*, and *literal*.

For "*I*" = *numerical indeterminacy*, i.e. it is a numerical interval, or a numerical set.

For "*I*" = *literal indeterminacy*, Dr. Vasantha and me considered that:

indeterminacy × indeterminacy = indeterminacy.

That's why we have chosen $I^2 = I$.

Similarly for the truth, $T^2 = T$, since:

truth × truth = truth.

And for the falsehood, $F^2 = F$, since:

$$falsehood \times falsehood = falsehood.$$

Indeterminacy in Computer Science

W.B. Vasantha Kandasamy

I am trying to work mainly on computer science simultaneously inducting indeterminacies whenever the model is discrete and far from real.

Neutrosophic Multiset Algebraic Structures

Florentin Smarandache

See also a new type of neutrosophics, *neutrosophic multisets*, never studied before:

http://fs.unm.edu/NeutrosophicMultisets.htm

and we can develop *Neutrosophic Multiset Algebraic Structures*.

k·n-1 and k·n+1 Conjectures

To Ilanthenral Kandasamy

Colatz Conjecture (which is the following: Take any positive integer n. If n is even divide it by 2 to get $n/2$. If n is odd multiply it by 3 and add 1 to obtain $3n+1$. Repeat the process (which has been called *Half Or Triple Plus One* or *HOTPO*) indefinitely. The conjecture states that no matter what number you start with you will always eventually reach 1.), was deviated to the *3n-1 Conjecture* (Vasantha-Ilanthenral-Smarandache, 2015), akin to Collatz Conjecture, but taking $3n-1$ instead of $3n+1$.

Further, we tried to generalize the *3n-1 Conjecture* to
k·n-1 Conjecture, where *k* is a positive odd number: 3, 5, 7,
... , in the following way:

Take any positive integer *n*. If *n* is even divide it by 2 to
get *n*/2. If *n* is odd multiply it by *k* and subtract 1 to
obtain *k·n*-1. Repeat the process (which we called *Half
Or k Times Minus One* or *HOKTMO*) indefinitely.

The conjecture states that if the number is a power of 2, or
after certain iterations one gets a power of 2, then one
ends up with 1; but if the number is not a power of 2
and one never gets to a power of 2 after doing
iterations, then one diverges to infinity.

Similarly for the *k·n+1 Conjecture*.

Smarandache multispace

To Linfan Mao

I read your paper on *biological n-system* and on *non-solvable*
systems. Good work!

What would be the solution on non-solvable system:

$$x+y = 1, x+y = 2 ?$$

Linfan Mao

Have no solution in classical meaning, but a solution of
points on *x+y=1* union with that of *x+y=2*, i.e., a
Smarandache multispace, which is the entire state of
system characterized by the two equations.

Funny Math Problems & Recreational Science

In our look for diversity (in order to avoid monotony of the same style of books) I was also thinking at funny math problems. Problems which have their own logic, if possible humorist ones.

For examples:

a) On a wire there are 10 birds. A hunter kills 3 of them. How many are left? [*Answer*: 0, since the 3 dead ones felt down, while the other 7 flied off!]

b) On a flat there are 10 birds. A hunter kills 3 of them. How many are left? [*Answer*: 3 - the dead ones!]

c) In a cage there are 10 birds. A hunter kills 3 of them. How many are left? [*Answer*: 10, because the dead and alive cannot escape from the cage!]

d) In the sky there are flying 10 birds. A hunter kills 3 of them. How many are left? [*Answer*: finally 7 who are alive, since the dead ones fall down.]

Smarandache Geometries

Ferhat Taş

I am a research assistant at İstanbul University. A friend of mine mentioned Smarandache geometry. I was interested in this subject and after some research, I found your books. There are very interesting subjects. But I did not find Smarandache curves (or s-curves). Is there a definition of s-curves?

When I search on Google, I get a lot of articles out there *http://fs.unm.edu/SC/SmarandacheCurves.htm.*

In addition, if you agree, I would like to work on with your *Smarandache curves and surfaces*.

My research interests: Computer aided geometric design (Especially Bezier curves-surfaces, blossoming of curves-surfaces), Kinematics, line geometry (dual number methods).

"Smarandache geometry is such a geometry in which there is at least one Smarandachely denied rule, and a Smarandache manifold (M;A) is an n-dimensional manifold M that supports a Smarandache geometry." [*http://fs.unm.edu/Geometries.htm*]

Florentin Smarandache

Salamo alecum!

Tesekkur ederim.

I was in a political refugee camp in Istanbul and Ankara for two years waiting for the American visa of emigration.

I spoke some broken Turkish at that time (1988-1990). I still remember a little (I know to read and approximately to write in Turkish), but I forgot many words.

Anadım?

See a small published paper on my geometry (i.e. a geometry in which at least one axiom is partially

validated and partially invalidated, or the axiom is only invalidated by in at least two ways) [*http://fs.unm.edu/IntrodSmGeom.pdf*].

I proposed this long ago (1969) since I observed that our world is not a perfect geometry, but made by subspaces where the axiom act differently. So, I put together heterogeneous subspaces in order to make a new space (trying to approximate/model our reality).

A curve in such a geometry space was called on my name.

Similarly for a surface in such geometry space (by the way, the *Smarandache surfaces* were not much studied at all; so you'd have a virgin terrain to work in).

This general definition contain a lot of classes of such curves, depending on the axioms that are invalidated and on the different ways the axioms are invalidated.

Of course you can study them. Maybe you know this UNM site on my books:

http://fs.unm.edu/ScienceLibrary.htm.

Walecum Salam, arkadas Ferhat!

There is a definition of <u>s-line</u>:

http://fs.unm.edu/Closed-s-lines.pdf

in an <u>s-manifold</u>:

http://fs.unm.edu/Iseri-book.pdf.

The definition was pushed to a broader sense, i.e. instead of "axiom" taking "theorem, lemma, property etc."

In the paper that you refer to, *Smarandache Curves in Minkowski Space-time*, written by your co-nationals Melih Turgut and Suha Yilmaz, their definition is a particular case of a Sm. curve, i.e. when the curve's position vector is composed by different vectors on another curve [one has some hybridity].

Discrete and continuum geometry

To Vic Christianto

About the controversy of continuum and discrete with respect to the universe:

My geometries (*http://fs.unm.edu/Geometries.htm*) also changed the Euclid's and even Hilbert's axioms, making hybrid geometrical spaces.

An idea might be to consider partially continuum and partially discrete geometry (so hybrid).

Also, we may have a paradox: if 0+0+...+0 ad infinitum = 0, but 0 x infinity = undefined, in calculus.

General Theory of Relativity and Smarandache Geometry

To Dmitri Rabounski

The General Theory of Relativity (GTR) describes the connection between pseudo-Riemannian manifold and the energy-momentum contained in this pseudo-manifold.

What about generalizing to my geometries?

Dmitri Rabounski

Yes, there is a theoretical possibility to extend the GTR to the *Smarandache Geometries*. I mean to introduce a connection between the Smarandache Geometry and the *energy-momentum tensor*. Just two problems. They are the same as those which did not allow to extending the GTR, with success, to the other geometries before.

Riemannian geometry has the well-developed mathematical techniques, while many others -- not;

Those non-Riemannian geometries, which are now well-developed, have so complicate mathematical techniques that even simplest problem of Special Relativity are very complicate to resolve (as in Finslearian geometry, for instance).

Finally, to extend the GTR to another non-Riemannian geometry, we need to know the differential rules, connection coefficients, and many others -- the complete mathematical techniques -- which allows to produce calculations in the framework of this geometry.

Florentin Smarandache

Thanks for the comments. I agree with you. My geometries are too large (too general) and maybe a particular case of such geometries should be

considered where we should be able to define a metric and the differential rules.

In the general Smarandache Geometrical case this cannot be done since the metrics and rules are very different from each other.

Special Theory of Relativity

To Waldyr Rodrigues

I interpreted the Special Theory of Relativity (STR) from a different viewpoint. I do not follow the mainstream dogma; I pass everything through my logos.

I do not talk about clocks, since the clock is an instrument to measure the time, instrument that may not work properly in certain conditions (for example because of an electromagnetic field the functioning of the clock may get distorted).

I considered the STR from the Absolute Time perspective. In this case, the two elapsed times

$$\Delta t' = \Delta t.$$

Then I solved for the speed and got a superluminal speed. What I did wrongly herein?

I have the right to consider an Absolute Time {as Galilee (1564-1642) and Newton (1643-1727) did}, why not?

What is my misconception? Please tell me the truth - I learn from you.

There are not two clocks, but the Absolute Time which shows the same time anywhere.

The relativistic velocity of speeds do not work well, because: if you compute *c-c* you get *0/0*.

CERN showed that the muon neutrino travels faster than light. About 174 high scientists from 13 countries signed the paper showing it. I don't feel that they all were bad …

Degrees of Redshift/Blueshift

When I referred to the medium the light passes through, I also understood the electric/magnetic/gravitational fields that are within it, which can affect the change in frequency of light wave.

For the suggested experiment with different clocks, I want to prove that the resulted dilation/contraction factors depend on the clock's material and construction type, i.e. different degrees of redshift/blueshift will be found depending on the clock's material and construction type.

Indeterminism

I do not agree with Einstein's aphorism "God does not play dice" since there is not only determinism in our universe.

Especially at the quantum level I'm afraid there is an indeterminism.

If it was only determinism in our universe, then a big equation could be built to predict everything - what I don't think it was possible.

Magnetic Fluid Dynamics

To Dmitri Rabounski

I agreed with the liquid Sun since Pierre-Marie Robitaille told me in Columbus, in February 2013. It is more plausible for the stars to be liquid than gaseous.

I feel there is some viscosity on each stars; which one should have a higher density in general, the small stars or giant stars? About the core of a star, Pierre did not say anything to me. We did not discuss much on this subject. Maybe the viscosity of the Sun liquid is variable inside.

You say in your "Inside Stars" book that the gravity approaches infinity near the Sun core surface, but it is not infinity as in a black hole; am I right? If the gravity approaches infinity near the core surface, what would happen in the center of the Sun?

I read the preface by Pierre Millette. He is French too (from Quebec maybe) upon his name.

Stellar plasma are modelled by magnetic fluid dynamics.

Schrodinger's Cat Paradox

To Robert Neil Boyd, Vic Christianto

A apropos to the *quantum communication*, and the *quantum paradox* that a particle may be in two different places at the same time, or Schrodinger's Cat paradox, only the *neutrosophic logic / set / probability* (NL, NS, NP) can catch this since it allows the neutrosophic components' sum T+I+F to be up to 3?

$$NL(Cat\ is\ alive) = (1, 1, 1),$$

which means T = 1 (*Cat is alive*), F = 1 (*Cat is dead*), I = 1 (*we do not know if the Cat is alive or dead*).

Un system se distruge mai uşor din interior decât din exterior

To Andruşa Vătuiu

Întrucât un sistem poate fi de forme şi mărimi diferite, în domenii variate, ideea matematică simplă ar fi următoarea:

Dacă suma tuturor forţelor interioare formează puterea sistemului ca tot unitar, să zicem că ar fi egală cu P, pentru a fi învins din afară, acest sistem trebuie atacat cu o forţă mai mare decât P.

Din interior, ar fi suficient să se deregleze/demonteze o forţă critică C, care este o subcomponentă a lui P (adică C < P) pentru a distruge întreg sistemul.

Un aforism: Divide et impera (latină) = învrajbește și cucerește.

Deci distrugerea unității interioare pentru a-i cuceri din exterior.

Poate cumva interpretat și cu ecuații diferențiale?!

Energy Fields

I advance a hypothesis that planet Earth (and other planets similarly) has regions with higher density energy, while other regions with lower density energy.

That's why some parts of the world (where there are higher density energy fields) are more developed than others parts of the world (which have lower density energy fields).

Surely, these high density energy fields change from time to time, from a region to another.

That's why the center of civilization has move from Egypt to Greece, then to Roman Empire, then to Western Europe, and now to United States.

Imaginary Physics

To Vic Christianto

The fact that many physical theories are too fantastic, too unrealistic, too idealistic, too perfect, non-practical I had observed from the beginning when trying my research in physics.

A lot of mathematics used, but working in... imaginary spaces!

Physics ideas to be developed

- A *cosmography* based on Navier-Stokes model. This includes implication to galaxies too.

- A Bass-Riccati model for carsharing growth.

Where it is uncertainty (indeterminacy, vagueness, incompleteness, unknown, unclear, contradiction, etc.) we can use neutrosophic set and logic and probability. In many physical phenomena we can find this...

Bipolar Signaling (Bipolar Transmission)

http://whatis.techtarget.com/definition/bipolar-signaling-bipolar-transmission

From Margaret Rouse

"Bipolar signaling, also called bipolar transmission, is a baseband method of sending binary data over wire or cable. There are two logic states, low and high, represented by the digits 0 and 1 respectively.

The illustration below shows a bipolar signal as it might appear on the screen of an oscilloscope. Each horizontal division represents one bit (binary digit). The logic 0 state is $^-$3 volts and logic 1 is $^+$3 volts. This is positive logic. Alternatively, logic 0 might be $^+$3 volts, and logic 1 might be $^-$3 volts; this would be negative logic.
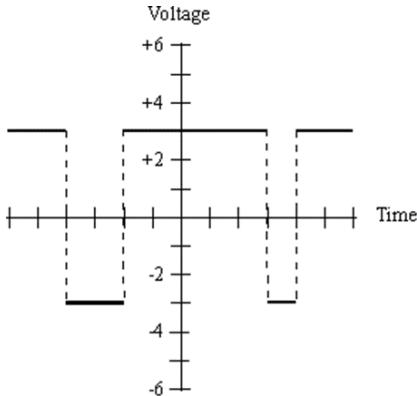
Whether positive or negative logic is used, the voltages representing the low and high states are equal and opposite; over time, the average voltage is approximately equal to 0."

*

To V. Christianto

First at all, what do you want to do about the bipolar signal?

Since we have values outside the interval [0, 1] we may consider the *refined neutrosophic offlogic*:

T = positive neutrosophic offlogic = {$^-3$, $^+3$}, which is split into $T_1 = ^-3$ and $T_2 = ^+3$.

F = negative neutrosophic offlogic = {$^+3$, $^-3$}, which is split into $F_1 = ^+3$ and $F_2 = ^-3$.

Not sure if I = emptyset, or I = some approximation, some noise (?)

So, we have, T_1, T_2, and F_1, F_2.

Another approach: *bipolar neutrosophic offlogic*.

You, if necessarily, need the bipolar neutrosophic, then still have to use the bipolar neutrosophic offlogic/offset since we have the values $^-3$ and $^+3$, outside of the interval [0, 1]:

$T^+ = {}^+3$, $T^- = {}^-3$;

$F^+ = {}^+3$, $F^- = {}^-3$;

$I^+ =$ some noise when processing the positive values, I^- = some noise when processing the negative values.

Not sure at I^+ and I^- what to say? They may be empty (or close to empty) sets as well (see in physics how the signal works).

Neutrosophic Entities in Pauling Spheron Model

Bill Harrington

Your concept of "neutrosophic entities". From our work, it would appear that they are highly involved in the Pauling "spheron" model.

Pairs of them define a triangle not organized in any particular dimensional base.

They also define each of the dimensions up through 7, plus 11.

It was never an initial intention for our research to enter the area of the Standard Model, because when our

theories met the constellation of particles, the set of mass ratios self-organized its own completely different organization to the set - including the inclusion of the "750 GeV Di-Photon", that has since "disappeared"...

Florentin Smarandache

Can you explain me how the neutrosophic entities are involved in in the Pauling "Spheron" model?

Vic Christianto

Pauling recognized the first spheron at 4 units. From our work, it has a topology of "a real and imaginary set of real and imaginary entities".

But how can you connect the periodic table with Pauling spheron model? And also how can you connect it with standing wave? What is the governing equation?

Yes, physics should be as simple as possible, but I do not see a general rule describing them all… they look as different rules of *pi* and *1*.

Dr. George Shpenkov also works out a periodic table close to Mendeleev, starting from classical wave.

Reality or Relativity

Florentin Smarandache

I read Thornhill's article about *Reality or Relativity* (regarding the spacetime), but I'd like to get a particular counter-example from our everyday life that does not work in Minkovsky's spacetime.

Dr. Charles Kenneth Thornhill has proved that Minkowski spacetime does not reflect reality. His papers are here: *www.etherphysics.net*.

Why the time axis is noted *ct* and not simply *t*? I know *c* = speed of light. So, why involving the speed of light to the time axis?

Stephen Crothers

The time axis is *ct*, not *t*, because this product *ct* gives units of length. In this way it is erroneously claimed that time is on equal footing with length and so there is a spacetime continuum. The whole notion is nonsense. Time is not on equal footing with length at all because it has different units. Consequently it cannot be another dimension. Minkowski's spacetime continuum is meaningless, as Thornhill has shown.

Florentin Smarandache

Why then considering *ct* and not another speed *v* times time *t*: i.e. *vt*? So, why light speed? What about if one puts the sound speed?

Ferson New Particle

Vic Christianto

A new type of particle, which is intermediate state between fermion and boson. We suggest to call it "ferson." It is our hope that if such a ferson can be observed in CERN, then it may open new interests to your neutrosophy.

Yes, it is indeed interesting for particle physicists who damnly wish to continue the service period of CERN expensive facilities after discovery of Higgs boson. They tried to extend standard model to super-symmetry but it failed to come to detector.

I just read that there are two possible theories which seem correspond to an intermediate statistics we're looking for: (a) anion fractional statistics by Franck Wlczek, which I am not sure, (b) G. Gentile statistics which predict the existence of "intermediate particle" between fermion and boson, but nobody has identified any experiment with such an intermediate particle.

So, allow me to suggest you to search and read G. Gentile's original paper (1940) on *Nuovo Cimento*. That way you have a chance to translate your mathematical theory of Neutrosophic Logic into a language which can be understood and testable by particle physicists.

Absolute Theory of Relativity

To Ajay Sharma

I parameterized the STR and I defined new Relativities, one of them being the *Absolute Theory of Relativity* (that has a different addition of velocities formula; without any anomalies like time dilation/contraction, space contraction, relativity of simultaneity, etc.), and I generated other Relativities too.

Who is that Unconscious that tells us things in our mind, the Spirit?

To Vic Christianto

Can we include the spirit into psychological framework?

I am interested, since I continue my mathematical psychology investigation.

A question for you: when the unconscious tells us something in our mind, who is that unconscious? The spirit?

Is the divine spirit part of our unconscious?

To Vic Christianto

There is into our paper { *Neutropsychology and beyond: (or A sketch of re-engineering Freudian mental model and implications* } no explanation/proof of what/how the spirit might be explained or detected in the human?

What there might be the spirit?

My question is: when you here a voice inside your head telling you to so something, who is that voice? Where that voice comes from?

It may come from your unconscious... Is the spirit part of unconscious?

Cellular Automaton Universe

Florentin Smarandache

Do you know anything in the nature that is without beginning and without ending?

Can we consider the universe as an entity without beginning and without ending?

Vic Christianto

In our article, our aim is to promote a universe which is self-growth but no expansion. I have looked for such models for years, but only in automaton model we can come up with a realistic model beyond differential equation.

- If you mean with no beginning, it is a cyclical universe, yes some people promoted this model, but not me.

- But if you mean with no beginning, it is an eternal universe, yes I believe that there is an eternal primordial fluid with which God created the stars and solar system etc.

Florentin Smarandache

No beginning means automatically no ending? And reciprocally?

I have thought in general if there exists an entity which has no beginning and no ending?

Gravitomagnetism

To Vic Christianto

I am interested in developing a better theory of *gravitomagnetism*.

Cosmology

In cosmology, the Hubble law is such a paramount importance. I already put an emphasize that one cannot distinguish the transition from linear regression to nonlinear regression easily, because there is always room for model indeterminacy. The new thing here is that we argue about possible nonlinearity of Hubble law. We can improve the definition of neutrosophy regression.

The purpose of the paper is to give outline of possible solution of quaternionic Riccati equation for ideal MHD. The originality is on suggesting that such a solution is theoretically existing, although we cannot obtain exact numerical solution.

Climate: global warming or global cooling?

Florentin Smarandache

I read the paper on dynamics of glaciers [*Exact Solution of 2D Plane-Parallel Flow for Glacier Dynamics* by Sergey V. Ershkov].

Indeed the ice is increasing and decreasing from winter to summer, but what about comparing from a year to another year? Is it *global warming* or *global cooling*?

Akira Kanda

Climatologists and geologists seem to have completely different opinion on this issue.

There are several definite things to be reckon with:

Ice floating on sea water will not raise sea level when it melts. This is a very simple physics which secondary school physics student will understand Ice on land when it melts goes into sea and increases sea level.

Atmosphere will expands when its temperature raises. In this way it releases heat energy and cools down.

Architect ice, ice of pure water floating on ocean when melts decreases sea water temperature around the surface as pure water is lighter than the sea water.

So, this causes immediate cooling down of the low level atmosphere.

Florentin Smarandache

It is like in *neutrosophic logic*, where opposite things may be true simultaneously, or false simultaneously.

Between Living and Non-Living

Vic Christianto

The virus is: between living and non-living.

Florentin Smarandache

Yes, the fact the virus is a sub-cellular between 'living being' and 'non-living chemical', or between 'life' and 'non-life' is as in neutrosophy the <neutA>, i.e. between the opposites <A> and <antiA>, in this case between the opposites <Life> and <antiLife>.

Vertical and Horizontal Tectonic Movements

V. V. Belousov and H. A. Meyerhoff have proposed the *theory of fixism* that the continents are fixed [leading geological though until the middle of 1960s], and only vertical tectonic movements occur. From these vertical tectonic movements only insignificant horizontal movements result.

We believe that both, vertical and horizontal large tectonic movements are manifesting on the Earth on a large timespan.

La règle de Dempster

À Jean Dezert

Aujourd'hui *academia.edu* m'a envoye un lien vers ton article: *On The Validity of Dempster-Shafer Theory* - que je savais.

Parce que le conflict $k = 1 - b_1 - b_2$, on peut varier b_1 et b_2 dans [0, 1] et obtenir n'importe quelle valeure nous voulons dans l'interval [0, 1].

Donc, si $b_1 = 0.4999$ et $b_2 = 0.500$, alors $1 - b_1 - b_2 = 0.001$, donc très petit conflict et la règle de Dempster-Shafer (DST) ne marche pas!

Je veux dire que pas seulement dans les grands conflicts la regle DST ne marche pas, mais pour n'importe quel comflict entre (0, 1) elle ne marche pas dans ton exemple. J'ai fait une généralisation de celui-ci.

Multiple-Criteria Decision-Making

Le Hoang Son

The next decision making depends on the previous decision making results (like the conditional probability).

Florentin Smarandache

Exactly, like in Markov Chains. This is another "parameter" for the decision-maker. In my book on *neutrosophic probability*, see the section on *Neutrosophic Conditional Probability for Independent Events*.

We may try to use the neutrosophic conditional probability in *multiple-criteria decision-making*, never used before.

Dynamic Decision Making

To Le Hoang Son, Dat Luu, Mumtaz Ali

I took a look at the *Dynamic Decision Making*, which is mostly literature without formulas; just some statistics involved.

We might be able to implement some dynamicity by considering the neutrosophic components as functions of time: $T(t)$, $I(t)$, $F(t)$.

I know that not only time influences the decision making, but the changes are done upon on different times.

Thus, we may compute decision at time $t = 1$, then at time $t = 2$, etc.

We can construct continuous membership functions in terms of integral for this. The decision making will change accordingly.

We can take continuous membership functions, or even discrete membership functions (because taking a decision every second, although not continuous, it is still close to continuous). Continuous will be more challenging but never done before.

There are *n* parameters that a decision depends on, therefore the continuous functions T, I, F should depend on all of them: $T(p_1, p_2, ..., p_n)$ and similarly for I and F.

I have simplified extremely the functions T, I, F to depend on time only (t), since no matter how many parameter influence, a decision is taken at time t_1, another decision at time t_2, etc.

In addition, the aggregation operators should depend on the parameters too, and there may be many different aggregation operators to use; for example: a decision maker DM_1 uses an aggregation operator AO_1, another DM_2 uses the aggregation operation DM_2, and so on.

Then there are the weights: w_1 for DM_1, w_2 for DM_2, and so on.

And then there should be a group decision making procedure, i.e. combining the decision of all DMs in order to get a single result.

The DM becomes then more and more complicated, of complexity of rank 3 - 4.

By the way, we may have dynamicity with respect to many factors / parameters, such as: time, decision makers, variation of neutrosophic components, type of aggregation operator, etc.

All parameters influencing the decision making, combined together, take a single decision at time t_1, afterwards at time t_2, etc.

Dezert-Smarandache Theory (DSmT)

DSmT uses the included middle in the hybrid models, while the neutrosophic logic/set/probability in the indeterminate component (which is neither true nor false).

One can adjust the fusion rules from independent sources to dependent sources.

For example, one can have two sources m_1 and m_2 that are d% dependent. Then one can combine their masses taking into account their dependency.

À Jean Dezert

Les auteurs approximent la PCR5 avec des fonctions convexes ("An evidence clustering DSmT approximate reasoning method based on convex functions analysis", par Q Guo, Y He, X Guan, L Deng, L Pan, T Jian - Digital Signal Processing, 2015).

Ils disent que c'est plus facile de faire cette approximation (qui est 99% accurate) que de calculer la PCR5. Je le pense pas, mais comme même la methode était differente des autres (jvd, de faire des approximations des fusions)... Donc, j'ai recommendé sa publication.

On poura (une idee qui m'est venue) approximer la fusion de m_1 et m_2 en general... Qu'en penses-toi?

Le deuxieme article ("Score-Level Fusion of Face and Voice Using Particle Swarm Optimization and Belief Functions", par Mezai, L. ; Hachouf, F., IEEE Transactions on Human-Machine, 2015) combine, la DST avec la PCR5... Donc DST + DSmT.

Je me rappelle, quand on a presenté la PCR5 a Philadelphie, j'ai dis a l'audience qu'on pourra utiliser nos règles de fusion, les PCRs, avec d'autres theories de la fusion. En verité, cela a été fait…

To Jean Dezert

In PCR5/6 formula what happens if the denominator $m_1(X)+m_2(X)$ tends towards 0 but is not equal to 0? This seems to be a very imprecise formulation.

If the denominator $m_1(X)+m_2(X)$ tends towards 0, then also the conflicting mass $m_1(X) \cdot m_2(X)$ that is transferable tends to zero [because $m_1(X)$ and $m_2(X)$ each of them tend to zero (since they are positive)], therefore the redistribution masses x1 and y1 also tend to zero.

That reflects continuity of PCR5/6.

For example, let's say $A \wedge B = \varphi$ and one has two sources of information:

	A	B	A∨B
m_1	e_1	b_1	$1-e_1-b_1$
m_2	a_1	e_2	$1-a_1-e_2$

where all a_1, b_1, e_1, e_2 are in [0, 1], and e_1 and e_2 are positive numbers very close to zero.

Then, using PCR5/6 one has:

$$x_1/e_1 = y_1/e_2 = (x_1+y_1)/(e_1+e_2) = e_1 \cdot e_2/(e_1+e_2)$$

whence

$$x_1 = [(e_1^2) \cdot e_2]/(e_1+e_2) \rightarrow 0$$
$$y_1 = [e_1 \cdot e_2^2]/(e_1+e_2) \rightarrow 0$$

where x_1 and y_1 are the transferable masses to A and respectively B, while x_1 and y_1 are parts of the conflicting mass $e_1 \cdot e_2$ since A and B are in conflict because their intersection is empty.

Difference between DSmT and DST

À Jean Dezert

Au debut DSmT était très proche de la DST: seulement $A \wedge B$ = nonempty.

On utilisait la DSmC (conjunctive rule etendue sur le hyper-power set) seulement. Meme toi tu as saisi ca. Et Haeni nous critiquait...

Mais, peu à peu, on a ajouté des nouvelles choses: new règles de fusion (les PCR5, les BCRs, les règles unformes ou partially uniformes, etc.), la DSmP$_e$, etc.

La PCR6, meme designée par Arnaud, fait maintenant partie de la DSmT.

Ensuite l'on a inclu le complement/négation, après des longs insistances - quand meme Arnaud est intervenu.

So, l'on a elargi au maximum l'espace de fusion - il peut etre different d'une algebre booléenne quand les elements n'ont pas des frontières precises.

Ensuite, l'intersection inconnu (A∧B = indeterminate, qui peut arriver dans la pratique) que personne n'a fait dans la fusion.

Nous avons besoin aussi de decision-making, different de AHP (Saaty), qui soit mieux et plus générale.

Nous devons peut-être aborder l'espace continu (pas seulement celui discret) de la fusion.

Donc de plus en plus l'on se distingue beaucoup de la DST et l'on est plus général que la DST.

A new method similar (or close) to TOPSIS

	C_1	C_2	C_3
	12/16	7/16	1/16
A_1	7	9	9
A_2	8	7	8
A_3	9	6	8
A_4	6	7	8

One multiplies on columns with the weights 12/16, 7/16, and 1/16 respectively, and one gets:

	C_1	C_2	C_3
A_1	84/16	**27/16**	9/16
A_2	96/16	21/16	8/16
A_3	**108/16**	_18/16_	_8/16_
A_4	_72/16_	21/16	8/16

With bold we have the largest numbers for each column, and underlined are the smallest numbers on each column.

We compute the sums for each line, by subtracting each number from the largest one:

$S_{1+} = |84/16-108/16| + |27/16-27/16| + |9/16-9/16| = 1.5000$
$S_{2+} = |96/16-108/16| + |21/16-27/16| + |8/16-9/16| = 1.1875$
$S_{3+} = |108/16-108/16| + |18/16-27/16| + |8/16-9/16| = 0.6250$
$S_{4+} = |72/16-108/16| + |21/16-27/16| + |8/16-9/16| = 2.6875$

Classifying these sums we get them on places:

$$S_{3+}, S_{2+}, S_{1+}, S_{4+}$$

in the order of which one is closer to the maximum.

Then:

$S_{1-} = |84/16-72/16| + |27/16-18/16| + |9/16-8/16| = 1.3750$
$S_{2-} = |96/16-72/16| + |21/16-18/16| + |8/16-8/16| = 1.6875$
$S_{3-} = |108/16-72/16| + |18/16-18/16| + |8/16-8/16| = 2.2500$
$S_{4-} = |72/16-72/16| + |21/16-18/16| + |8/16-8/16| = 0.1875$

Classifying these sums we get them on places:

$$S_{3-}, S_{2-}, S_{1-}, S_{4-}$$

in the order of which one is further from the minimum.

If we compute T_i, we get the same ordering:

$T_1 = (S_1-) / [(S_1-) + (S_1+)] = 0.478261$

$T_2 = (S_2-) / [(S_2-) + (S_2+)] = 0.586957$

$T_3 = (S_3-) / [(S_3-) + (S_3+)] = 0.782609$

$T_4 = (S_4-) / [(S_4-) + (S_4+)] = 0.065217$

hence the order is the same:

$$T_3, T_2, T_1, T_4.$$

*

Belton and Gear [1983] firstly considered the example below:

	A	B	C
A	1	1/9	11
B	9	1	9
C	1	1/9	1

and the result using AHP is:

$$A = 1/11, B = 9/11, C = 1/11$$

(with alpha-D one gets the same result).

Then they say they repeated line of B:

	A	B	C	B
A	1	1/9	1	1/9
B	9	1	9	1
C	1	1/9	1	1/9
B	9	1	9	1

They constructed the above matrix.

Then, using the AHP one gets rank reversal.

*

Why we got the same rank in positive solutions, S_{+1}, S_{+3}, S_{+2}, S_{+4}, and same rank in negative solutions S_{-1}, S_{-3}, S_{-2}, S_{-4} ?

It is normal, since for positive values $S_{+}\ldots$ one considers the smallest values of $S_{+}\ldots$ (i.e. the most close values of $S_{+}\ldots$ to the maximum value).

While, for the negative values $S_{-}\ldots$ one considers the largest values $S_{-}\ldots$ (i.e. the further values of $S_{-}\ldots$ from the minimum value).

Even more, if we do the line summation, we also get the same order L_1, L_3, L_2, L_4:

L_1: 0.7+3.6+2.7+1.6 = 8.6

L_2: 0.8+2.8+2.4+1.4 = 7.4

L_3: 0.9+2.4+2.4+1.8 = 7.5

L_4: 0.6+2.8+2.4+1.2 = 7.0

In my opinion, the TOPSIS Simplified is consistent no matter how we do it, and its result is more justified than that of classical TOPSIS.

Alpha-D MCDC & TOPSIS

We have the following procedure:

- first we find the weights w_1, w_2, ..., w_n of criteria C_1, C_2, ..., C_n respectively using alpha-D MCDM;

- then we multiply for each alternative A_1, A_2, ..., A_m the coefficients corresponding to the above criteria by their weights.

Discussion:

1) if for each criterion column C_i the maximum is the best, we add the coefficients for each row, and the biggest result is the best;

2) if for each criterion column C_i the minimum is the best, we similarly add the coefficients for each row, and the smallest is the best;

3) if for some criteria C_i the maximum is the best, for other criteria C_j the minimum is the best, and maybe for other criteria C_k another one is the best (i.e. neither the maximum, nor the minimum), then we use the SIMPLIFIED TOPSIS:

- we make per column the absolute difference between each component and the ideal one;

- then we add the results per row; the smallest result is the best (being the closest to the ideal result).

k-Nearest Neighbors Classifier

To Yaman Akbulut, Abdulkadir Sengur, Yanhui Guo

For the *k-Nearest Neighbors Classifier*, we'll also explore the k-NN method where Dezert-Smarandache theory will be used to calculate the data samples' memberships, replacing Dempster's rule by Proportional Conflict Redistribution Rule # 5 (PCR5) that is more performant in order to handle the assignments of the final class.

Paradoxism și Absurd

To Liviu Jianu

Paradoxism și absurd nu înseamnă același lucru.

Absurd = nu are sens.

Paradoxism = are sens, dar pe dos!

Propozițiile absurde nu au sens.

Iată un exemplu: "Războiul de 30 de ani a durat 7 metri."

Despre aceasta propoziție poți spune că e falsă (în logica clasică), dar nu este exact.

În logica neutrosofică, această propoziție este nedeterminată (nici adevarată, nici falsă).

În logica (și probabilitatea) neutrosofică, o propoziție are un grad de adevăr, un grad de nedeterminare (sau neutralitate) și un grad de fals.

Propoziția "La Craiova peste o săptămână va ploua", are un grad de adevăr (să zicem 60% șansa de a ploua), un grad de nedeterminare (să zicem 10% șansa de care nu suntem siguri) și un grad de fals (să zicem 30% șansa că nu va ploua).

Nu poți zice, ca în logica clasică: propoziția este adevărată sau falsă, ci să aproximezi / prezici un grad/șansă de adevăr.

Aceste procente se obțin în urma studierii a diferiți parametri metereologici, care pot da prognoze diferite…

Neutrosofia (o nouă ramură a filozofiei) se bazează pe triadele <A>, <neutA> și <antiA>.

Propoziția "Războiul de 30 de ani a durat 7 metri" este falsă în toate celelalte ramuri filozofice – ceea ce nu reflectă cu acuratețe valoarea ei, dar în neutrosofie este nedeterminată (adică este <neutA>).

Schopenhauer's Will Philosophy

To Vic Christianto

These topics are all interesting:

- Schopenhauer's will philosophy and quantum physics;

- meta-realities of modern physics;

- the quantum mysticism is against scientific realism.

I'd first be interested in connecting Schopenhauer's will philosophy and quantum physics with neutrosophy.

In neutrosophy, we can connect an idea with its opposite idea and with its neutral idea and get common parts, i.e. $<A> \wedge <nonA> = $ nonempty set.

The common part of the uncommon things! It is a true/real... paradox.

From neutrosophy, all started: *neutrosophic logic, neutrosophic set, neutrosophic probability, neutrosophic statistics, neutrosophic measure, neutrosophic physics, neutrosophic algebraic structures* etc. and further *plithogeny, plithogenic set, plithogenic logic, plothogenic probability* etc.

Included Multiple Middle

To Vic Christianto

You know, neutrosophy is non-Aristotelian, since the middle term does exist (<neutA>, which is between <A> and <antiA>), even more, I have refined the middle term and wrote a philosophy book:

http://fs.unm.edu/LawIncludedMultiple-Middle.pdf

(*Law of Included Multiple-Middle*, i.e. <A> and <antiA> as opposites, and in between multiple middles: $<neutA>_1$, $<neutA>_2$, ...)

Included Middle between Spirituality and Rationality

To Vic Christianto

About the *Included Middle between Spirituality and Rationality*, I interpret it this way:

- in treating a malady one uses both, western rational medicine, and eastern spiritual praying;

but the praying has also a rational implication: an autosuggestion to the patient that will enhance his brain to impulse the body to better fight against malady and to readjust to worst living conditions.

My *Law of Included Multiple Middle* (shows that between opposites, for example between Spirituality and Rationality, we may have more multiple middles: M_1, M_2, ... in between.

T, I, F-statements

Dinko Juric

I am curious about to what extent T, I, F-statements can be applied to legal phenomena that infer a high degree of uncertainty and would have liked to discuss this matter with you.

Florentin Smarandache

You look for the case where you have opposite concepts/ideas/theories in your legal field. For example: two laws that happens to be contradictory in some degree (T and F), and get a solution in between (I). As I know, in US there is a law against marijuana, but marijuana is used in medicine.

So, the law is curved/blended now, and people are allowed to the use of a small quantity of marijuana.

Imperiile cresc și descresc

După cum scria Dimitrie Cantemir, referitor la otomani, imperiile cresc și descresc – și acest fenomen se repetă de când lumea.

În timp ce unele dispar, altele apar…

Religii și Secte

Și religiile se influențează reciproc, împrumutând una de la alta; iar când omogenitatea unei religii este prea mare (depășind un optimal specific) se diversifică, împărțindu-se în sub-religii, secte, culte etc.

Religia noastră este… știința

Profesorul Young Bae Jun spune că religia noastră este… matematica!

Prin extindere, eu aș continua că **religia noastră este… știința!**

Plithogenic Algebraic Structures

Definition of Plithogenic Algebraic Structures

Let S be a non-empty set, included in a universe of discourse U, defined as follows:

$$S = \{x \mid x = a_0 + a_1 P_1 + a_2 P_2 + ... + a_n P_n, n \geq 1, a_i \in R$$

or $a_i \in C$, for $0 \leq i \leq n$,

where R = the set of real numbers, C = the set of complex numbers, and all P_i are called Symbolic (Literal) Plithogenic Components}.

Definition of Plithogenic Numbers

The numbers of the form $PN = a_0 + a_1 P_1 + a_2 P_2 + ... + a_n P_n$ defined as above are called Plithogenic Numbers.

Operations with Plithogenic Numbers

Let's consider two plithogenic numbers:

$$PN_1 = a_0 + a_1 P_1 + a_2 P_2 + ... + a_n P_n, PN_2 = b_0 + b_1 P_1 + b_2 P_2 + ... + b_n P_n$$

Addition of Plithogenic Numbers

$$PN_1 + PN_2 = (a_0 + b_0) + \sum_{i=1}^{n} (a_i + b_i) P_i$$

Subtraction of Plithogenic Numbers

$$PN_1 - PN_2 = (a_0 - b_0) + \sum_{i=1}^{n} (a_i - b_i) P_i$$

Multiplication of Symbolic Plithogenic Components

In order to be able to multiply $P_i \cdot P_j$, several laws may be defined on their set $\{P_1, P_2, ..., P_n\}$, as relationships between them constructed by the experts according to their need for each application.

We recall and use now our 2015 Absorbance Law [1], simply defined as: the greater absorbs/eats the smaller.

We assume that in the above definition of the plithogenic numbers the symbolic plithogenic components are ranked increasingly, or

$$P_1 < P_2 < ... < P_n$$

where "<" may mean: smaller, less important, under, inferior, etc.

$$P_i \cdot P_j = P_{\max\{i,j\}}, \text{ whence } (P_i)^2 = P_i.$$

Multiplication of Plithogenic Numbers

$$PN_1 \cdot PN_2 = (a_0 + a_1 P_1 + a_2 P_2 + ... + a_n P_n) \cdot (b_0 + b_1 P_1 + b_2 P_2 + ... + b_n P_n)$$

and then one multiplies them term by term as in classical algebra, using the above multiplication of symbolic plithogenic components.

The algebraic structures constructed on the set PS, and using the operations between plithogenic numbers defined above, are called *Plithogenic Algebraic Structures*.

Type-n Neutrosophic Set

1) Let's consider a given Neutrosophic Set:

$$NS_1 = \{x(T_1(x), I_1(x), F_1(x)); T_1(x), I_1(x), F_1(x) \subseteq [0,1]; x \in U\}$$

This is called <u>Type-1 Neutrosophic Set</u> (or simply Neutrosophic Set).

Example of an element of this set: *a(0.6, 0.2, 0.7).*

The neutrosophic components $T_1(x), I_1(x), F_1(x)$, may be single-valued or subsets of [0, 1], and they represent the degrees of membership, indeterminacy, and nonmembership respectively. We assigned them the index 1 in order to clearly indicate their type-1.

2) If the functions $T_1(x), I_1(x), F_1(x)$, in their turn, depend on other classical or fuzzy extension functions (no matter which ones, may be: classical, plithogenic, neutrosophic, intuitionistic fuzzy, picture fuzzy, spherical fuzzy, etc.), we get a <u>Type-2 Neutrosophic Set</u>.

A Type-2 (neutrosopohic – spherical fuzzy) Set is:
$$T_1(x) = (TT_2(x), TI_2(x), TF_2(x)), I_1(x) = (IT_2(x), II_2(x), IF_2(x)),$$
$$F_1(x) = (FT_2(x), FI_2(x), FF_2(x))$$

Example of an element:

a(0.6(0.5,0.8,0.4), 0.2(0.6,0.2,0.9), 0.7(0.3,0.1,0.7)).

$$NS_2 = \{x(T_1(x)[TT_2(x), TI_2(x), TF_2(x)];$$
$$I_1(x)[IT_2(x), II_2(x), IF_2(x)];$$
$$F_1(x)[FT_2(x), FI_2(x), FF_2(x)]; x \in U\}$$

3) In general, a **Type-n Neutrosophic Set** is composed from a *Type-(n-1) Neutrosophic Set* in a similar way as passing from Type-1 to Type-2.

Algorithm

Each classical, fuzzy, or fuzzy extension type set (let's denote it by *alpha*) may be extended to an alpha Type-n Set, by hybridization (using other types of sets) or not (using only this same *alpha type set*).

The most general form is **Type-n Plithogenic Set.**

My **lab**[oratory] is a virtual facility with non-controlled conditions in which I mostly perform scientific meditation and chats: *a nest of ideas* (**nidus idearum**, in Latin). I called the jottings herein *scilogs* (truncations of the words *scientific*, and gr. Λóγος – appealing rather to its original meanings "ground", "opinion", "expectation"), combining the welly of both science and informal (via internet) talks (in English, French, Spanish and Romanian).

In this *fifth book of scilogs* collected from my nest of ideas, one may find new and old questions and solutions, referring mostly to topics on NEUTROSOPHY – email messages to research colleagues, or replies, notes about authors, articles, or books, so on.