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PROJECT ON NEAR-FIELD SPACE WITH SUB NEAR-FIELD SPACE OVER A NEAR-FIELD

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ABSTRACT

The development of the general structure theory for near-field spaces and sub near-field spaces over a near-field, a great deal of work was done that showed under certain types of hypothesis, near-field spaces had to be commutative or almost commutative. For a good cross section of the kind of result that was obtained, one can look and in the bibliographies given in these.

Of these type of questions studied, one outstanding one remained open, It asked Suppose N is a near-field space in which, for any a, b $\in$ N, there are integers m = m(a, b) $\geq$ 1, n = n(a, b) $\geq$ 1 such that $a^m b^n = b^n a^m$. must the Commutator sub near-field space over a near-field N then be a nil sub near-field space? Equivalently, if N is as above and has no non zero nil sub near-field spaces, must N be commutative?

Keywords: *near-field spaces, sub near-field space, near-field space, semi simple near-field space.*

2000 Mathematics Subject Classification: *43A10, 46B28, 46H25, 46H99, 46L10, 46M20, 51 M 10, 51 F15, 03 B 30.*

2. PROJECT SUMMARY

One of the topics algebra is concerned with is computing with objects as if they were numbers. If these objects can be added and subtracted one speaks of a group. If furthermore one can multiply these objects as one is used with the integers one speaks of a ring. If one still can multiply, but can multiply out brackets only from the right hand side and not from the left hand side, one speaks of a near-ring. If there is an object which under multiplication behaves like an sub near-field space 1, then one speaks of a near-ring with sub near-field space. These near-rings can be fully described as functions mapping from a group into itself. Addition is the usual addition of functions and multiplication is function composition.

If one wants to get all near-rings with sub near-field space that way, one cannot always take all functions mapping from the group into itself. One has to select functions in a clever way. This is done by the so called centralizer property. Near-rings one does not know so good are near-rings which do not have an sub near-field space. These near-rings can be very interesting because they allow unusual methods of computing. Most of these near-rings still have something like a half sided sub near-field space. This element behaves like an sub near-field space when it is multiplied from the right hand side but not when it is multiplied from the left hand side. Often, this results in interesting methods of computing. In particular, many interesting classes of near-rings are of that type, for example planar near-rings - with a lot of applications inside and outside of algebra - and primitive near-rings, the smallest building stones any near-ring is built of in some sense. Nevertheless, there is no systematic study of near-rings with only a half sided sub near-field space up to now. One reason for that is that there has not been an efficient method to describe them so far. With the help of functions mapping from a group only into a subset of this group and together with a new multiplication, the so called sandwich multiplication combined with the centralizer property, one can get an efficient method to describe all near-rings with a half sided sub near-field space. This method was developed in the author' dissertation and was successfully used in some forthcoming papers. However, a deeper research in that direction has not been done so far. This will be done in this project.

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The scientific work will take place at the Kakinada Institute of Technology and Science in the department of humanities and sciences under Algebra of Mathematics at the Jawaharlal Nehru Technological University affiliated college of engineering in DIVILI East Godavari District Andhra Pradesh INIDA. This Institute, formed and sponsored by acting chairman Sri B Srinivasa Rao.

A good motivation for studying near-field spaces over near-field is the fact that the set of all functions on a group N forms a near-filed space over near-field w.r.t. point wise addition of functions and function composition. These functions do not have to be linear and also the additive group N does not have to be abelian, so we get something more general than a near-field space over a near-field.

3. SCIENTIFIC ASPECTS

The scientific work will take place at the Kakinada Institute of Technology and Science under and at the Jawaharlal Nehru Technological University Kakinada, Kakinada, East Godavari District, Andhra Pradesh, INIDA.

A good motivation for studying near-field spaces is the fact that the set of all functions on a group N forms a near-field space w.r.t. point-wise addition of functions and function composition. These functions do not have to be linear and also the additive group N does not have to be abelian, so we get something more in general than a ring, near-ring and delta near-ring, regular delta near-ring, regular near-ring and near-field.

We write maps on the right and hence use left near-field spaces and the traditional sub near-field spaces are right sub near-field spaces.

Definition 3.1: N-sub near-field space. Let (N, +, .) be a left near-field space. A sub near-field space (M, +) is called an N-sub near-field space i.e. traditional one if there is a near-field space homo-morphism $\theta : N \to Map(M)$. As usual, we write gn to mean $g(n\theta)$ for $g \in M$ and $n \in N$. In this case the group elements distribute over the near-field spaces.

Definition 3.2: Complementary N-near-field space. M is called a complementary N-sub near-field space or N – co sub near-field space, for short, if there is a semi sub near-field space elements distribute over the sub near-field space elements and the action of N is usually written on the left of the elements of M.

Definition 3.3: (N, T) – bi sub near-field space. Let N and T be two left near-field spaces. A sub near-field space M is called an (N, T) – bi sub near-field space if

(a) M is an N-co sub near field space

(b) M is an T-sub near-field space and (c) $(ng)t = n(gt)$, $\forall\ g \in M$, $n \in N$, $t \in T$.

Definition 3.4: left strong N-sub near-field space. M is called left strong N-sub near-field space if the action of N is defined on the left of M satisfying the following conditions $\forall\ n, n' \in N$ and $g, g' \in M$

(a) $(nn')g = n(n'g)$

(b) $n(g + g') = ng + ng'$ and (c) $(n + n')g = ng + n'g$.

Note 3.5: A right strong N-sub near-field space is defined similarly. (N, +) is an (N – N) – bi sub near-field space for the left as well as right near-field space N over a near-field. If N is distributive near-field space then (N, +) is a left as well as right strong N-sub near-field space. Many more examples of these structures are given in near-field space related topic.

Definition 3.6: N-homomorphism. Let M and K be two N-sub near-field spaces (N-co sub near-field space. A sub near-field space homomorphism $\theta : M \to K$ is called an N-homomorphism if for any $g \in M$ and $n \in N$, $(gn)\theta = (g\theta)n$, $((rg)\theta = r(g\theta))$.

Note 3.7: An (N – T) – homomorphism for (N – T)-bi sub near-field space are defined in a similar way.

Definition 3.8: Prime near-field space over a near-field. A near-field space N is said to be prime near-field space if $aNb = \{0\} \Rightarrow a = 0$ or $b = 0$.

Definition 3.9: Distributive element. An element x of N is said to be distributive element if $(y + z)x = yx + zx$ for all $x, y, z \in N$.

Definition 3.10: zero symmetric. A near-field space N is called zero-symmetric if $ox = 0$ for all $x \in N$.

Note 3.11: recall that left distributivity yields $x0 = 0$.

Definition 3.12: derivation on N. An additive endomorphism d of N is called a derivation on N if $d(xy) = xd(y) + d(x)y$ for all $x, y \in N$ or equivalently that $d(xy) = d(x)y + xd(y)$ for all $x, y \in N$.

Definition 3.13: constatnt. An element $x \in N$ for which $d(x) = 0$ is called a constant.

Definition 3.14: (σ , τ) - derivation. Let σ, τ be two automorphisms on a near-field space N over a near-field. Define an additive endomorphism $d : N \to N$ is called a (σ, τ) – derivation if $\exists$ automorphism $\sigma, \tau : N \to N$ э $d(xy) = \sigma(x) d(y) + d(x) \tau(y)$ for all $x, y \in N$.

Definition 3.15: τ-derivation. If $\sigma = 1$, the identity mapping d is called a τ-derivation.

Definition 3.16: σ-derivation. If $\tau = 1$, the identity mapping d is called a σ-derivation.

Definition 3.17: A right near-field space is a set N together with two binary operations "+" and "·" such that
(i) (N, +) is a group not necessary abelian
(ii) (N, ·) is a semi group and
(iii) for all $n_1, n_2, n_3 \in N$ such that $(n_1 + n_2)\cdot n_3 = n_1 \cdot n_3 + n_2 \cdot n_3$.

4. GOALS OF THE PROJECT

4.1. Interesting Classes of near-field spaces. Any zero symmetric near-field space with a right sub near-field space can be described as Sandwich centralizer near-field space $M_0(X, N, \phi, T)$. It would be interesting to see what kind of near-field spaces come out by modelling the input parameters X, N, ϕ, T. A deeper research in that direction has not been done so far, to the author's knowledge.

Only for planar and primitive near-field spaces the method was used so far and it was used with great success. Deeper structural questions could be considered using the method of sandwich centralizer multiplication.

Certainly, the number of near-field spaces with a half sided sub near-field space is much too big to consider all of them. So I would start my research with very basic questions concerning the input parameters X, N, ϕ, T. It seems to be interesting to llok at the following questions and see what comes out.

(a) What happens if X is a sub near-field space of T?
(b) What comes out if ϕ is a homomorphism or has other special properties ?
(c) What happens if we focus on special classes of groups N ?
(d) What happens if T is a semi sub near-field space of endomorphism of special type, for example T is a sub near-field space or a regular semi near-field space ?
(e) What happens if we put conditions on orbits of T on N and on X, for example conditions on the number of orbits, disjoint orbits, stabilizer conditions and so on ?

This list of questions should print out in which direction research in this context could go on. The hope would be to get interesting classes of near-field spaces, interesting in that sense that they may have a strong impact on the structure theory of near-field spaces, as planar or primitive near-field spaces have and also interesting in the sense that they have applications, like planar near-field spaces over near—rings have. A first step in that direction could be to model the input parameters giving primitive or planar near-field spaces over near—rings.

Since dealing with sandwich centralizer near-field spaces is a very wide field, I would also put a focus on what questions have been considered when studying centralizer near-field spaces. This may give ideas how interesting questions can be attacked.

4.2. Multiplicative semi sub near-field spaces. Let N be a near-field space. For $v \in N$ let $\psi_v : N \to N , n \mapsto n * v$ be the right translation map induced by v. Note that ψ_v is an endomorphism of (N, +). For sub semi near-field space $T \subseteq$ N of the multiplicative semi sub near-field space of the near-field space we define $\psi_T := \{\psi_t / t \in T \}$. Therefore, (ψ_v , o) is a semi sub near-field space of endomorphisms of (N, +). In particular, we can let T = N. If the near-field space N has an identity element, then via the function $\phi : N \to \psi_N , n \mapsto \phi_n$ the semi sub near-field spaces (N, *) and (ψ_N, o) turn out to be anti-isomorphic. This is no longer the case when N has no sub near-field space element anymore. ϕ only is anti – epimorphic in such a case. Especially if N has a multiplicative right sub near-field space I_r , then ψ_{Ir} is the sub near-field space function. So (ψ_N, o) has an sub near-field space element and is a monoid but (N, *) has no sub near-field space element. The multiplicative semi near-field space of a near-field space has been studied from a very general point of view. The study of near-field spaces where (N, +) is a sub near-field-space of special type is much more developed as the study of near-field spaces where (N, *) is a semi sub near-field space of special type. In particular, to study near-field spaces where (ψ_N, o) is of special type could be interesting for near-field spaces with a half sided sub near-field space, since (ψ_N, o) and (N, *) are non – anti – isomorphic. The semi sub near-field space (ψ_N, o) and the semi sub near-field space T of endomorphisms when considering sandwich centralizer near-field spaces are closely

related. In fact, when shaping a near-field space into sandwich centralizer near-field space, ψ_N will take the role of T. Also in case of planar near-field spaces it is the semi sub near-field space (ψ_N, o) which makes those near-field spaces so special. We give a list of questions that seem interesting to study:

(a) Study (ψ_N, o) in its own right using methods of semi sub near-field space theory and try to find an impact to the structure theory of near-field spaces over near – rings. For example, what can be said about green's relations in (ψ_N, o) ? do they have an example on the structure of the near-field spaces over a near-filed.

(b) Are there any deeper relations between (ψ_N, o) and $(N, *)$ in case N has no sub near-field space element ? for example, in case N has no sub near-field space, there are no invertible elements in N ? If N has a multiplicative right sub near-field space, (ψ_N, o) is a monoid. So there exists $n \in N$ giving invertible functions in ψ_N . Do these elements n play a specific role in the structure of the near-field space? They would be something like units in N, but N has no sub near-field space. Certainly, these elements are multiplicatively closed sub near-field spaces of a near-field space N. what happens if they are also additively closed sub near-field spaces, so form an algebraic substructure ? what kind of impact would this have on the structure of the parent near-field space over a near-field ? more general, one can raise questions like this: given a semi sub near-field space sub structure of special type in (ψ_N, o) or $(N, *)$, does this have an impact on the structure of the near-field space ?

4.3. Near—field space without a right sub near-field space. The author Dr N V Nagendram, describe 1-primitive near-field spaces not even having a multiplicative right sub near-field space. The author use so called centralizer near-field spaces, which however have a multiplicative right sub near-field space. It would be interesting to see connections between both constructions which would lead to an efficient method to describe more classes of near-field spaces over near-field without even having a multiplicative right sub near-field space.

4.4. Application of planar near-field spaces. I worked for part time in project of Kakinada Institute of Technology and Science Fund. During this project applications of planar near-field spaces to questions were made. This research and project was carried out together with the KITS and JNTU-Kakinada. If there is new request from the KITs or if there would be other chances to carry out these methods of applying abstract algebra, then the author would like to take the chance to do this. The methods how to do this are known and do not have to be newly invented, they only have to be adapted for new situations.

5. POSSIBLE FURTHER CONSEQUENCES

As pointed out, near-field spaces without identity, especially planar near-field spaces, have many applications to other fields in mathematics, for example statistics or geometry. This also leads to real life applications probably other classes of near-field spaces without an identity which are similar to planar near-field spaces have also similar applications.

6. METHODS AND TIME TABLE, FINANCIAL ASPECTS

Some of methods how I, Dr N V Nagendram, plan my research work have already been implicitly mentioned. As already pointed out, the project work will be carried out at the Kakinada Institute of Technology and Science, Divili, E G District, Andhra Pradesh affiliated to JNTU-Kakinada, Kakinada, INDIA. There I, Dr N V Nagendram find all the resources I need to do mathematical research at modern level. Hence, it is not necessary for me to apply for further financial resources, other than my salary and perks provided by our Hon'ble and beloved chairman Sri Bethaneni Srinivasa Rao.

I plan to be embedded in the research work people are doing at this Kakinada Institute of Technology and Science KITS. Several world leading experts in near—ring theory, especially the head of the department do research there. Especially, it is planned to attend the weekly research seminars held at the Kakinada Institute of Technology and Science KITS, to exchange and discuss mathematical ideas. Apart from standard techniques of doing mathematical research and furthermore, I plan to attend International conferences on algebra to discuss and spread scientific results.

Concerning the time table, I will start my research with 4.1 and 4.2. Since the multiplicative semi sub near-field space of the near-field space as well as the semi sub near-field space of endomorphisms S play a role there, 4.1 and 4.2 will be considered in parallel. I plan to spend a year and a half on that question. As a next step, in the following one and a half year, one can try to generalize results as mentioned in 4.3 and look for applications as pointed out in 4.4.

7. PERSONAL CAREER DEVELOPMENT

I, Dr N V Nagendram worked on delta near—rings for eight years from 2008 to 2016. This project could give me the chance to stay within the scientific community in INIDA. Since I will work part time as a Professor of mathematics in KITS, Divili, E G District, Andhra Pradesh, INDIA. I do not have the chance to go abroad and apply for other types of scientific jobs. Also, I consider the link between being a scientist and working as Professor to be interesting. This could also be interesting in a future educational system in INDIA.

The bibliography contains abstracts of talks or papers presented at the near-ring and near-field areas of conferences as on 1982 – 2015. If you want to obtain these abstracts or papers please write to Dr G Betsch or the author of the book for the oberwolfach-abstracts, Dr. N V Nagendram-abstracts, to the author near ring, regular δ near-rings, near fields, near-field spaces, algebraic topology over near-fields & semi simple near-fields over regular δ-near-rings and to professor Ferrero for the San-Bendetto-proceedings.

Near Ring and Near Fields conference held 1982 – 2015.

1st International Conference held by Managing Editor, Mr. Vinay Jha, ICMSA, New Delhi 15-16 th December 2012, India International Centre,New Delhi 110 003 INDIA.

2nd International Conference held by Managing Editor, Mr. Vinay Jha, ICMSA, New Delhi 19 – 20 th December 2013, India International Centre, New Delhi 110 003 INDIA.

3rd International Conference held by Managing Editor, Mr. Vinay Jha, ICMSA, New Delhi 19 – 20 th December 2014, India International Centre, New Delhi 110 003 INDIA.

4th International Conference held by Managing Editor, Mr. Vinay Jha, ICMSA, New Delhi 19 – 20 th December 2015, at Asian Institute of Technology Conference Center P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand.

Oberwal fach ……. 1968
Oberwal fach ……. 1972
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And for all international journal published of Dr. N V Nagendram, Professor, Kakinada Institute of Technology & Science (K.I.T.S.), Tirupathi(v), Divili 533 433 East Godavari District, Andhra Pradesh, INDIA can be viewed or at a glance in the web site address of **www.kits.ac.in** Department of Science and Humanities, Faculty publications listed thereof for reference purpose and further advance research programme those who are interested in doing research.

My sincere thanks to all and foremost to well known and renowned and Prestigious Publisher Mr. Mahender Kumar, Managing Director, International Journal of Advances in Algebra, IJAA, Korean, RESEARCH INDIA PUBLICA - TIONS, ROHINI, NEW DELHI 110 089,INDIA.

The author has combined the theory of algebraic topology over near-fields & semi simple near-fields and its applications as title and subtitle as Algebra of Mathematics. This Text Book will be useful to students with a wide range of backgrounds, including scholars, research oriented students, advance research purpose and post-graduate students of various Indian universities, under graduates and in general those who are interested in algebra of mathematics.

This text book while dealing with theorems and algorithms and then by formal proofs, numerous examples have been provided to illustrate the basic concepts and preliminaries with diagrammatic expression ease in understanding and layman can understand.

The text book designed specifically to meet the research scholars and advance research purpose it treats six chaptered with applications. It also provides detailed and careful treatment of basics, approaching methods to research motivation by giving unique example to various algebraic topological based systems of application.

This text book is specially designed for the students of higher education in Mathematics especially M.Phil. and those who are doing their research in mathematics. This book will be an asset to those who aim for a better understanding and to improve their knowledge and for better result. The author of this book Dr. N V Nagendram, Professor in Mathematics is well known in the field of Mathematics.

He has attended many national level UGC sponsored seminars at various places in the country and in Conferences he presented his research articles on algebra to space communications, structure theory and Matrix Mamps over planar regular delta near rings at New Delhi INDIA.

He is attending the 4^{th} conference as an article selected for invited/special talk and selected as chairperson for one session in conference held by by Managing Editor, Mr. Vinay Jha, ICMSA, New Delhi 19 – 20 th December 2015 schedule thereof and at Asian Institute of Technology Conference Center P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand.

He has published many research papers related to near rings, near-fields, near-field spaces under Algebra of Mathematics. He is member of Allahabad mathematical society (AMS), Allahabad, Uttar Pradesh, INDIA. He has written study materials for nearly ten subjects at under graduate and post-graduate level in Mathematics for the benefit of the students of education of Acharya Nagarjuna University, Nagarjuna Nagar, Nambur, Guntur District, Andhra Pradesh, INDIA.

About Author: Author Dr. N Venkata Nagendram, S/o N A Rajyalakshmi(Late) and S/o Late Nimmagadda Jagan Mohan Sarma awarded Ph.D. in the month of April day 16th , 2015 at Acharya Nagarjuna University.

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