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CLOSED NAGENDRAM Γ-SEMI SUB NEAR-FIELD SPACES OF A Γ-NEAR-FIELD SPACE OVER NEAR-FIELD

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ABSTRACT

In this paper yet to complete the closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field, what remains is to show that an abstract closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field, H of a Nagendram Γ-semi near-field space N is an embedded sub-manifold. H is then a Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field and finally applications of the closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field.

Keywords: *Γ-near-field space; Γ-Semi sub near-field space of Γ-near-field space; Semi near-field space of Γ-near-field space, Nagendram Γ-semi sub near-field space, smooth, stabilizer, regular value, symplectic Nagendram Γ-semi near-field space, closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field.*

2000 Mathematics Subject Classification: *43A10, 46B28, 46H25,6H99, 46L10, 46M20, 51 M 10, 51 F 15,03 B 30.*

SECTION-1:

1.1 The closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field.

Definition 1.1.1: Suppose H and K are Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field N and $f : H \to K$ is a continuous Γ-near-field space homomorphism. Then f is said to be "smooth".

Definition 1.1.2: Let $f : M \to N$ be a C^∞ map of manifolds. A point $y \in N$ is a regular value of f if for any $x \in f^{-1}(y)$, $(df)_x : T_xM \to T_yN$ is onto.

Definition 1.1.3: A Nagendram Γ-semi sub near-field space of a Γ-near-field space N over near-field N acts on a manifold M. The stabilizer or isotropy Γ-semi sub near-field space of $x \in M$ is $N_x = \{a \in N / a . x = x \}$

Definition 1.1.4: The orbit of $x \in M$ is $N. x = \{ a . x / a \in N \}$

Definition 1.1.5: Let f is continuous its graph $\Gamma_f = \{(a, f(a)) \in H X N / a \in H \}$ is closed Nagendram Γ-semi sub near-field space of a Γ-near-field space N over near-field of H X N.

Definition 1.1.6: Let B = all bilinear forms on N^n suppose n = 2k and examine

$$\omega(v, w) = \left(v, \begin{bmatrix} 0 & I \\ -I & 0 \end{bmatrix} x \right) = \sum_{i=1}^{k} v_i\, w_{i+k} - \sum_{i=k+1}^{2k} v_i\, w_i - k$$

, the stabilizer Nagendram Γ-semi sub near-field space of a Γ-near-field space N over near-field of ω is denoted $S_p(N^{2k})$ or $S_p(k, N)$ and is called the symplectic Nagendram Γ-semi sub near-field space.

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Theorem 1.1.7: Let N be a Nagendram Γ-semi sub near-field space of a Γ-near-field space over near-field. Suppose H $\subseteq$ N is an abstract Nagendram Γ-semi sub near-field space and an embedded sub manifold. Then H is a Nagendram Γ-semi sub near-field space.

Proof: Fix $\|.\|$ on g. choose neighbourhoods W′ of $0 \in g$ and W of $1 \in$ N so that exp : W′ → W is a diffeomorphism. Let V′ = W′ ∩ {- W′}. Take V = exp (V′) and note that $a \in V \Rightarrow a^{-1} \in V$. Define Log: $(\exp \mid V)^{-1} : V \to V'$ and let h = {X ∈ g / there exist sequences $\{h_n\} \subseteq H \cap V$, $\{t_n\} \subseteq N \geq 0$ with (i) Lim $h_n = 1$, (ii) Lim t_n Log h_n = X as $n \to \infty$}

<u>To prove (a):</u> there exists a neighbourhood U′ of $0 \in h$ such that exp (U′) ⊆ H.

For that let us take U′ = V′ ∩ h. Then for any X ∈ U′ there are sequences $\{h_n\}$, $\{t_n\}$ so that (i) and (ii) holds good. Since Lim $h_n = 1$ and Lim t_n Log $h_n = 0$ as $n \to \infty$. Denote by $\{t_n\}$ the largest integer less than or equal to t.

We then have $\lim_{n\to\infty} (t_n - [t_n])\, Log\ h_n = 0$. So that X = $\lim_{n\to\infty} t_n\, Log\ h_n = \lim_{n\to\infty} [t_n]\, Log\ h_n$.

In view of this we see that,

$$\exp(X) = \lim_{n\to\infty} \exp([t_n])\, Log\ h_n = \lim_{n\to\infty} \exp\left(Log\ h_n\right)^{[t_n]} = \lim_{n\to\infty} \left(h_n\right)^{[t_n]} \in H.$$

Since $\left(h_n\right)^{[t_n]} \in$ H for all n and H is closed. This completes the proof of the exp(U′) ⊆ H. Proved (a).

<u>To prove (b)</u>: h is al linear Nagendram Γ-semi sub near-field space of g.

For that we fix and pick X ∈ h. Then sequences $\{h_n\}$ and $\{t_n\}$ satisfying the conditions
(i) Lim $h_n = 1$,
(ii) Lim t_n Log h_n = X as $n \to \infty$ }. Now, $\{h_n^{-1}\} \subseteq V \cap H$ and

$$\lim_{n\to\infty} \left(h_n^{-1}\right) = \left(\lim_{n\to\infty} h_n\right)^{-1} = 1^{-1} = 1 \text{ while } \lim_{n\to\infty} t_n\ Log\ h_n^{-1} = -\lim_{n\to\infty} t_n\ Log\ h_n = -X \in h.$$

Also for all t ≥ 0, we have $\lim_{n\to\infty} \left[t(t_n) Log\ h_n\right] \to tX$. Hence tX ∈ h for all t ∈ N.

Now if X, Y∈h. Then for t infinitesimal tX, tY ∈ U′ and so exp tX. exp tY ∈ H. In addition, since $\lim_{n\to\infty} \exp tX \exp tY = 1$, exp tX. exp tY∈V. Hence for t infinitesimal, exp tX. exp tY∈V∩H. But,

$$\left.\frac{d}{dt}\right|_{t=0} Log\ \left(\exp tX \exp\ tY\right) = \lim_{n\to\infty} \frac{1}{t} Log\left[\exp tX \exp\ tY\right] = X + Y.$$

Let $t_n = 1/n$ and $h_n = \exp t_n X \exp t_n Y$. Then $h_n \in H$ and Lim $h_n = 1$. It follows that $\lim_{n\to\infty} t_n\ Log\ h_n = X + Y \in h$.
this completes the proof of the h is al linear Nagendram Γ-semi sub near-field space of g. Proved (b).

<u>To prove (c)</u>: For any neighbourhoods U′ of $0 \in h$, exp (U′) is a neighbourhood of I ∈ H.

For that we prove in contradiction method of proof. Then, there exists a neighbourhood U′ of $0 \in h$ and a sequence $\{h_n\} \subseteq H \setminus \exp(U')$ such that $h_n \to 1$. Choose a linear Nagendram Γ-semi sub near-field space ι in g so that $g = h \oplus \iota$. Thus, there are sexuences $\{X_n\} \subseteq h$, $\{Y_n\} \subseteq \iota$ so that $h_n = \exp X_n \exp Y_n$ for n infinitesimal. Note that $Y_n \neq 0$ since $h_n \notin \exp(U')$.

Now, $h_n \in H$ implies that $\exp(X_n) \in H$ and so $\exp(X_n)^{-1} h_n \in H$. On the other hand, $\frac{1}{\|Y_n\| Y_n}$ is bounded. By passing to a subsequence, we may assume that $\frac{1}{\|Y_n\| Y_n} \to Y \in \iota$ with $\|Y\| = 1$. Let $h_n = \exp(Y_n)$ so that for n large, $h_n \in V \cap U$ and $Y_n = \text{Log}(h_n)$. Since $Y_n \to 0$, $h_n \to 1$ and $\frac{1}{\|Y_n\| \; Log \; h_n} \to Y \in h$, a contradiction to our assumption. Hence For any neighbourhoods U′ of $0 \in h$, exp (U′) is a neighbourhood of $I \in H$. Proved (c). On proving (a), (b) and (c) we can conclude that there exists a linear Nagendram Γ-semi sub near-field space *h* of *g* a neighbourhood V′ of $0 \in g$ and a neighbourhood V of $1 \in G$ such that 1. exp : V′ → V′ is a diffeomorphism, 2. exp (V′ ∩ *h*) is a neighbourhood of I in H. This completes the proof of the theorem.

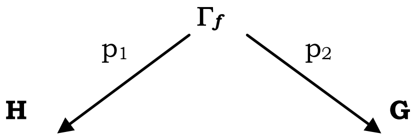
SECTION 2:

2.1 Applications of the closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field

Introduction. The Nagendram Γ-semi sub near-field spaces algebra of a Nagendram Γ-semi near-field space of a Γ-near-field space over near-field. If H is a closed Nagendram Γ-semi sub near-field space of a Nagendram Γ-semi near-field space of a Γ-near-field space over near-field N, then the Nagendram Γ-semi sub near-field spaces algebra *h* of H is $\{ X \in g \,/\, \exp tX \in H, \; \forall\, t \in N \}$ Since exp is natural , $\exp tX \in H$ for all t. Conversely, if $\exp tX \in H$ for all t. $X = \left.\frac{d}{dt}\right|_{t=0} \exp tX \in T_1 H = h$. Our first application of the closed Nagendram Γ-semi sub near-field spaces of a Γ-near-field space over near-field theorem is a rather surprising result above continuous Γ-semi sub near-field space homomorphisms.

Theorem 2.1.1: Suppose H and N are Nagendram Γ-semi sub near-field spaces and $f : H \to N$ is a continuous Nagendram Γ-semi sub near-field space homomorphism. Then *f* is smooth.

Proof: Since *f* is continuous, its graph $\Gamma_f = \{(a, f(a)) \in H \times N \,/\, a \in H \}$ is closed Nagendram Γ-semi sub near-field space of a Γ-near-field space N over near-field of H X N. Consider the projections



Now, p_1 is a Nagendram Γ-semi sub near-field space homomorphism and we can thus write $f = p_2 \circ p_1^{-1}$. So its enough to prove p_1^{-1} is smooth. But, dp_1 is everywhere onto and injective. P_1^{-1} is smooth. This completes the proof of the theorem.

Theorem 2.1.2: Let $f : M \to N$ be a smooth map of manifolds. Then, the set of regular values of *f* is dense in N.

Note 2.1.3: If $f^{-1}(y) = \Phi$, y is still a regular value. Hence, if *f* (M) is a single point in N, the component N*f* (M) is still dense and consists of regular values.

Proposition 2.1.4: Suppose $f : A \to B$ is a Nagendram Γ-semi sub near-field space homomorphism. Then (i) if *f* is onto, $(df)_a : T_a A \to T_{f(a)} B$ is onto for all $a \in A$ and (ii) if *f* is 0ne-one for all $a \in A$.

Proof: $\forall\, a \in A$, $L_{f(a)} \circ f = f \circ L_a$. So $(dL_{f(a)})_1 \circ (df)_1 = (df)_a \circ (dL_a)_1$. Consequently, using the fact that L_a is always a diffeomorphism, dim ker $(df)_a$ = dim ker $(df)_1$ and dim im $(df)_a$ = dim im $(df)_1$ for all $a \in A$.

To prove (i): The set of regular values of *f* is dense in B. By assumption B = *f* (A) and so there is $b \in f(A)$ which is a regular value. Hence there is $a_0 \in A$ so that $(df)_a$ is onto for all $a \in A$.

To Prove (ii) : Suppose that $(df)_1 (X) = 0$ for some $X \in T_1 A$. then $f(\exp t X) = \exp(t(df)_1(X)) = 1$ for all $t \in N$. Thus, $\{\exp tX\} \subseteq \ker f = \{1\}$. So X = 0 for all $a \in A$. This completes the proof of the theorem.

Proposition 2.1.5: Suppose a Nagendram Γ-semi near-field space N acts on a manifold M. For each x ∈ M, the stabilizer Nagendram Γ-semi near-field space N_x is a Nagendram Γ-semi sub near-field space of a Γ-near-field space over near-field.

Proof: Choose x ∈ M. we shall show that N_x is closed Nagendram Γ-semi near-field space in N. Let A : N X M → M denote the action of N on M. Define l_x : N → N X M by l_x (a) = (a, x). Then $N_x = \{a \in N: A(l_x(a)) = x\}$.
i.e. $N_x = l_x^{-1} (A^{-1}(x))$. Noting that both A and l_x are continuous. This completes the proof of the proposition.

We denote Nagendram Γ-semi sub near-field spaces algebra N_x of a Nagendram Γ-semi near-field space of a Γ-near-field space over near-field by g_x. Note that $g_x = \{X \in g : (\exp tX).x = x \ \forall \ t \in N\}$

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