DYNAMIC ISO-SPHERE HOLOGRAPHIC RINGS WITH EXTERIOR AND INTERIOR ISO-DUALITY

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Abstract

In this cutting-edge exploration, we introduce and define the "dynamic iso-sphere Inopin holographic ring" (IHR), which is built from a "dynamic iso-topic lifting" equipped with an iso-unit function that is characterized by constant change. The resulting developments indicate that the dynamic iso-sphere IHR is simultaneously iso-dual to an "exterior dynamic iso-sphere IHR" and an "interior dynamic iso-sphere IHR". For this, we identify both the continuously-varying and discretely-varying cases. Ultimately, the conclusions suggest that a new branch of iso-mathematics may be in order.

Keywords: Geometry and topology; Santilli iso-number; Santilli iso-sphere; Dynamic iso-sphere; Inopin holographic ring.

1 Introduction

In a forward attempt to establish order in chaos, A.E. Inopin introduced the dual space-time IHR topology in a proof of quark confinement [1], which received a topological upgrade in the triplex generalization of [2]. In Euclidean complex space, Inopin's dual 3D space-time IHR topology comprises a 1-sphere IHR "time zone" that delineates two spatial 2-branes, whereas in Euclidean triplex space, Inopin's dual 4D space-time IHR topology generalizes the 1-sphere IHR to a 2-sphere IHR that delineates two spatial 3-branes [1, 2]. In other words, the brane states can be inferred from the IHR states and vice-versa because the IHR acquires Berry phase transitions and is simultaneously dual to both branes [1, 2].

Recently, R.M. Santilli's iso-mathematics [3, 4, 5, 6, 7] was applied to Inopin's dual 4D space-time IHR topology (with the 2-sphere IHR) [1, 2, 8] to establish the iso-dual 4D space-time IHR topology (with the iso-2-sphere IHR) [9]. Subsequently, the new class of dynamic iso-spaces was constructed [10]; a dynamic iso-space is an iso-space that is characterized by constant *change* [10]. More specifically, a dynamic iso-space is built with a dynamic iso-topic lifting that arises due to a dynamic iso-unit function that varies over time [10]. Santilli's discovery of iso-mathematics gave way to these dynamic constructs because he proved that his iso-unit can be, among many things, a function [3, 4, 5, 6, 7]. Therefore, in this paper, we apply the emerging dynamic iso-spaces [10] to the iso-dual 4D space-time IHR topology [9] to define *dynamic iso-sphere IHRs*.

We launch our investigation with Section 2, where we augment the iso-sphere IHR [9] by initiating definitions for the *exterior iso-sphere IHR* and the *interior iso-sphere IHR*—for this, we demonstrate the exterior and interior *iso-duality* between the three distinct, locally iso-morphic IHR implementations. Next, in Section 3, we deploy the dynamic iso-topic lifting of [10] to upgrade the initial results of Section 2, where we mobilize definitions for the exterior dynamic iso-sphere IHR and the interior dynamic iso-sphere IHR—here, we consider the general, continuous, and discrete cases. Finally, we conclude our venture with the recapitulation of results and future outlook of Section 4.

2 Iso-sphere IHR exterior and interior iso-duality

Here, we discuss and extend the iso-sphere IHR [9] by specifically identifying the exterior and exterior iso-duality.

Following [1, 2], let T^1 be a 1-sphere IHR of amplitude-radius $r = 1$ and amplitude-curvature $\kappa = \frac{1}{r}$ that is iso-metrically embedded in the complex space S^2, such that eq. (13) of [2] identifies

$$T^1 = \{\vec{s} \in S^2 : |\vec{s}| = r\}, \tag{1}$$

where $T^1 \subset S^2$ is the multiplicative group of all non-zero complex coordinate-vectors of amplitude-radius r. Next, let T^2 be a 2-sphere IHR that is iso-metrically embedded in the triplex space S^3, such that eq. (40) of [2] identifies

$$T^2 = \{\vec{s} \in S^3 : |\vec{s}| = r\}, \tag{2}$$

where $T^2 \subset S^3$ is the multiplicative group of all non-zero triplex coordinate-vectors of amplitude-radius r; T^1 is the great circle of T^2 so both non-linear structures share the same amplitude-radius r and amplitude-curvature $\kappa = \frac{1}{r}$, where $S^2 \subset S^3$ and $T^1 = T^2 \cap S^2$ [2]. In this IHR topology [1, 2], eqs. (14) and (40) in [2] demonstrate that the micro 2-brane sub-space $S^2_- \subset S^2$ and the micro 3-brane sub-space $S^3_- \subset S^3$ correspond to *interior* dynamical systems, while the macro 2-brane sub-space $S^2_+ \subset S^2$ and the micro 3-brane sub-space $S^3_+ \subset S^3$ correspond to *exterior* dynamical systems, where T^1 delineates S^2_- and S^2_+, and T^2 delineates S^3_- and S^3_+.

Now, following Santilli's iso-number methodology [3, 4, 5, 6, 7] and the iso-sphere IHR definition [9], we select some positive-definite iso-unit $\hat{r}_+ > r$ with the corresponding positive-definite inverse $\hat{r}_- = \frac{1}{\hat{r}_+} < r$ to establish the array of *exterior* iso-topic liftings

$$\begin{array}{rccc} f(\hat{r}_+): & T^n & \rightarrow & T^n_{\hat{r}_+} \\ f^{-1}(\hat{r}_+): & T^n_{\hat{r}_+} & \rightarrow & T^n \end{array}, \quad n \in \{1, 2\}, \tag{3}$$

for the

1. *exterior iso-1-sphere IHR* $T^1_{\hat{r}_+}$ and
2. *exterior iso-2-sphere IHR* $T^2_{\hat{r}_+}$.

In this case of eq. (3), a given $T^n_{\hat{r}_+}$ is "outside" T^n because $\hat{r}_+ > r$. Thus, $\hat{r}_+$ is termed the *exterior iso-unit*, which serves as the *exterior iso-amplitude-radius* for both $T^1_{\hat{r}_+}$ and $T^2_{\hat{r}_+}$, while $\hat{r}_-$ serves as the *exterior iso-amplitude-curvature* for both $T^1_{\hat{r}_+}$ and $T^2_{\hat{r}_+}$.

So a question comes to mind: how might the iso-amplitude-curvature $\hat{r}_-$ fit into the structure and function of the said iso-sphere IHR topology? In the iso-sphere IHR topology introduction of [9], we recall that the iso-amplitude-curvature property was only mentioned in a brief context due to the limited scope of that analysis. Therefore, in this section, we wish to further probe the applicability of the iso-amplitude-curvature by deploying it to define an additional topological iso-structure. Hence, in addition to being the exterior iso-amplitude-curvature of $T^1_{\hat{r}_+}$ and $T^2_{\hat{r}_+}$, we furthermore define $\hat{r}_-$ as the *interior iso-amplitude-radius* and *interior iso-unit* of two *new* iso-sphere IHRs, namely the

1. *interior iso-1-sphere IHR* $T^1_{\hat{r}_-}$ and
2. *interior iso-2-sphere IHR* $T^2_{\hat{r}_-}$,

with the corresponding array of *interior* iso-topic liftings

$$\begin{array}{rccc} f(\hat{r}_-): & T^n & \rightarrow & T^n_{\hat{r}_-} \\ f^{-1}(\hat{r}_-): & T^n_{\hat{r}_-} & \rightarrow & T^n \end{array}, \quad n \in \{1, 2\}. \tag{4}$$

In this case of eq. (4), a given $T^n_{\hat{r}_-}$ is "inside" T^n because $\hat{r}_- < r$. Hence, upon recalling the relation $\hat{r}_- = \frac{1}{\hat{r}_+}$, we realize that $\hat{r}_+$ is also the *interior iso-amplitude-curvature* of both $T^1_{\hat{r}_-}$ and $T^2_{\hat{r}_-}$! Thus, in terms of iso-amplitude-radius and iso-amplitude-curvature, we've identified a *fundamental iso-duality* between $T^n_{\hat{r}_+}$ and $T^n_{\hat{r}_-}$. Therefore, in addition to the lemmas of [9], the results of eqs. (3–4) indicate the following:

Lemma 1. *An n-sphere IHR T^n of amplitude-radius (and unit) $r = 1$ that is iso-topically lifted via $T^n \rightarrow T^n_{\hat{r}_+}$ to the exterior iso-n-sphere IHR $T^n_{\hat{r}_+}$ of exterior iso-amplitude-radius (and exterior iso-unit) $\hat{r}_+ > r$ can be simultaneously lifted via $T^n \rightarrow T^n_{\hat{r}_-}$ to the interior iso-n-sphere IHR $T^n_{\hat{r}_-}$ of interior iso-amplitude-radius (and interior iso-unit) $\hat{r}_- < r$ if $\hat{r}_- = \frac{1}{\hat{r}_+}$, where $\hat{r}_+$*

is the interior iso-amplitude-curvature of $T^n_{\hat{r}_-}$ *and* $\hat{r}_-$ *is the exterior iso-amplitude-curvature of* $T^n_{\hat{r}_+}$*, such that* $T^n_{\hat{r}_+}$ *and* $T^n_{\hat{r}_-}$ *are iso-dual and locally iso-morphic to* T^n*.*

At this point, we've discussed and extended the iso-sphere IHR of [9] to include the exterior and interior iso-sphere IHRs of eqs. (3–4) and Lemma 1. See Figure 1 for a depiction of this scenario.

3 Dynamic iso-sphere IHR

Here, we apply the dynamic iso-topic lifting of [10] to the iso-sphere IHR results of Section 2, where we will introduce the general definitions for the exterior and interior dynamic iso-sphere IHRs in Section 3.1. Subsequently, in Section 3.2, we push beyond the general form to construct the continuous and discrete cases.

3.1 General

Thus, following the dynamic methodology of [10], we define the positive-definite dynamic iso-unit function as

$$\hat{r}_+ \equiv \hat{\delta}_{x+}(t) > r \tag{5}$$

with its corresponding positive-definite inverse

$$\hat{r}_- \equiv \frac{1}{\hat{\delta}_{x+}(t)} \equiv \hat{\delta}_{x-}(t) < r, \tag{6}$$

where $\hat{\delta}_{x+}(t)$ increases and $\hat{\delta}_{x-}(t)$ decreases simultaneously as the parameter t varies as $t \to \infty$, such that the "x" label denotes *general* form. Hence, eq. (3) can be rewritten to establish the *exterior dynamic iso-topic lifting* form

$$\begin{array}{rccc} f(\hat{\delta}_{x+}(t)): & T^n & \to & T^n_{\hat{\delta}_{x+}(t)} \\ f^{-1}(\hat{\delta}_{x+}(t)): & T^n_{\hat{\delta}_{x+}(t)} & \to & T^n \end{array}, \quad n \in \{1, 2\}, \tag{7}$$

to define the

1. *exterior dynamic iso-1-sphere IHR* $T^1_{\hat{\delta}_{x+}(t)}$ and

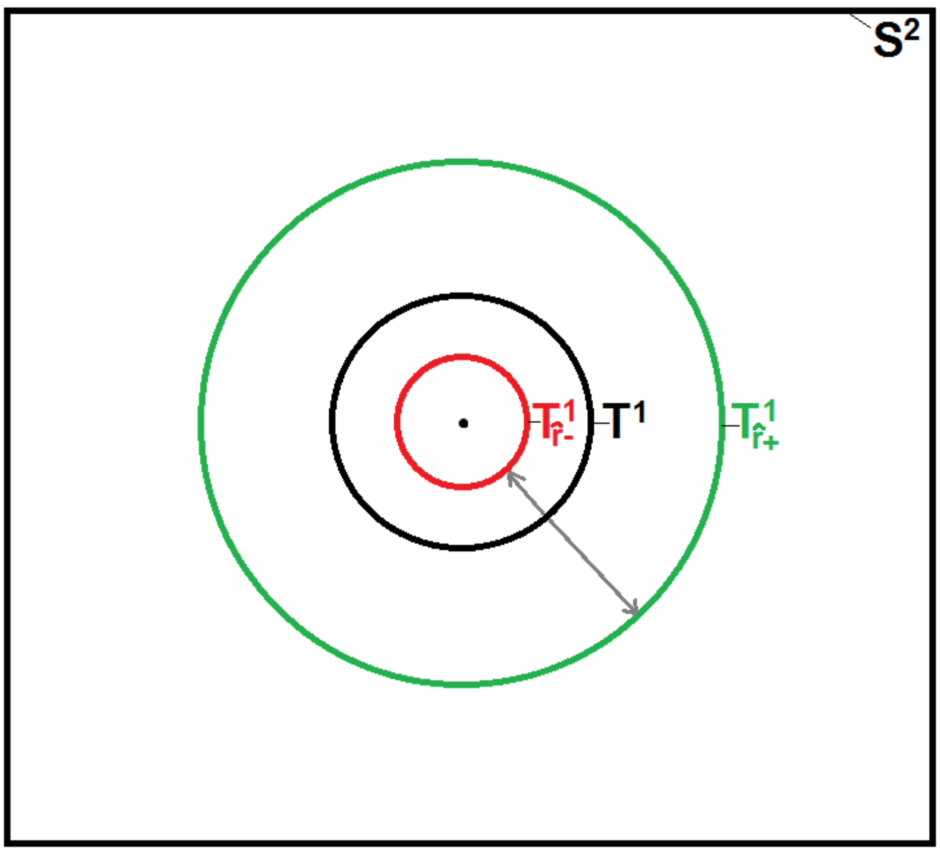

Fig. 1: The iso-1-sphere IHR T^1 is iso-topically lifted to both the exterior iso-1-sphere IHR $T^1_{\hat{r}_+}$ and the interior iso-1-sphere IHR $T^1_{\hat{r}_-}$ simultaneously, where $T^1_{\hat{r}_+}$ and $T^1_{\hat{r}_-}$ are iso-dual.

2. *exterior dynamic iso-2-sphere IHR* $T^2_{\hat{\delta}_{x+}(t)}$.

Similarly, eq. (4) can be rewritten to express the *interior dynamic iso-topic lifting* form

$$\left.\begin{array}{lccc} f(\hat{\delta}_{x-}(t)): & T^n & \rightarrow & T^n_{\hat{\delta}_{x-}(t)} \\ f^{-1}(\hat{\delta}_{x-}(t)): & T^n_{\hat{\delta}_{x-}(t)} & \rightarrow & T^n \end{array}\right., \quad n \in \{1,2\}, \tag{8}$$

to define the

1. *interior dynamic iso-1-sphere IHR* $T^1_{\hat{\delta}_{x-}(t)}$ and

2. *interior dynamic iso-2-sphere IHR* $T^2_{\hat{\delta}_{x-}(t)}$.

Therefore, the implications and results of eqs. (5–8) authorize us to establish the following:

Lemma 2. *An n-sphere IHR T^n of amplitude-radius (and unit) $r = 1$ that is dynamically iso-topically lifted via $T^n \rightarrow T^n_{\hat{\delta}_{x+}(t)}$ to the exterior dynamic iso-n-sphere IHR $T^n_{\hat{\delta}_{x+}(t)}$ of exterior dynamic iso-amplitude-radius (and exterior dynamic iso-unit) $\hat{\delta}_{x+}(t) > r$ can be simultaneously lifted via $T^n \rightarrow T^n_{\hat{\delta}_{x-}(t)}$ to the interior dynamic iso-n-sphere IHR $T^n_{\hat{\delta}_{x-}(t)}$ of interior dynamic iso-amplitude-radius (and interior dynamic iso-unit) $\hat{\delta}_{x-}(t) < r$ if $\hat{\delta}_{x-}(t) = \frac{1}{\hat{\delta}_{x+}(t)}$ as the parameter t varies, where $\hat{\delta}_{x+}(t)$ is the interior dynamic iso-amplitude-curvature of $T^n_{\hat{\delta}_{x-}(t)}$ and $\hat{\delta}_{x-}(t)$ is the exterior dynamic iso-amplitude-curvature of $T^n_{\hat{\delta}_{x-}(t+}$, such that $T^n_{\hat{\delta}_{x+}(t)}$ and $T^n_{\hat{\delta}_{x-}(t)}$ are dynamically iso-dual and locally iso-morphic to T^n.*

At this point, we've successfully applied the *general* dynamic iso-topic lifting definitions of [10] to the iso-sphere IHR results of Section 2 by introducing the definitions for the exterior and interior dynamic iso-sphere IHRs in Section 3.1, where the resulting constructions of eqs. (5–8) are characterized by Lemma 2. See Figure 2 for a depiction of this scenario.

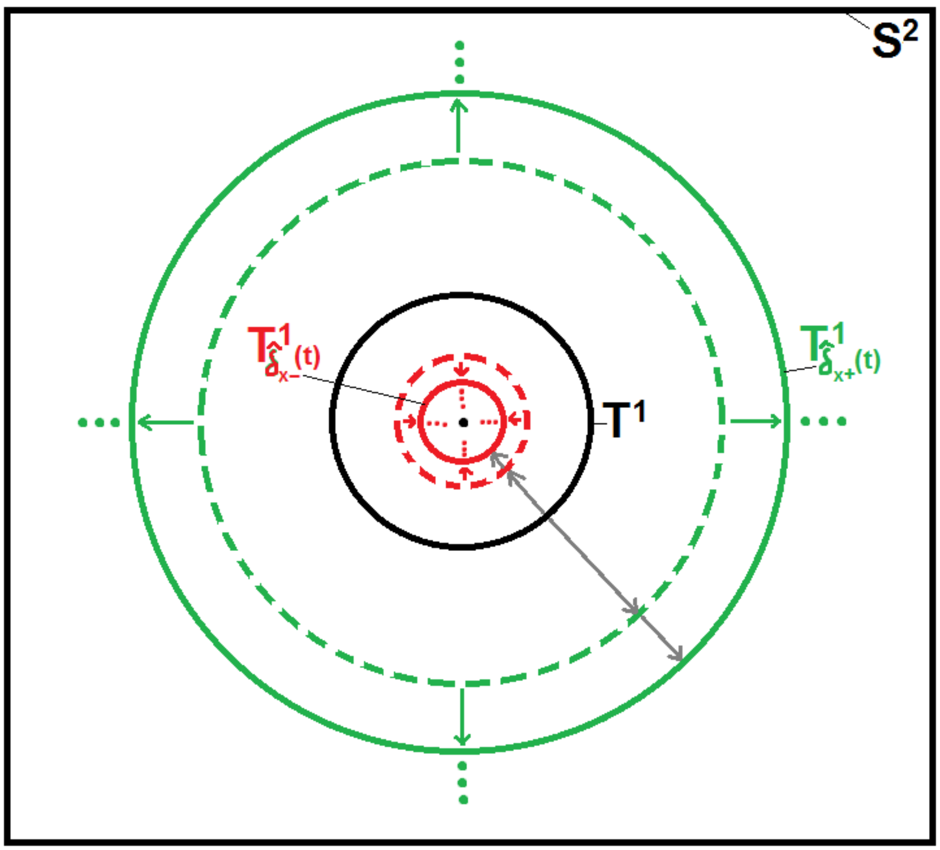

Fig. 2: The iso-1-sphere IHR T^1 is dynamically iso-topically lifted to both the exterior dynamic iso-1-sphere IHR $T^1_{\hat{\delta}_{x+}(t)}$ and the interior dynamic iso-1-sphere IHR $T^1_{\hat{\delta}_{x-}(t)}$ simultaneously as the parameter t varies as $t \to \infty$, where $T^1_{\hat{\delta}_{x+}(t)}$ and $T^1_{\hat{\delta}_{x-}(t)}$ are iso-dual.

3.2 Continuous and discrete

Next, we combine the continuous and discrete dynamic iso-space definitions of [10] with the general dynamic iso-sphere IHR definitions of Section 3.1 to assemble the continuous and discrete dynamic iso-sphere IHR implementations.

First, we will show that $T^n_{\hat{\delta}_{x-}(t)}$ and $T^n_{\hat{\delta}_{x+}(t)}$ can be defined as *continuous dynamic iso-n-sphere IHRs* if the dynamic iso-unit functions $\hat{\delta}_{c+}(t)$ and $\hat{\delta}_{c-}(t)$ are both continuous as their parameter t varies, where we label $x = c$ to denote the "continuous" case. Hence, for example, let t be the continuously varying parameter for the *continuous exterior and interior dynamic iso-unit* functions

$$\begin{array}{lllll} \hat{r}_+ & \equiv & \hat{\delta}_{c+}(t) & \in & \mathbb{R}_c \\ \hat{r}_- & \equiv & \hat{\delta}_{c-}(t) & \equiv & \frac{1}{\hat{\delta}_{c+}(t)} \in \mathbb{R}_c \end{array}, \ 0 < \hat{\delta}_{c-}(t) < r < \hat{\delta}_{c+}(t) < \infty, \ t \to \infty, \tag{9}$$

such that $\mathbb{R}_c$ is a positive-definite continuous set (i.e. the positive real numbers), to consequently define the

1. *continuous exterior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c+}(t)}$ and
2. *continuous interior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c-}(t)}$,

where we rewrite eqs. (7–8) in the *continuous exterior and interior dynamic iso-topic lifting* form

$$\begin{array}{llll} f(\hat{\delta}_{c+}(t)): & T^n & \to & T^n_{\hat{\delta}_{c+}(t)} \\ f^{-1}(\hat{\delta}_{c+}(t)): & T^n_{\hat{\delta}_{c+}(t)} & \to & T^n \end{array}, \quad n \in \{1, 2\}, \tag{10}$$

and

$$\begin{array}{llll} f(\hat{\delta}_{c-}(t)): & T^n & \to & T^n_{\hat{\delta}_{c-}(t)} \\ f^{-1}(\hat{\delta}_{c-}(t)): & T^n_{\hat{\delta}_{c-}(t)} & \to & T^n, \end{array} \quad n \in \{1, 2\}, \tag{11}$$

respectively. In eqs. (10–11), T^n remains locally iso-morphic to both $T^n_{\hat{\delta}_{c-}(t)}$ and $T^n_{\hat{\delta}_{c+}(t)}$ as t continuously varies. Thus, the results of eqs. (9–11) permit us to identify the following:

Lemma 3. *An exterior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c+}(t)}$ *is a continuous exterior dynamic iso-n-sphere IHR if the exterior dynamic iso-unit function* $\hat{\delta}_{c+}(t)$ *is continuous as its parameter* t *varies.*

Lemma 4. *An interior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c-}(t)}$ *is a continuous interior dynamic iso-n-sphere IHR if the interior dynamic iso-unit function* $\hat{\delta}_{c-}(t)$ *is continuous as its parameter* t *varies.*

Second, we will show that $T^n_{\hat{\delta}_{x-}(t)}$ and $T^n_{\hat{\delta}_{x+}(t)}$ can also be defined as *discrete dynamic iso-n-sphere IHRs* if the dynamic iso-unit functions $\hat{\delta}_{d+}(t)$ and $\hat{\delta}_{d-}(t)$ are both discrete as their parameter t varies, where we label $x = c$ to denote the "discrete" case. Hence, for example, let t be the discretely varying parameter for the *discrete exterior and interior dynamic iso-unit* functions

$$\begin{array}{rcccl} \hat{r}_+ & \equiv & \hat{\delta}_{d+}(t) & \in & \mathbb{R}_d \\ \hat{r}_- & \equiv & \hat{\delta}_{d-}(t) & \equiv & \frac{1}{\hat{\delta}_{d+}(t)} \in \mathbb{R}_d \end{array} ,\ 0 < \hat{\delta}_{d-}(t) < r < \hat{\delta}_{d+}(t) < \infty,\ t \to \infty, \tag{12}$$

such that $\mathbb{R}_d$ is a positive-definite discrete set (i.e. positive Fibonacci numbers), to consequently define the

1. *discrete exterior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c+}(t)}$ and
2. *discrete interior dynamic iso-n-sphere IHR* $T^n_{\hat{\delta}_{c-}(t)}$,

where we rewrite eqs. (7–8) in the *discrete exterior and interior dynamic iso-topic lifting* form

$$\begin{array}{rccc} f(\hat{\delta}_{d+}(t)): & T^n & \to & T^n_{\hat{\delta}_{d+}(t)} \\ f^{-1}(\hat{\delta}_{d+}(t)): & T^n_{\hat{\delta}_{d+}(t)} & \to & T^n \end{array} ,\quad n \in \{1, 2\}, \tag{13}$$

and

$$\begin{array}{rccc} f(\hat{\delta}_{d-}(t)): & T^n & \to & T^n_{\hat{\delta}_{d-}(t)} \\ f^{-1}(\hat{\delta}_{d-}(t)): & T^n_{\hat{\delta}_{d-}(t)} & \to & T^n, \end{array} ,\quad n \in \{1, 2\}, \tag{14}$$

respectively. In eqs. (13–14), T^n remains locally iso-morphic to both $T^n_{\hat{\delta}_{d-}(t)}$ and $T^n_{\hat{\delta}_{d+}(t)}$ as t discretely varies. Thus, the results of eqs. (12–14) enable us to identify the following:

Lemma 5. *An exterior dynamic iso-n-sphere IHR $T^n_{\hat{\delta}_{d+}(t)}$ is a discrete exterior dynamic iso-n-sphere IHR if the exterior dynamic iso-unit function $\hat{\delta}_{d+}(t)$ is discrete as its parameter t varies.*

Lemma 6. *An interior dynamic iso-n-sphere IHR $T^n_{\hat{\delta}_{d-}(t)}$ is a discrete interior dynamic iso-n-sphere IHR if the interior dynamic iso-unit function $\hat{\delta}_{d-}(t)$ is discrete as its parameter t varies.*

At this point, we've successfully combined the continuous and discrete dynamic iso-space definitions of [10] with the general dynamic iso-sphere IHR definitions of Section 3.1 to assemble the continuous and discrete dynamic iso-sphere IHR implementations, where the resulting constructions of eqs. (9–14) are characterized by Lemmas 3–6.

4 Conclusion

The results of this work include original definitions and lemmas for continuous and discrete dynamic iso-sphere IHRs. Through this process, we identified the iso-duality that fundamentally relates the dynamic iso-sphere IHR to the exterior and interior dynamic iso-sphere IHRs, which are locally iso-morphic. This emerging array of dynamic iso-spheres is significant because it extends the Santilli's pioneering work [3, 4, 5, 6, 7] to new realms of exploration with potential (near future) application to the disciplines of science, technology, and engineering.

Thus, there is still much work to do, as we must continue to relentlessly scrutinize, challenge, and upgrade this emerging framework via the scientific method. In particular, we suggest that in order to test the validity of our results and advance the general capability and applicability of these dynamic systems to subsequent levels, a thorough and rigorous iso-mathematical investigation should be conducted along this research trajectory. For this, we must prove the said lemmas and expand the framework by instantiating additional pertinent IHR families of dynamic iso-spheres, and furthermore the dynamic geno-spheres, dynamic hyper-spheres, and dynamic iso-dual-spheres.

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