ENVISIONING ENHANCED NUMERICAL MANIPULATION

Eugenio E. Souza. ABSTRACT: To refine this, I must establish a rigorous mathematical foundation for the proposed number system. I also need to provide a formal definition of structural information and demonstrate how the system preserves it. Furthermore, I must include a detailed analysis of the proposed system's computational complexity, covering the time and space requirements for encoding and decoding numbers. I must also address the issue of representation uniqueness by proving that every number has a unique representation within the system. Additionally, I need to include a comprehensive comparison with existing number systems, highlighting the proposed system's advantages and disadvantages. Finally, I should provide further implementation details using SageMath, including code examples and performance analysis. This would help demonstrate the system's practical viability and facilitate the replication of results by other researchers. Here, then, is a brief glimpse of an eternal apprentice bookbinder – much like Faraday (September 22, 1791 – August 25, 1867).

1 Introduction

In this Math(Art) piece (exceeding 24 is heresy). A state-of-the-art review such as one found in a scientific paper, is not included. The study of non-conventional number representation systems constitutes a fertile field within analytic number theory, symbolic dynamics, and the geometry of self-similar fractals. Traditionally, the expansion of a real or complex number relies on a fixed integer or complex base accompanied by a restricted set of digits, as consolidated in the complex radix numeration systems investigated by Knuth [4] and Penney [3]. Within these classical frameworks, representations are predominantly analyzed via standard scalar valuation functions. However, when complex numbers or irrational trajectories are mapped onto symbolic alphabets, conventional integer valuations inherently induce a degeneration of spatial boundaries, particularly regarding the geometric length and positioning of leading (left) zeros.

This work, 24 pages, introduces a theoretical framework centered on the development and parameterization of non-conventional positional structures, formally designated as Eugênio Numbers. The analytical relevance of this algebraic architecture is established through the Fundamental Conjecture. This conjecture postulates that any element of the complex plane $\mathbb{C}$ can be uniquely embedded into a sequential numeric space spanned by these foundational representational elements, thereby ensuring algebraic closure under a rigorously defined boundary metric.

To bridge this independent formulation with established literature, we map the fundamental operators of our system to well-defined mathematical objects. Specifically, we demonstrate that the projection dynamics of the framework closely correlate with the discrete properties found in Beatty Sequences, based on the behavior of floor operators applied to irrational multiples [2]. Furthermore, the systematic concatenation of digital sequences aligns closely with the foundational concepts of transcendental constants, such as the Champernowne and Liouville constants [5]. I cite a few classic references, without fully situating the theory in relation to the vast existing literature on β-expansions, bijective bases, complex radix systems, Dumont-Thomas/Fabre constructions, and the topology of ω-words. As if weren't a proletariat manufacturing diplomas.

Departing from the purist constraints of classical mathematical analysis, this paper approaches these numeric structures through a pragmatic, computational lens. Algorithmic implementation via SageMath [6], are proposed as alternative tools for data compression, positional encoding, and symbolic representations within $\mathbb{C}$ where the preservation of word length and prefix properties is critical.

2 Formal Definition of the Structural Framework

Let $\Sigma = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ be a finite alphabet, and let Σ^* denote the free monoid of all finite sequences (words) generated by Σ under the operation of string concatenation.

We define a *Numerical Gene* $\mathcal{E}_N$ (with any arithmetic property $\pi = \mathcal{P}(n)$, for example: $\langle 7\rangle$ set of multiples of 7, $\langle\sim 2\rangle$ set of odd numbers or of non-multiples of 2, since $\sim$ means "not") as a symbolic word mapped to a decimal positional system.

Eugênio Krishna's Numerical Gene $K_N = N$. Eugênio Shiva's Numerical Gene $S_N = 2N$ (N-th even number). Eugênio Zeus's Numerical Gene Z_N (N-th prime number).

The arithmetic property is the necessary condition for the existence of genetic partitionings $((\notin, \in) \notin)$ – and, consequently, for the existence of $\mathcal{E}_N$ – when translating real (and complex, quaternion, ...) numbers into Theorgyas.

For example, consider $3.1807236\ldots$; by having genes multiples of 3, it becomes a number that can be manipulated via partitions: $\mathcal{E}_1 = 3, \mathcal{E}_2 = 180, \cdots \to \mathcal{E}_1.\mathcal{E}_2\mathcal{E}_3 \cdots = (3).(180)(7236)\ldots$

Definition (N-th Numerical Gene)**.** *Let* Σ *and* Σ^**. An arithmetic property* π *is formalized via a subset* $P_\pi \subseteq \mathbb{N}$ *with its respective characteristic function* $\chi_\pi \colon \mathbb{N} \to \{0,1\}$*.*

N-th numerical gene $\mathcal{E}_N = (d_{k-1}d_{k-2}\ldots d_1d_0) \in \Sigma^*$ *is a finite word of length* $k = \mathcal{C}(\mathcal{E}_N)$*, where* $\mathcal{E}_N$*, subject to the structural restriction that its localized scaling maps directly into* P_π*.*

The valuation function val*:* $\Sigma^* \to \mathbb{Q}$ *projects this symbolic structure to its exact decimal scalar via the finite sum:*

$$D_0 \in \mathbb{Z}\ (k \in \mathbb{Z}_{>0}) \to D_c = D_{c-1} + 1 \in \mathbb{Z} \to D_{k-1} = D_0 + k - 1 \in \mathbb{Z} \tag{1}$$

$$\text{val}(\mathcal{E}_N) = \sum_{i=0}^{k-1} d_i \cdot 10^{D_i} \in \left\{n \in \mathbb{N} \;\middle|\; \chi_\pi\left(n \cdot 10^{-D_0}\right) = 1\right\} \to \text{val}^*(\mathcal{E}_N) = \text{val}(\mathcal{E}_N) \cdot 10^{-D_0} \in P_\pi$$

Definition (Non-Degenerate Real Valuation Mapping)**.** *Let* $\Sigma^{\mathbb{Z}}$ *be the Space of Bi-Infinite Sequences – determined by the space of an infinity of finite sequences – that represent expansions of real numbers.*

$$\textbf{val}^*\colon \boldsymbol{\Sigma}^* \to \bigcup \boldsymbol{P_\pi} = \mathbb{N} \iff \textbf{val}_{\mathbb{R}}\colon \boldsymbol{\Sigma}^{\mathbb{Z}} \to \mathbb{R}$$

Non-Degenerate Real Valuation Mapping as a multi-component operator that projects a formal bi-infinite $\mathbf{d} = \ldots d_1d_0.d_{-1}d_{-2}\ldots$ into the field of real numbers via a globally convergent radix series, subject to a *Syntactic-Numerical Equivalence* constraint that isolates the word morphology from scalar collapse.

$$\text{val}_{\mathbb{R}}(\mathbf{d}) = \sum_{i=-\infty}^{+\infty} d_i \cdot 10^i \iff \text{val}_{\mathbb{R}}(U_1) = 1 \to 1 = \sum_{c=1}^{+\infty} 0 \cdot 10^c + 1 \cdot 10^0 + \sum_{i=-1}^{-\infty} 0 \cdot 10^i \tag{2}$$

Definition (Concatenation Operator and Word Monoid)**.** *Let* $\Sigma = \{0,1,2,\ldots,9\}$ *be the decimal alphabet, and let* Σ^* *denote the free monoid generated by* Σ *under the operation of concatenation* $(\circ)$*, where the empty word is the identity element* ϵ*. For any two numerical genes* $\mathcal{E}_H, \mathcal{E}_{H+1} \in \Sigma^*$ *with word lengths* $\mathcal{C}(\mathcal{E}_H) = k$ *and* $\mathcal{C}(\mathcal{E}_{H+1}) = m > 1$*, respectively, such that:*

$$\mathcal{E}_H = (d_{(k+m-1)}\ldots d_m) \iff \mathcal{E}_{H+1} = (d_{(m-1)}\ldots d_1d_0)\ (M \in \mathbb{Z}_{>0}) \tag{3}$$

$$\mathcal{E}_{H\circ(+)1} \in \Sigma^* \textit{ of length } \mathcal{C}(\mathcal{E}_{H\circ(+)1}) = (k+m) \textit{ and } Lim_{S\to\infty}\mathcal{C}(\mathcal{E}_{H\circ(+)S}) = \mathcal{C}(\mathcal{E}_{H\circ(+)\aleph_0}) \tag{4}$$

$$\mathcal{E}_{H\circ(+)1} = \mathcal{E}_H \circ \mathcal{E}_{H+1} = (d_{(k+m-1)}\ldots d_1d_0) \iff \mathcal{E}_{H\circ(+)(M+1)} = \mathcal{E}_{H\circ(+)M} \circ \mathcal{E}_{(H+M+1)} \tag{5}$$

Property (Neutral Identity Element)**.** *The algebraic valuation of the identity of the neutral word* $\epsilon = \ddot{\emptyset}_{\langle\sim\pi\rangle} \in \Sigma^*$ *is formally defined as being a* empty(number) *that possesses some specific arithmetic property* $\sim\pi$ *for each Eugênio Number whose genetics enjoy the arithmetic property* π*. In the context of Theorgyas, this structural identity satisfies:*

$$\mathcal{E}_N = (\ddot{\emptyset}_{\langle\sim\pi\rangle}d_{k-1}\ldots d_0) = (d_{k-1}\ldots d_0) \iff \mathit{val}(\epsilon \circ \mathcal{E}_N) \cdot 10^{-D_0} = \mathit{val}(\mathcal{E}_N) \cdot 10^{-D_0} \in P_\pi \tag{6}$$

2.1 Formalization of the Valuation Mapping and Boundary Operators

To bridge the Σ^* and $\mathbb{R}$ without loss of syntactic data, the valuation operator is formalized as a multi-component projection. Under this mapping, left and right zero-extensions do not collapse to a scalar zero, but are preserved as dynamic boundary compensation variables $(0_{Rg}, 0_{Lf})$.

Definition (Generalized Valuation and Boundary Translation). *Let $\mathcal{R}_\Delta = \{(w_0, v) \in \Sigma^* \times \mathbb{R} \mid w_0 \stackrel{\Delta}{=} f(w_1, w_2, \ldots, w_s)\}$ be the relation set governing all valid delta-equalities over the free monoid. The boundary context mapping is formalized as a relator $\mathcal{B}$: $\mathcal{R}_\Delta \to \mathbb{R}^2$ that assigns to each syntactically balanced pair (w_0, v) a tuple of left and right translation variables $(0_{Rg}, 0_{Lf})$ satisfying the linear constraint:*

$$x_\theta = \mathrm{val}_{\mathbb{R}}(w_\theta)\ (\forall w_\theta \in \Sigma^*) \to x_0 + 0_{Lf} = 0_{Rg} + f(x_1, x_2, \ldots, x_s) \to x_0 + 0_{Lf} = 0_{Rg} + v \tag{7}$$

Definition (Theorgyas Ring). *Let $(R, +, \cdot)$ be a conventional ring. The **Theorgyas Ring** $\mathcal{O}_T$ shares the algebraic structure of R, where its elements $(0_{Rg}, 0_{Lf}) \in R^2$ emerge dynamically from a delta-equality subject to $0_{Lf} = f(0_{Rg})$. By setting $0_{Rg} = 0$ to fix the value of 0_{Lf}, the resulting pair $(0, 0_{Lf})$ is called **canonical**.*

2.2 Krishna Function and Factorized Projections

Definition (Factorized Floor Operator). *Let $S \subset \mathbb{C}$ be the set of structured symbolic expressions of the form $Z = A \cdot B$, where $A \in \mathbb{R} \setminus \mathbb{Q}$ represents a non-square irrational component and $B \in \mathbb{Z}_{>0}$ parameterizes an underlying digit block. To ensure strict algebraic uniqueness and eliminate representational ambiguity, the pair (A, B) must satisfy a minimality constraint on the scalar multiplier B, defined via the canonical decomposition:*

$$B = \min\{\beta \in \mathbb{Z}_{>0} \mid Z = \alpha \cdot \beta,\ \alpha \in \mathbb{R} \setminus \mathbb{Q}\} \tag{8}$$

By the Well-Ordering Principle of the positive integers, this minimal element exists and is uniquely determined. Based on this canonical representation, the factorized floor operator $\lfloor\cdot\rfloor_f$: $S \to \mathbb{R}$ is a well-defined syntactic projection acting as:

$$\lfloor AB \rfloor_f := \lfloor A \rfloor \cdot \sqrt{B^2} = \lfloor A \rfloor \cdot B = \lfloor \mathrm{val}(\mathcal{E}_{1\circ(+)\aleph_0} \cdot 10^\delta) \rfloor \cdot B = \mathrm{val}(\mathcal{E}_{1\circ(+)h}) \cdot B \cdot 10^\delta \in \mathbb{Z}_{\geq B} \tag{9}$$

Definition (Krishna $f_{\mathbb{C}}$ and Zeus $f^*_{\mathbb{C}}$ Functions). *Let $N \in \mathbb{Z}_{>0}$:*

$$\lfloor\langle f_{\mathbb{C}}(N)\rangle\rfloor_f := \lfloor\langle N + iN\rangle\rfloor_f = N \iff \mathcal{E}_N = \lfloor\sqrt{2N^2}\rfloor_f = \lfloor\sqrt{2}\rfloor \cdot N = 1 \cdot N\ (K_N := \mathcal{E}_N) \tag{10}$$

$$\lfloor\langle f^*_{\mathbb{C}}(N)\rangle\rfloor_f := \lfloor\langle P_N + iP_N\rangle\rfloor_f \iff \mathcal{E}_N = \lfloor\sqrt{2}\rfloor \cdot P_N \in \{2, 3, 5, 7, 11, 13, \ldots\}\ (Z_N := \mathcal{E}_N) \tag{11}$$

Definition (Eugênio Functions). *Shiva by $[x_1, y_1]$, Ana by $[x_2, y_2]$, Graça by $[x_3, y_3]$. Examples of genetic function definitions to obtain specific Eugenio numbers. This leads to the conjecture:*

$$\mathcal{E}_N = \lfloor\langle N(x_c + y_c\sqrt{-1})\rangle\rfloor_f := [N, x_c, y_c]_f \iff (val(\mathcal{E}_{1\circ(+)\aleph_0}) = \Theta_c)\ (\forall\Theta_c \in \mathbb{R} \setminus \mathbb{Q}) \tag{12}$$

2.3 Symbolic Anchoring and Structural Partitions

To parameterize the positioning of leading zeros and structural blocks within the numeric genes, we introduce a symbolic anchoring operator based on uniform word patterns. Let $\mathbf{1}_k \in \Sigma^*$ denote a word consisting of k repetitions of the digit 1 (and η_k for k repetitions of the digit η).

Definition (Anchoring Complement and Indicator Set). *Given a specific digital anchor sequence $\delta_1 \in \Sigma^*$, we define its specialized index set $\mathcal{P}_1$ and its structural partition function via:*

$$\mathcal{P}_1 = \left\{\delta_1 \in \mathbb{Z}_{>0} \mid \delta_1 = \frac{10^k - 1}{10 - 1},\ \textit{for } k \in \mathbb{Z}_{>0}\right\} \iff \sim\mathcal{P}_1 = \left\{\delta_{\sim 1} \neq \frac{10^k - 1}{10 - 1}\right\} \tag{13}$$

$$\mathcal{P}_1 = \{1, 11, 111, 1111, \dots\} \iff \sim \mathcal{P}_1 = \{0, 00, \dots, 02, 002, 0002, \dots, 45, \dots\} \tag{14}$$

The boundary partition of an arbitrary numerical gene E_N under the anchoring sequence is given by the prefix juxtaposition mapping resulting in a specific prefixed arithmetic property π:

$$\Phi_\eta(\mathcal{E}_N) = \delta_{\sim\eta} \circ \delta_\eta \to \mathcal{E}(S, M)_{\Phi_\eta} = \mathcal{E}(S, M)\langle\delta\eta\rangle \iff \Phi_{\sim\eta}(\mathcal{E}_N) = \delta_\eta \circ \delta_{\sim\eta} \to \langle\eta\delta\rangle = \langle\sim\delta\eta\rangle$$

To formally capture the morphology of tail segments and decimal boundary shifts without structural collapse, we define the *Gene-Windowing Operator* over the infinite word representing a specific entity. Let $\mathcal{Y}$ be an infinite symbolic sequence (substantive) decomposed into ordered structural blocks or genes, denoted as $\mathcal{Y} = (G_1)(G_2)(G_3)\dots$, where each $G_k \in \Sigma^*$ represents the k-th gene of the sequence. For any pair of structural indices $(n, m) \in \mathbb{Z} \times \mathbb{Z}$, the windowed representation $\mathcal{Y}(n, m)$ forms a countable set as n and m range over all integers and is uniquely defined by (where the dot $(\cdot)$ denotes the formal radix point (decimal separator)):

$$\mathcal{Y}(n, m) = \left(\mathcal{E}_{n\circ(+)m}\right) \cdot \left(\mathcal{E}_{(n+m+1)\circ(+)\aleph_0}\right) \therefore \mathcal{Y}_{(2.7182\dots)}(-1, \mp 1)\langle\delta 2\rangle = \pm(2)(7182) \cdot (8182)\dots$$

Example 2.3.1. *Let Lu and: $G_1 = 2$, $G_2 = 7182$, $G_3 = 8182$, $G_4 = 84590452$, $Lu(0, 0) = 0$*

$$\mathcal{L}u^+_{\aleph_0} = \{Lu(0, 0), Lu(1, 0) = (2) \cdot (7182)\dots, Lu(2, 0) = (7182) \cdot (8182)\dots, \mathcal{Y}_{(2.71828\dots)}(1, 1), \dots\}$$

3 Structural Representations of Complex Trajectories

Proposition (Existence of Complex Representations via Eugênio Numbers). There exists a non-empty subset of complex numbers $\mathcal{S} \subset \mathbb{C}$ such that, for each $z = x + iy \in \mathcal{S}$, its real and imaginary components can be embedded into the sequential numeric space through a linear combination of two structured Eugênio Numbers:

$$z = \left[\mathrm{val}_\mathbb{R}(\mathcal{E}(1, M_x)_{\Phi_\eta}) - \mathrm{val}_\mathbb{R}(\mathcal{K}(N_c, 0))\right] \cdot 1 + \left[\mathrm{val}_\mathbb{R}(\mathcal{E}(1, M_y)_{\Phi_\beta}) - \mathrm{val}_\mathbb{R}(\mathcal{K}(N_k, 0))\right] \cdot i \tag{15}$$

Remark (Canonical Uniqueness within the Structured Domain). Although a complex coordinate $z \in \mathcal{S}$ structurally admits multiple representations within the free monoid Σ^*, algebraic uniqueness within this specific domain is strictly restored by a deterministic minimizing filter. Let $\mathcal{A}(z) \subset \mathbb{N}^2$ be the non-empty set of all admissible coordinate pairs (N_c, N_k) satisfying the representational criteria for z. We define the canonical representational state as $(N_c^*, N_k^*) = \min_\preceq\{(N_c, N_k) \in \mathcal{A}(z)\}$, under the standard lexicographical order $\preceq$. Since $\mathcal{A}(z)$ is a non-empty subset of $\mathbb{N}^2$, the Well-Ordering Principle guarantees that a minimal element exists, while the antisymmetry of $\preceq$ ensures its uniqueness. Thus, the mapping $z \mapsto (N_c^*, N_k^*)$ is unique for any valid element within $\mathcal{S}$, preventing representational ambiguity.

3.1 Non-Standard Formulation of the Existential Subspace

Let $^*\mathbb{R}$ and $^*\mathbb{N}$ denote the fields of hyperreal and hypernatural numbers, respectively, within the framework of Robinson's non-standard analysis. Let $\omega \in {^*\mathbb{N}} \setminus \mathbb{N}$ be a fixed, infinite hypernatural integer indexing the transfinite syntactic boundary, and let $\lambda \in {^*\mathbb{N}}$ be a strictly larger infinite integer ($\lambda > \omega \gg \kappa$) bounding the ultra-extended fractional tail. Invoking the Transfer Principle, the non-conventional positional expansion of a valid trajectory coordinate $x^* \in {^*\mathbb{R}}$ belonging to the component space of $\mathcal{S}$ is rigorously defined as an exact hyperfinite sum without loss of structural memory or prefix degeneration:

$$x^* = \sum_{c=2}^{\omega}\left[\frac{D^-_{c+1}}{10^{c+1}}\right] + \sum_{c=2}^{\kappa}\left[\frac{d_c}{10^{-c}}\right] + \left[\frac{d_1}{10^{-1}} + \frac{d_0}{10^0}\right] + \left[\frac{D^-_1}{10^1} + \frac{D^-_2}{10^2}\right] + \sum_{c=\lambda}^{\omega+1}\left[\frac{D^-_{c+1}}{10^{c+1}}\right] \tag{16}$$

This formulation ensures that even under non-standard extensions, the structural history of the prefix and leading zeros is preserved for the numbers contained in the representational subset.

4 Genetic Partitioning Operator

$\forall(d_{k-1}\dots D_1 D_0.D_-^1 D_-^2\dots)\in\mathbb{R}$ $(D_0\neq D_-^1)$ can be generically partitioned by δD_0.

Given, and without loss of generality, the real number: $16.7511121314675111213146\dots$

To partition it in such a manner as to exhibit a concatenated sequence of numerical genes, there must exist within this number the sequence of conditions $(\notin,\in)$ with respect to a subset of the natural numbers defined by an arithmetic property π.

Thus, given the specialized arithmetic property $\delta 6$:

$$1\notin\langle\delta 6\rangle,\ 16\in\langle\delta 6\rangle,\ 167\notin\langle\delta 6\rangle \implies (16).751112131467511121314675111213146\dots \tag{17}$$

$$7,\ 75,\ 751,\ 7511,\ 75111,\ 751112,\ 7511121,\ 75111213,\ 751112131,\ 7511121314\notin\langle\delta 6\rangle \tag{18}$$

$$75111213146\in\langle\delta 6\rangle \implies (16).(75111213141516)(75111213146)(75111213146)\mathcal{E}_5\dots \tag{19}$$

For numbers of the type: $22.2360677236067723606772360677\dots2360677\dots2360677\dots$

In general, one can introduce an operator (Krishna ($\mathcal{K}(\Psi,0)$) Number) to establish a simple, structured arithmetic property $D_0\neq D_-^1$ (A simple condition, as it ensures genetic partitioning):

$$22.23606772360677\dots+1.234567\dots=23.4706355\dots \implies (23).(47063)\dots \tag{20}$$

$$22.2360677236067723606772360677\dots=\mathrm{val}_{\mathbb{R}}\left((23).(47063)\dots\right)-\mathrm{val}_{\mathbb{R}}\left(\mathcal{K}(1,0)\right) \tag{21}$$

5 Invariance Properties of the Representational Subspace

The existential viability of the subset $\mathcal{S}$ depends directly on the structural dynamics of the boundary operators. To ensure that genetic partitioning is algorithmically viable, the mechanical Krishna operator must guarantee a non-mirroring boundary condition across the decimal point.

Proposition (Invariance by Krishna Perturbation within $\mathcal{S}$). For any constant coordinate trajectory x belonging to the component space of $\mathcal{S}$, there exists at least one deterministic Krishna trajectory state Ψ within the finite state space $\Sigma_{\{+11\}}=\{0,1,2,3,4,5,6,7,8,9,11\}$ capable of inducing a perturbation such that the resulting units digit D_0 and tenths digit D_-^1 satisfy the strict non-mirroring boundary condition:

$$D_0\neq D_-^1 \tag{22}$$

Proof. To demonstrate the structural stability of this representational subset, we verify the boundary behavior under the additive action of the operator. Suppose there existed a pathological trajectory coordinate $x^*\in\mathcal{S}$ capable of canceling out this difference across all 11 test states simultaneously, thus keeping the neighboring digits mirrored at all times ($D_0=D_-^1$).

Let us subject this structural domain to the test of facts:

1. **The Initial State Test ($\Psi=0$):** Since the first Krishna operator injects no force into the sum ($\mathcal{K}(0,0)=0$), our expression reduces to the isolated number itself ($x^*+0=x^*$). For the neighboring digits to be equal at this stage, the starting coordinate must carry this symmetry within its structure. For visualization purposes, let us choose the value $x^*=5.500\dots$ [where $D_0=\lfloor 5.50\dots\rfloor=5$ and $D_-^1=\lfloor 10\{5.50\dots\}\rfloor=5$].

$$(\lfloor x^* \rfloor = 5 \text{ and } \{x^*\} = 0.5) \; 10\{K\} = \mathcal{K}(\phi, 0) \; (T_0 \in \{0,1\} \text{ and } T_1 \in \{0,1\})$$

$$5.5 + 0.0 = 5.5 \; (D_-^1 = D_0) \; 5.500\cdots + 1.23456\cdots = 6.73456\ldots \; (D_-^1 \neq D_0)$$

$$D_0 = (\lfloor x^* \rfloor + \lfloor K \rfloor + \lfloor \{x^*\} + \{K\} \rfloor) \bmod 10 \to D_0 = (5 + \phi - 1 + T_0) \bmod 10$$

$$(\lfloor 10\{x^*\} \rfloor + \lfloor 10\{K\} \rfloor + \lfloor \{10\{x^*\}\} + \{10\{K\}\} \rfloor) \bmod 10 = (5 + \phi + T_1) \bmod 10$$

$$10B = 5 + \phi + T_1 - D_-^1 \to \phi = 10B - 5 - T_1 + D_-^1 \; (\phi = 10A - 5 + 1 - T_0 + D_0)$$

$$\phi < \Psi \to D_-^1 = D_0 \to \Psi - \gamma = 10 \times B - 5 - T_1 + D \to \Psi = 10 \times B - 5 - T_1 + D + \gamma$$

$$\phi \geq \Psi \to \Psi + \alpha = 10A - 5 - T_0 + D_0 + 1 \to \gamma + \alpha = 10(A - B) + T_1 - T_0 + D_0 - D + 1$$

$$\gamma + \alpha = 10(A - B) + T_1 - T_0 + D_0 - D + 1 \to T_1 = \gamma + \alpha + T_0 - D_0 + D - 1 + 10(B - A)$$

$$T_1 = \gamma + \alpha + T_0 - D_0 + D - 1 + 10B - 10A \to D_-^1 = (\phi + T_0 + D + 5 - 1 - D_0) \bmod 10$$

$$D_0 \neq D_-^1 \to D_-^1 \neq (4 + \phi + T_0 + D - D_-^1) \bmod 10 \to 10C = 5 + \phi - 1 + T_0 + D - 2D_-^1 - \xi$$

$$D_0 = (2D_-^1 + \xi - D) \bmod 10 \to D_0 \neq (2D_0 - D) \bmod 10 \to (D_0 - D) \bmod 10 > 0 \to D_0 \neq D$$

□

6 Zeros(Lf/Rg) in the context of delta equality in Theorgyas

We formalize the non-equivalence between left-padded ($\mathbf{0}_{\mathrm{Lf}}$) and right-padded ($\mathbf{0}_{\mathrm{Rg}}$) variables over Σ^*. Concatenation induces non-symmetric shifts in local evaluations based on the anchoring boundary. Mapping the quadratic expansion over the joint discrete projection space yields:

$$\mathcal{A}\left([f_R(N, M), 1, 1]_f, [f_R(Q, P), 1, 1]_f\right) \stackrel{\Delta}{=} f_R\left(\mathcal{U}(N, Q), \mathcal{T}(M, P)\right) \tag{23}$$

$$\mathcal{B}\left([(N + 3M)^2, 1, 1]_f, [(M + 3N)^2, 1, 1]_f\right) \stackrel{\Delta}{=} \left(\mathcal{L}(N, M) + 3 \times \mathcal{J}(M, N)\right)^2 \tag{24}$$

$$\begin{cases} w \triangleq f(w_1, \ldots, w_n) = f(\ldots) \\ \mathrm{val}_{\mathbb{R}}(w) + 0_{\mathrm{Lf}} = 0_{\mathrm{Rg}} + f(\ldots) \in \mathbb{R} \end{cases} \qquad \begin{cases} w \in \Sigma^* \quad (\textit{a priori} \text{ Eugenio Number})(w_i \in \Sigma^*) \\ f(\ldots) \in \mathbb{R} \quad \text{(Scalar result of the real function)} \\ 0_{\mathrm{Lf}}, 0_{\mathrm{Rg}} \in \mathbb{R} \quad \text{(Dynamic boundary compensators)} \end{cases}$$

Evaluating at $(N, M) = (2, 1)$:

$$\mathcal{B}\left([(2 + 3 \times 1)^2, 1, 1]_f, [(1 + 3 \times 2)^2, 1, 1]_f\right) \stackrel{\Delta}{=} \left(\mathcal{L}(2, 1) + 3 \times \mathcal{J}(1, 2)\right)^2 \tag{25}$$

$$\mathcal{B}\left(\lfloor 1.41421\ldots \rfloor \cdot 25, \lfloor 1.41421\ldots \rfloor \cdot 49\right) \stackrel{\Delta}{=} \left(\mathcal{L}(2, 1) + 3 \times \mathcal{J}(1, 2)\right)^2 \tag{26}$$

$$\mathrm{val}_{\mathbb{R}}(\mathcal{B}(25, 49)) + \mathbf{0}_{\mathrm{Lf}} = \mathbf{0}_{\mathrm{Rg}} + \left(\mathrm{val}_{\mathbb{R}}(\mathcal{L}(2, 1)) + 3 \times \mathrm{val}_{\mathbb{R}}(\mathcal{J}(1, 2))\right)^2 \tag{27}$$

As an exercise in imagination: Imagine the following expression:

$$\mathrm{val}_{\mathbb{R}}(\mathcal{B}(25, 49)) = \sum_{c=1}^{50} \left[(1 + (c \bmod 9)) \times 10^{c+1}\right] + \sum_{c=1}^{\lambda} \left[(1 + (c \bmod 9)) \times 10^{-(c+1)}\right] \tag{28}$$

$$\mathrm{val}_{\mathbb{R}}(\mathcal{B}(25, 49)) + \mathbf{0}_{\mathrm{Lf}} = \mathbf{0}_{\mathrm{Rg}} + (93103.113123133143\cdots + 3 \times 50515.25354565\ldots)^2 \tag{29}$$

7 The Rational Distribution

7.1 Distribution(%): Rational Vs. Krishna(Theta, Zero)

Rank and Intervals $d^+_{k-1}\dots D^+_1 D^+_0 . D^1_- D^2_- \dots d^h_-$	**Krishna**	(%)
1st 00.97 to 00.97 and 01.08 to 02.07 and 03.18 to 03.21 04.28 to 04.32 and 05.38 to 05.43 and 06.48 to 06.54 07.58 to 07.65 and 08.68 to 08.76 and 08.88 to 09.87	$\mathcal{K}(8,0)$	24.00
2nd 01.06 to 01.06 and 02.16 to 02.16 and 03.26 to 03.26 04.36 to 04.36 and 05.46 to 05.46 and 06.55 to 06.56 07.68 to 08.67 and 08.86 to 08.86 and 09.96 to 09.96	$\mathcal{K}(2,0)$	10.90
3rd (Tied) 00.01 to 00.96 01.07 to 01.07 and 02.17 to 02.17 and 03.27 to 03.27 04.37 to 04.37 and 05.47 to 05.47 and 06.57 to 06.57 07.66 to 07.67 and 08.87 to 08.87 and 09.97 to 09.99	$\mathcal{K}(1,0)$	10.80
3rd (Tied) 01.05 to 01.05 and 02.15 to 02.15 03.25 to 03.25 and 04.35 to 04.35 and 05.44 to 05.45 06.58 to 07.57 and 08.85 to 08.85 and 09.95 to 09.95	$\mathcal{K}(3,0)$	10.80
3rd (Tied) 01.02 to 01.02 and 02.08 to 02.12 03.28 to 04.27 and 08.82 to 08.82 and 09.92 to 09.92	$\mathcal{K}(6,0)$	10.80
6th 01.04 to 01.04 02.14 to 02.14 and 03.24 to 03.24 and 04.33 to 04.34 05.48 to 06.47 and 08.84 to 08.84 and 09.94 to 09.94	$\mathcal{K}(4,0)$	10.70
7th 01.03 to 01.03 and 02.13 to 02.13 and 03.22 to 03.23 04.38 to 05.37 and 08.83 to 08.83 and 09.93 to 09.93	$\mathcal{K}(5,0)$	10.60
8th 01.01 to 01.01 02.18 to 03.17 and 08.80 to 08.81 and 09.90 to 09.91	$\mathcal{K}(7,0)$	10.50
9th 01.00 to 01.00 and 09.88 to 09.89 and 08.77 to 08.79	$\mathcal{K}(9,0)$	00.60
10th 00.98 to 00.99	$\mathcal{K}(11,0)$	00.20
00.00 to 00.00	Any $\mathcal{K}(\theta,0)$	00.10
Total Shared Space		**100.00**

$$07.65 \oplus \mathcal{K}(8,0) \to 7.65 + 8.910\cdots = 16.560\cdots \to (16).(56)(101213141516)\cdots = \mathcal{E}(1,0)_{\Phi_6} \quad (30)$$

$$07.65 \oplus \mathcal{K}(1,0) \to 7.65 + 1.23456\cdots = 8.88456\ldots \notin \{\ldots,\ \mathcal{E}(1,0)_{\Phi_0},\ \ldots,\ \mathcal{E}(1,0)_{\Phi_1},\ \ldots\} \quad (31)$$

$$07.65 \oplus \mathcal{K}(7,0) \to 7.65 + 7.891011\cdots = 15.5410\ldots \notin \{\ldots,\ \mathcal{E}(1,0)_{\Phi_0},\ \ldots,\ \mathcal{E}(1,0)_{\Phi_1},\ \ldots\} \quad (32)$$

$$7.65 \oplus \mathcal{K}(9>8,0) = (16).(75111213141516)\cdots = \mathcal{E}^*(1,0)_{\Phi_6} \to 7.65 \oplus \mathcal{K}(8,0) = \mathcal{E}(1,0)_{\Phi_6} \quad (33)$$

8 Running SageMath

$$\mathcal{K}\left(\sqrt{(1-9)^2},0\right) \triangleq \mathcal{G}(1,0)-\mathcal{K}(9,0)=\mathcal{E}(1,0)\langle\delta 0\rangle-\mathcal{K}(9,0) \tag{34}$$

$$\sim \mathbf{2}10\ \mathbf{2}10\ \mathbf{20}1112131415161718 1920\ \mathbf{20}2122232425262728 2930\ \ldots$$

$$-\ \mathbf{19}\ \mathbf{2}10\ \mathbf{2}11\ \mathbf{2}12\ \mathbf{2}13\ \mathbf{2}14\ \mathbf{2}15\ \mathbf{2}16\ \mathbf{2}17\ \mathbf{2}18\ \mathbf{2}19\ \mathbf{2}20\ \mathbf{2}21\ \mathbf{2}22\ \mathbf{2}23\ \ldots$$

$$1=[10.1011121314151617181920\ldots]-[9.1011121314151617181920\ldots] \tag{35}$$

$$\mathbf{0}_{\mathrm{Rg}}=0\to 8.910\cdots+\mathbf{0}_{\mathrm{Lf}}=1\longrightarrow \mathbf{0}_{\mathrm{Lf}}=-7.910\cdots=-\mathrm{val}_{\mathbb{R}}\left(\mathcal{E}(1,0)\langle\delta 7\rangle\right) \tag{36}$$

A single counterexample suffices to refute Theorem 3.1. We therefore invite the reader to employ the SageMath routines herein to identify any real number whose symbolic expansion fails to satisfy the stated embedding conditions. The existence of such a value would rigorously invalidate the theorem.

```
def zetta(lua,una,uva,ku=12,kuz=12):
    if ku>12:
        mary=[]
        if lua==0:
            kuz=0
        else:
            for w in range(ku):
                while bool(kuz > 1):
                    kuz = kuz / 10
                lea=ku-w-1
                kuz = lea+kuz
                if lua==lea:
                    break
        myu=kuz+una/uva
        while bool(myu > 1):
            myu = myu / 10
        for luz in range(ku):
            mym=int(myu*10)
            myu=myu*10-mym
            mary.append(mym)
    else:
        for w in range(12):
            while bool(kuz > 1):
                kuz = kuz / 10
            lea = 11-w
            kuz = lea+kuz
            if lea==lua:
                break
        mary = n(kuz,digits=15)
    return mary
```

Compare:

tenta(**pi+e**,1,100) with tenta(sqrt(34),1,100). tenta(**pi*e**,1,100) with tenta(sqrt(73),1,100) and obtain corroboration of whether the number is either Transcendent or Irrational Algebraic.

Remark. $\mathcal{I}[E_N]$ is a symbolic representation mechanism. While it may be bypassed during global scalar computations, its application is fundamental when one requires isolating, identifying, or recovering the exact boundary state of a specific E_N for a given index N within the expansion.

```
def tenta(pk,yk=1,zk=10):
    gal = pk*yk; V=1
    if gal<yk and gal>pk*pk:
        pk=1; yk=1
    tu = zetta(V,pk,yk)
    dia = pk/yk+tu
    if gal!=floor(gal):
        V = 0; kk=34*zk; tu = 0
        if sqrt(pk/yk) not in QQ:
            Mno = RealField(kk)
            dia = Mno(pk/yk)+tu
    nuw = floor(dia); s=1; cm=0
    pkt = (nuw // 10)*100
    vd = floor(10*(dia-nuw))
    vc = (10*nuw-pkt) // 10
    while vc==vd:
        V=V+1; tu=zetta(V,pk,yk)
        dia=pk/yk+tu; nuw=floor(dia)
        vd = floor(10*(dia-nuw))
        pkt = (nuw // 10)*100
        pykt = 10*nuw-pkt
        vc = pykt // 10
    cm = floor(log(nuw,10))+1
    kur = nuw-(nuw // 10)*10
    kum=zetta(V,pk,yk,10*zk)
    zito=1; nu=0; my=[]
    cum=len(kum)-2
    while nu<cum:
        while kum[nu]==kur and nu<cum:
            zito=zito*10+kum[nu]; nu=nu+1
            if nu < len(kum) and kum[nu]!=kur:
                if cm>nu:
                    s=s+1
                mur=int(log(zito,10))
                zyto=zito+(mur-1)*10^mur
                my.append(zyto); zito=1
        while kum[nu]!=kur and nu<cum:
            zito=zito*10+kum[nu]; nu=nu+1
    kr='(%d, 0)Eug(#%d)'%(s,kur); my.insert(0,kr)
    kr2='(%d, 0)Krshna'%V; my.append(kr2); print(my)
    return #Genetic sequencing using Fundamental NT-Theorem.
```

Given the Corollary Genetic Limit Theorem (Irrational Algebraic Numbers) ([1] Page 21)

$$\mathbb{T} = \{\exists(E_\infty) \mid (C(E_\infty) = \textbf{Infinite}\text{ Digits}) \; \forall(\mathbb{T}\textbf{ranscendent } \mathcal{E}(N, M) \text{ Number})\} \tag{37}$$

Similarly, Liouville's constant multiplied by one hundred (100L) Partitioned by $\langle\delta1\rangle$:

$$\mathcal{E}(2\sqrt{-1} \pm 1)\langle\delta1\rangle = \pm(11)(0001)(000000000000000001).L_4 \ldots L_{(\infty-N)} \ldots (00\ldots01) \tag{38}$$

$$C(L_\infty) = C(00000000000000000000000\ldots000000000000000000000001) = \infty \text{ Digits} \tag{39}$$

[Link To The Codes]

8.1 SageMath: Rational Distribution

```
def zetta(lua,una,uva,kuz=12):
    for w in range(12):
        while bool(kuz > 1):
            kuz = kuz / 10
        lea = 11-w
        kuz = lea+kuz
        if lea==lua:
            break
    mary = n(kuz,digits=15)
    return mary
```

```
def domg(V=1):
    ma=[]; mau=0; yk=100
    mu=n(1/yk,digits=4); m=[]
    for pk in range(10*yk-1):
        tu = zetta(V,pk+1,yk)
        dia = (pk+1)/yk+tu
        nuw = floor(dia)
        pkt = (nuw // 10)*100
        vd = floor(10*(dia-nuw))
        vc = (10*nuw-pkt) // 10
        while vc==vd:
            V=V+1; tu=zetta(V,pk+1,yk)
            dia=(pk+1)/yk+tu; nuw=floor(dia)
            vd = floor(10*(dia-nuw))
            pkt = (nuw // 10)*100
            pykt = 10*nuw-pkt
            vc = pykt // 10
        ma.append(V); V=1
        if pk>0 and ma[pk-1]!=ma[pk]:
            if ma[0]==ma[pk-1] and mau==0:
                mula=n(pk/yk,digits=4)
                m.append((mu,mula,ma[pk-1]))
                mau=1; mu=n((pk+1)/yk,digits=4)
            mula=n((pk+1)/yk,digits=4)
            m.append((mu,mula,ma[pk]))
            mu=n((pk+2)/yk,digits=4)
    mula=n((pk+1)/yk,digits=4)
    m.append((mu,mula,ma[pk]))
    return print(m) #SageMath codes (by the author) QR code
```

$$\left[\boldsymbol{\mathcal{U}(2,0) = (12).(112)(1112)\ldots \quad \mathcal{R}(1,0) = (2).(002)(0002)\ldots}\right]$$

$$\left\|\left(\ddot{\aleph}_{\infty}!\right)\dot{\emptyset}_{\sim\#1}1 + ZeR0\$_{(E\&D)}\right\|$$

$$\mathcal{U}(2,0) = (12).(112)\ldots \quad \mathcal{R}(1,0) = (2).(002)\ldots \quad \mathcal{J}(1,0) = (10).(110)\ldots$$

$$12.1121112\cdots - 2.0020002\cdots = 10.11011\cdots \rightarrow \mathcal{J}(1,0) = \mathcal{U}(2,0) - \mathcal{R}(1,0)$$

$$\mathcal{U}(2,0) = (12).(112)\ldots \quad \mathcal{R}(1,0) = (2).(002)\ldots \quad \mathcal{J}(1,0) = (24).(24)\ldots$$

$$12.1121112\cdots \times 2.0020002\cdots = 24.24844\cdots \to \mathcal{J}(1,0) = \mathcal{U}(2,0) \times \mathcal{R}(1,0)$$

tenta(pi+e,1,55)

- $(\pi + e) = \mathrm{val}_{\mathbb{R}}\left(\mathcal{Y}(1,0)\right) - \mathrm{val}_{\mathbb{R}}\left(\mathcal{K}(0,0)\right)$
- $(\pi + e) = (3.14159265\ldots) + (2.71828182\ldots) \simeq \sqrt{34}$
- $\mathcal{Y}(1,0) \simeq (\ddot{\emptyset}_{[\sim\delta 5]}5).(85)(987448204883847382293085)E_4 \ldots E_{44}(77865)(655)$
- 2Digits$E_1 = \ddot{\emptyset}_{[\sim\delta 5]}5$; 2Digits$E_2 = 85$; 24Digits$E_3 = 987448204883847382293085$;
- 7Digits$E_4 = 4632165$; 5Digits$E_5 = 38195$; 10Digits$E_6 = 4416493075$; 3Digits$E_7 = 065$;
- 3Digits$E_8 = 395$; 23Digits$E_9 = 94191222003189303663975$; 2Digits$E_{10} = 65$;
- 20Digits$E_{11} = 93199417003867283495$; 12Digits$E_{12} = 409614478445$; 3Digits$E_{13} = 285$;
- 4Digits$E_{14} = 3665$; 7Digits$E_{15} = 6891125$; 10Digits$E_{16} = 8206179625$;
- 6Digits$E_{17} = 804625$; 43Digits$E_{18} = 6937033890767481884164313298820118687934745$;
- 7Digits$E_{19} = 0370215$; 16Digits$E_{20} = 0181400976002645$; 4Digits$E_{21} = 1635$;
- 5Digits$E_{22} = 96635$; 10Digits$E_{23} = 6002176255$; 7Digits$E_{24} = 8311795$;
- 14Digits$E_{25} = 42924100326625$; 34Digits$E_{26} = 7722791336709193776046419667209065$;
- 2Digits$E_{27} = 05$; 36Digits$E_{28} = 011463379941333432762897684449218495$;
- 26Digits$E_{29} = 06266103921714874187918275$; 13Digits$E_{30} = 6619746297035$;
- 7Digits$E_{31} = 6072065$; 14Digits$E_{32} = 92396762642135$; 13Digits$E_{33} = 6861484392915$;
- 6Digits$E_{34} = 082175$; 4Digits$E_{35} = 1125$; 21Digits$E_{36} = 894089391274700610555$;
- 2Digits$E_{37} = 95$; 28Digits$E_{38} = 8228634322396218162072244845$;
- 13Digits$E_{39} = 2478299327175$; 10Digits$E_{40} = 1421634065$;
- 24Digits$E_{41} = 871282286482741311074225$; 2Digits$E_{42} = 75$; 4Digits$E_{43} = 6985$;
- 2Digits$E_{44} = 15$; 5Digits$E_{45} = 77865$; 3Digits$E_{46} = 655$; $[\ldots]$.

tenta(sqrt(34),1,60)

- $\sqrt{34} = (5.830951\ldots) = \mathrm{val}_{\mathbb{R}}(\mathcal{X}(1,0)) - \mathrm{val}_{\mathbb{R}}(\mathcal{K}(0,0))$
- $\mathcal{X}(1,0) \simeq (\ddot{\emptyset}_{[\sim\delta 5]}5).(83095)\ldots(99868889760718195)(35)E_{44}$
- 2Digits$E_1 = \ddot{\emptyset}_{[\sim\delta 5]}5$; 5Digits$E_2 = 83095$; 7Digits$E_3 = 1894845$;
- 11Digits$E_4 = 30047087415$; 5Digits$E_5 = 28775$; 3Digits$E_6 = 455$;
- 6Digits$E_7 = 830765$; 11Digits$E_8 = 21398334885$; 5Digits$E_9 = 97195$;
- 3Digits$E_{10} = 445$; 28Digits$E_{11} = 0006744867810061996712627665$;
- 8Digits$E_{12} = 24032645$; 4Digits$E_{13} = 3035$; 5Digits$E_{14} = 39855$;
- 10Digits$E_{15} = 6789622075$; 2Digits$E_{16} = 35$; 6Digits$E_{17} = 491135$;
- 19Digits$E_{18} = 1813873616170806285$; 21Digits$E_{19} = 903226078824447181665$;
- 2Digits$E_{20} = 05$; 3Digits$E_{21} = 435$; 20Digits$E_{22} = 97702392681686483765$;
- 7Digits$E_{23} = 4326965$; 19Digits$E_{24} = 6421729978147097925$;
- 14Digits$E_{25} = 31836338977115$; 12Digits$E_{26} = 470623113685$;
- 14Digits$E_{27} = 61884349867175$; 2Digits$E_{28} = 05$; 2Digits$E_{29} = 35$; 5Digits$E_{30} = 13175$;
- 43Digits$E_{31} = 3636837194019937644723483340963706328933005$;
- 11Digits$E_{32} = 89334677225$; 6Digits$E_{33} = 130975$; 8Digits$E_{34} = 22074105$;
- 10Digits$E_{35} = 6780100845$; 5Digits$E_{36} = 06255$; 4Digits$E_{37} = 6745$;
- 11Digits$E_{38} = 90797897615$; 26Digits$E_{39} = 11223133642460468368762805$;
- 18Digits$E_{40} = 624634146266194085$;
- 39Digits$E_{41} = 042811310467774613761830226208747301295$;
- 17Digits$E_{42} = 99868889760718195$; 2Digits$E_{43} = 35$; 9Digits$E_{44} = 881492245$; $[\ldots]$.

tenta(pi*e,1,60)

- $(\pi \times e) = \mathrm{val}_{\mathbb{R}}\left(\mathcal{Q}(1,0)\right) - \mathrm{val}_{\mathbb{R}}\left(\mathcal{K}(0,0)\right)$
- $(\pi \times e) = (3.14159265\ldots) \times (2.71828182\ldots)$
- $\mathcal{Q}(1,0) \simeq (\ddot{\emptyset}_{[\sim\delta 8]}8).(5397342226735670654635508)\ldots(278)E_{36}$
- 2Digits$E_1 = \ddot{\emptyset}_{[\sim\delta 8]}8$; 25Digits$E_2 = 5397342226735670654635508$;
- 17Digits$E_3 = 69546574495034888$; 13Digits$E_4 = 5357651149618$;
- 14Digits$E_5 = 79601130179228$; 10Digits$E_6 = 6111573308$; 9Digits$E_7 = 075725638$;
- 37Digits$E_8 = 6971047394391377494251167746764632118$;
- 16Digits$E_9 = 7590696023990618$; 26Digits$E_{10} = 36345379070414542021599488$;
- 7Digits$E_{11} = 9633428$; 13Digits$E_{12} = 5274670004668$;
- 24Digits$E_{13} = 776609307271129039350748$; 16Digits$E_{14} = 0401055727040348$;
- 9Digits$E_{15} = 627303998$; 20Digits$E_{16} = 65654064416617922928$; 7Digits$E_{17} = 5713708$;
- 15Digits$E_{18} = 216374412976168$; 15Digits$E_{19} = 471172544672318$;
- 13Digits$E_{20} = 4203407516578$; 23Digits$E_{21} = 73020506707999472076298$;
- 19Digits$E_{22} = 9679643737139009008$; 3Digits$E_{23} = 398$; 4Digits$E_{24} = 7078$;
- 10Digits$E_{25} = 5220633048$; 3Digits$E_{26} = 298$; 5Digits$E_{27} = 03538$;
- 16Digits$E_{28} = 4640173153001978$; 12Digits$E_{29} = 236276770258$;
- 22Digits$E_{30} = 0357412559720551726398$; 2Digits$E_{31} = 98$;
- 20Digits$E_{32} = 61734495909261241228$; 3Digits$E_{33} = 968$;
- 6Digits$E_{34} = 076458$; 3Digits$E_{35} = 278$;
- 55Digits$E_{36} = 5420543163215795419510261753326139327091269239274357568$; $[\ldots]$.

9 Delta-Equality (Classic)

$$\mathcal{K}\left(2\theta,0\right) \triangleq \mathcal{K}\left(\theta,0\right)+\mathcal{K}\left(\theta,0\right)\ \ (0<\theta\leq A)\rightarrow \mathcal{K}\left(2\theta,0\right)+\mathbf{0}_{\mathrm{Lf}}(\theta)=\mathbf{0}_{\mathrm{Rg}}(\theta)+2\mathcal{K}\left(\theta,0\right) \tag{40}$$

$$[(2).(3)(4)\dots] \triangleq [2\times(1).(2)(3)(4)\dots]\rightarrow[2.3456\dots+\mathbf{0}_{\mathrm{Lf}}(1)=\mathbf{0}_{\mathrm{Rg}}(1)+2.4691\dots] \tag{41}$$

10 Representation of a Physical Zero

Suppose a coordinate system's origin is drawn during a lecture of duration $T=50$ minutes.

Its localized physical existence coexists with temporal evolution, formalized inline as:

$$0(T)=\mathrm{val}_{\mathbb{R}}(\mathcal{K}(T,0))-\mathrm{val}_{\mathbb{R}}(\mathcal{K}(T,0)) \iff (1.23456789\dots)-(1.23456789\dots)=0 \tag{42}$$

11 Computational Indexing and Left-Zero Preservation

Standard positional projections collapse structures like $00000001\in\Sigma^*$ to $1\in\mathbb{N}$, destroying word length history. To prevent this with, use the bijective function $\mathcal{I}\colon \Sigma^*\to\mathbb{N}$ (where $k=\mathcal{C}(\mathcal{E}_N)$):

$$\mathcal{I}[\mathcal{E}_N]=k\cdot 10^k+\mathrm{val}(\mathcal{E}_N)\cdot 10^{-D_0} \iff 1\cdot 10^1+\sum_{i=0}^{1-1} d_i\cdot 10^i=11=\mathcal{I}[U_1] \tag{43}$$

References

[01] E. E. Souza. *Marya Leonor. Esposas Phylhas SolPhyas.*
Printed Unique Copy, Personal Collection, February 2026.

[02] C. Frougny. Number representation and finite automata.
In *Topics in Symbolic Dynamics and Applications*, vol. 279 of London
Math. Soc. Lecture Note Ser., pp. 207–228. Cambridge University Press, 2000.

[03] W. Penney.
A binary system for complex numbers. *Journal of the ACM*, 12(2):247–248, 1965.

[04] D. E. Knuth.
An imaginary number system. *Communications of the ACM*, 3(4):245–247, 1960.

[05] M. Lothaire. *Combinatorics on Words.*
Cambridge Mathematical Library. Cambridge University Press, 2nd edition, 1997.

[06] S. Leon.
Elementos de Computação Matemática com SageMath. Rio de Janeiro: SBM, 2019.

Appendix(a): An Ordering of the Set of Complex Numbers

$$X_s-Y_s\oplus\mathcal{K}\left(\Theta_s,\theta_s\right)=X_s-Y_s+\mathrm{val}_{\mathbb{R}}\left(\mathcal{K}\left([X_s,1,1]_f,[Y_s,1,1]_f\right)\right) \tag{44}$$

$$X_1+Y_1\sqrt{-1}<X_2+Y_2\sqrt{-1} \iff X_1-Y_1\oplus\mathcal{K}\left(\Theta_1,\theta_1\right)<X_2-Y_2\oplus\mathcal{K}\left(\Theta_2,\theta_2\right) \tag{45}$$

$$(3.1415926\dots)-2\cdot\sqrt{-1}=\pi-2\cdot\sqrt{-1}<3+e\cdot\sqrt{-1}=3+(2.71828182\dots)\cdot\sqrt{-1} \tag{46}$$

$$\pi+2\ \ominus\ \mathcal{K}\left(3,2\right)=5.141\dots-345.678\dots<0.281\dots+345.678\dots=3-e\ \oplus\ \mathcal{K}\left(3,2\right) \tag{47}$$

From this, it is possible to derive practical and simplified rules for ordering the set complex.

Appendix(b): Genes containing an infinite number of Digits

Epistemological Note on Transfinite Syntactic Frontiers:
The formal developments in this section deliberately venture beyond the boundaries of classical real analysis and conventional radix numeration theory. While standard calculus restricts the concept of a limit to scalar metric convergence within $\mathbb{R}$, *the construction of the infinite gene* $\lfloor \mathcal{E}(\infty,0)\langle \delta d\rangle \rfloor_f$ *requires an alternative paradigm rooted in the structural dynamics of the free monoid* Σ^ω. *Here, we operate under a non-standard transfiniteness where structural memory, string prefixes, and suffix stabilization parameters take precedence over traditional numerical magnitudes. Consequently, the limits discussed herein should be interpreted as two-sided syntactic boundary limits rather than standard real-valued limits, establishing a new conceptual frontier for symbolic computation and structural number systems.*

In this section we present a formal analysis, developed collaboratively between the author and his...

Construction of the Finite Genes

The finite genes considered in the text have the form

$$G_1 = 1122, \quad G_2 = 11122, \quad G_3 = 111122, \quad G_4 = 1111122, \quad \ldots \tag{48}$$

Each G_n consists of a growing block of digits "1" followed by a block of digits "2".
The infinite concatenation

$$G_1 G_2 G_3 G_4 \cdots \tag{49}$$

produces a decimal expansion whose intermediate blocks grow without bound.
Since no finite index marks the beginning of a repeating pattern, this infinite concatenation does *not* yield a periodic decimal expansion.

Construction of the Infinite Gene

The manuscript, however, describes a second object: the *infinite gene* $\lfloor \mathcal{E}(\infty,0)\langle \delta 2\rangle \rfloor_f$.
This object is not obtained by concatenation, but by a simultaneous update at each stage of the computation. The intended mechanism is:

- When the computer generates $G_1 = 1122$,
  it updates the infinite gene to something resembling $1\ldots 12\ldots 2$.
- When it generates $G_2 = 11122$, the infinite gene becomes $111\ldots 1122\ldots 22$.
- When it generates $G_3 = 111122$, the infinite gene becomes $11111\ldots 1111222\ldots 222$.

At each stage, the infinite gene receives:

1. an increased prefix of digits "1";
2. an increased suffix of digits "2".

In the idealized limit of a machine capable of computing indefinitely, the infinite gene tends toward the symbolic form

$$\lfloor \mathcal{E}(\infty,0)\langle \delta d\rangle \rfloor_f = \underbrace{11111\ldots}_{\text{infinitely many 1's}} \underbrace{ddddd\ldots}_{\text{infinitely many d's}} \quad \text{with: } d = 2 \in \{2,3,4,5,6,7,8,9,0\} \tag{50}$$

Infinite because it is a Word. Therefore: In Eugênio Krishna and Eugênio Zeus There are Infinite Synonyms for the Word Infinite. [Infinite Being almost All Numbers and a Bit Tiny more and a Bit Tiny more and a Bit Tiny more ...]. The Sequence of Naturals: Marathon Runners in number Infinite with the Fastest called: **INFINIT.**

Periodicity in the Limit: We now address the central question

Is the decimal value associated with $\lfloor \mathcal{E}(\infty, 0)\langle\delta 2\rangle \rfloor_f$ a periodic decimal?

The answer depends on the interpretative framework:

1. For every finite stage of the construction, no periodicity occurs.
   There is no finite index N such that the digits stabilize from that point onward.

2. In the limit, however, the symbolic object $\lfloor \mathcal{E}(\infty, 0)\langle\delta 2\rangle \rfloor_f$ possesses a tail consisting exclusively of the digit "2". This tail is perfectly periodic with period 1: $2, 2, 2, 2, \ldots$

Thus, the infinite gene becomes periodic *only in the limit.*
The index N at which periodicity begins is not a natural number but a transfinite boundary:

$$N = \infty.$$

Consequently, the periodicity of $\lfloor \mathcal{E}(\infty, 0)\langle\delta 2\rangle \rfloor_f$ exists only as a symbolic limit property. From the standpoint of classical real analysis, no eventually periodic decimal expansion is obtained, since no finite position marks the beginning of the repeating block.

Originality and Implications of the Construction

The construction of the infinite gene introduces a novel hybrid object: a symbolic decimal expansion whose prefix grows without bound while its suffix converges to a perfectly periodic pattern. This creates a structure that is neither a standard real number nor a conventional formal power series. Instead, it behaves as a two-sided limit object in which the non-periodic region expands indefinitely while the periodic region stabilizes.

This mechanism is original in at least three respects:

1. It separates the notions of finite periodicity and limit periodicity, showing that a decimal expansion may be periodic only at a transfinite index.

2. It provides a symbolic model for representing numbers whose structural memory (prefix length, block boundaries, and digit genealogy) is preserved even in the limit, aligning with the manuscript's broader theme of "preventing the boundary degeneration of leading zeros".

3. It suggests new directions for non-standard numeration systems, particularly in contexts where the preservation of syntactic information is more important than the scalar value itself. Potential applications include symbolic compression, hierarchical encoding, and non-Archimedean models of numerical data.

In this sense, the infinite gene E_∞ is not merely a curiosity but a prototype for a new class of symbolic expansions whose analytic, topological, and computational properties merit further investigation.

Infinite-Digit Numbers with Prescribed Arithmetic Properties

Within the framework of the Eugenio Numbers and the Krishna Function, it becomes possible to construct numerical objects whose digit expansions are infinite and yet obey a prescribed arithmetic property at every finite stage of their generation.

This mechanism differs fundamentally from classical decimal expansions, since the structural constraints are imposed symbolically at the level of the generating process rather than at the level of the resulting scalar value.

A paradigmatic example arises from the Krishna projection associated with the pair $(\pm 1, \infty)$. The manuscript describes this construction informally as

$$\mathcal{K}(\pm 1, \infty) = \pm[\ldots(\ddot{\emptyset}_{\langle\sim 1\rangle}\ddot{\emptyset}_{\langle 1\rangle})(\ddot{\emptyset}_{\langle\sim 1\rangle}1)(\ddot{\emptyset}_{\langle\sim 1\rangle}2)\ldots(\ddot{\emptyset}_{\langle\sim 1\rangle}12345\ldots)(\ddot{\emptyset}_{\langle\sim 1\rangle}\ddot{\emptyset}_{\langle 1\rangle})\ldots] \in {}^*\mathbb{Z}$$

where each parenthetical block (n) denotes the n-th finite digit sequence generated by the Krishna operator. When these blocks are concatenated in order, they produce the infinite symbolic expansion

$$K_\infty = \ddot{\emptyset}_{\langle\sim 1\rangle}1234567891011121314\cdots \tag{51}$$

that is, the infinite juxtaposition of all positive integers written in base 10.

This object is not a real number in the classical sense, since its digit expansion does not stabilize nor satisfy any eventual periodicity. Instead, K_∞ is a *structural limit object*: each finite prefix encodes a well-defined arithmetic property (the natural ordering of the integers), while the infinite extension preserves this property without collapse or truncation.

More generally, the Krishna Function allows the construction of infinite-digit objects whose digits encode any computable arithmetic property. For example, one may generate an K_∞ whose n-th block encodes:

- the parity of n,
- the prime factorization of n,
- the residue of n modulo a fixed integer,
- the Beatty sequence associated with an irrational slope,
- or any symbolic pattern derived from a deterministic arithmetic rule.

In all such cases, the resulting K_∞ is an infinite symbolic expansion whose structure is determined by the arithmetic property imposed on each finite stage. The novelty of this approach lies in the fact that the infinite object is not merely a limit of real numbers, but a *syntactic limit* in the free monoid of digit sequences. This preserves genealogical information about the digits, including block boundaries, growth rates, and the order in which arithmetic properties are encoded.

Thus, the Krishna-generated infinite gene K_∞ exemplifies a broader principle: infinite-digit numbers can be constructed so as to satisfy any desired arithmetic property at every finite stage, while the infinite symbolic limit retains the full structural memory of the generating process. This capability extends the expressive power of positional numeration systems beyond the classical real numbers, opening new avenues for symbolic encoding, non-standard arithmetic, and computational representations of infinite structures.

Conceptual Viability and Numerical Simplicity in Defining Infinity

The construction of the infinite gene K_∞ through the iterative process

$$\mathcal{K}(1, 0) = (1).(2)(3)(4)(5)(6)\ldots \tag{52}$$

and its symbolic concatenation

$$K_\infty = 12345678910111213\cdots \tag{53}$$

raises an important conceptual question:

Is it viable, coherent, and numerically practical to define
The infinite object of the Krishna Function in this manner?

From a structural standpoint, the answer is affirmative.

The Krishna operator does not attempt to approximate a real number in the classical sense; instead, it generates a sequence of symbolic blocks whose arithmetic meaning is preserved at every finite stage. The infinite object is therefore not a limit in $\mathbb{R}$, but a *syntactic limit* in the free monoid of digit sequences. This distinction is crucial: it allows the definition of infinity to be governed by structural rules rather than analytic constraints.

Conceptually, the definition of K_∞ is viable because the infinite object inherits its meaning from the generating mechanism. Each block (n) encodes the integer n in base 10, and the infinite concatenation preserves the natural ordering of the integers without collapse or ambiguity. The infinite expansion is therefore not arbitrary; it is the unique symbolic structure that satisfies the rule: "The n-th block encodes the integer n".

From a numerical perspective, the construction is remarkably simple.

At any finite stage N, the partial expansion $K_{N\to\infty} = 1234567891011 \cdots N$.

is computable using only elementary string concatenation. No limits, no floating-point approximations, and no analytic convergence criteria are required. The infinite object is therefore approachable through finite computation, even though it is not itself finite. This dual nature – conceptually infinite yet practically finite at every stage – makes the Krishna definition of infinity particularly elegant. It provides a workable model of infinite digit sequences that is both structurally meaningful and computationally accessible. Unlike classical decimal expansions, which rely on analytic convergence, the Krishna construction relies solely on symbolic rules, making it compatible with the broader goals of the Eugenio Numbers framework: the preservation of structural memory, the avoidance of boundary degeneration, and the explicit encoding of arithmetic properties in the digit sequence itself. In this sense, defining infinity in $\mathcal{K}(1,0)$ through the sequence $(1),(2),(3),(4),\ldots$ is not only conceptually coherent but also numerically simple and structurally powerful. It demonstrates that infinite-digit numbers with precise arithmetic properties can be generated in a deterministic and transparent manner, reinforcing the viability of symbolic infinite constructions within the Eugenio Numbers paradigm.

> Thus, the infinite gene presents itself not only as a conceptual curiosity, but as a structurally coherent and computationally feasible symbolic object, expanding the expressive power of positional numerals beyond the classical analysis. If the prime number P_∞ exists, then the multiple of 2 V_∞ will also exist (both with infinite digits):

$$P_{(\infty+1)} = 2\times 3\times 5\times 7\times\cdots\times P_\infty + 1 \to P_{(\infty+1)} = 10\times 3\times 7\times\cdots\times P_\infty + 1 \tag{54}$$

$$V_\infty = 2\times 3\times 5\times 7\times 11\times\cdots\times P_\infty + 0 \to V_\infty = 10\times 3\times 7\times 11\times\cdots\times P_\infty \tag{55}$$

$$\mathcal{K}(1,3) = (1)(2)(3)(4).(5)(6)\ldots V_{(\infty-n)}P_{(\infty-n+1)}\cdots V_{(\infty-1)}P_\infty\ldots V_\infty P_{(\infty+1)} \tag{56}$$

$$\lfloor\langle P_n + iP_n\rangle\rfloor_f \to \mathcal{Z}(\sqrt{-1}\pm 2) = \pm(3)(P_{2+1}).(7)(11)(13)\ldots P_n\ldots P_\infty P_{(\infty+1)} \tag{57}$$

Reformulation Conceptual and Numerical in Defining Infinity

$$K_\infty = 123456789101112\circ\cdots\circ V_{\infty-1}\circ P_\infty\circ P_\infty\circ V_{\infty-1}\circ\cdots\circ 121110987654320\oplus 1 = P_{(\infty+1)} \tag{58}$$

Appendix(c): Algebraic Operations

Let $\mathcal{H}(T,K)$ and $\mathcal{U}(S,V)$ be two structured numerical representations within the free monoid Σ^*. To define algebraic operations over these symbolic sequences without inducing syntactic or structural data loss, the entities are evaluated via a non-degenerate real valuation mapping $\mathrm{val}_\mathbb{R} : \Sigma^* \to \mathbb{R}$. The additive operation is formalized by projecting the independent components into the complete ordered field of real numbers $\mathbb{R}$:

$$\mathcal{H}(T,K)+\mathcal{U}(S,V)\longmapsto \mathrm{val}_{\mathbb{R}}(\mathcal{H}(T,K))+\mathrm{val}_{\mathbb{R}}(\mathcal{U}(S,V)) \tag{59}$$

By leveraging the algebraic closure properties of the real field $\mathbb{R}$, the resulting scalar sum is mapping-invariant. This scalar value can then be uniquely transformed back into the structured representation domain as a linear combination of Eugênio and Krishna canonical states:

$$\mathrm{val}_{\mathbb{R}}(\mathcal{H}(T,K))+\mathrm{val}_{\mathbb{R}}(\mathcal{U}(S,V))\longmapsto \mathcal{H}(T,K)+\mathcal{U}(S,V)=\mathcal{G}(A,B)-\mathcal{K}(C,0) \tag{60}$$

From the Pythagorean theorem, this algebraic architecture enables the seamless embedding of classical geometric constraints. Under the standard identity $25=3^2+4^2$, let $X(T_n)$ be the metric constraint defined over a bounded trajectory state $1\leq T_n=n\leq 45$:

$$25=3^2+4^2\rightarrow Y(T_n)\triangleq X(T_n)\quad Y(T_n)=[\mathrm{val}_{\mathbb{R}}(\mathcal{H}_{25}(T_n,0)\langle\delta 6\rangle)-\mathrm{val}_{\mathbb{R}}(\mathcal{K}(1,0))] \tag{61}$$

$$X(T_n)=[\mathrm{val}_{\mathbb{R}}(\mathcal{C}_3(T_n,0)\langle\delta 4\rangle)-\mathrm{val}_{\mathbb{R}}(\mathcal{K}(1,0))]^2+[\mathrm{val}_{\mathbb{R}}(\mathcal{C}_4(1,0)\langle\delta 5\rangle)-\mathrm{val}_{\mathbb{R}}(\mathcal{K}(1,0))]^2 \tag{62}$$

Appendix(d): Strictly Theorgyas Addition

To define algebraic operations directly over the structural morphology of the free monoid Σ^* without falling back into standard scalar reduction, we introduce the concept of the *Strictly Theorgyas Addition.* Departing from the preservative constraints of classical real valuations (val_R), this operator acts as a pure morphological synthesizer. It processes structural genes symmetrically, moving outwards from the formal radix point toward the boundaries of both the integer and fractional components, treating the divergence from classical arithmetic as a fundamental property of inter-genetic mutations.

Definition (Strictly Theorgyas Addition)**.** *Let* $(\mathcal{B}_{\pi_2}$ *And* $\mathcal{L}_{\pi_1})\in\Sigma^{\mathbb{Z}}$ *be two structured Eugenio Numbers partitioned under arbitrary (and potentially distinct) arithmetic properties* π_1 *and* π_2*, centered around the formal decimal separator* $(\cdot)$*, expressed as:*

$$\mathcal{L}_{\pi_1}=\dots(G^{\pi_1}_{2L})(G^{\pi_1}_{1L})\cdot(G^{\pi_1}_{-1L})(G^{\pi_1}_{-2L})\dots \tag{63}$$

$$\mathcal{B}_{\pi_2}=\dots(G^{\pi_2}_{2B})(G^{\pi_2}_{1B})\cdot(G^{\pi_2}_{-1B})(G^{\pi_2}_{-2B})\dots \tag{64}$$

where $G^{\pi_1}_{nL},G^{\pi_2}_{nB}\in\Sigma^*$ *denote the homologous genetic blocks for* $n\in\mathbb{Z}\setminus\{0\}$*, using the identity element* $\epsilon=\ddot{\emptyset}_{\langle\sim\pi\rangle}$ *if the regional sequence lengths mismatch. The Strictly Theorgyas Addition, denoted by the morphological operator* $\boxplus$*, is defined as the bidirectional synchronous concatenation of genes expanding from the boundary core:*

$$\mathcal{L}_{\pi_1}\boxplus\mathcal{B}_{\pi_2}\triangleq\dots(G^{\pi_1}_{2L}\circ G^{\pi_2}_{2B})(G^{\pi_1}_{1L}\circ G^{\pi_2}_{1B})\cdot(G^{\pi_1}_{-1L}\circ G^{\pi_2}_{-1B})(G^{\pi_1}_{-2L}\circ G^{\pi_2}_{-2B})\dots \tag{65}$$

Remark (The Non-Preservative Morphological Domain). Under this paradigm, when $\pi_1\neq\pi_2$, the structural output $\mathcal{Y}^{\text{Result}}=\mathcal{L}_{\pi_1}\boxplus\mathcal{B}_{\pi_2}$ intentionally sacrifices standard scalar addition invariants ($\mathrm{val}_R(\mathcal{L})+\mathrm{val}_R(\mathcal{B})$). The resulting positional shift and word length variations represent a non-Archimedean geometric synthesis – a structural mutation revealing the raw combinatorial intersection between distinct numeric partitioning rules within the free monoid.

Although the traditional scalar sum is corrupted, the resulting string $\mathcal{Y}^{\text{Result}}$ must retain algorithmic viability to undergo a secondary genetic re-partitioning. To achieve this, its newly generated structural boundary must satisfy a strict non-mirroring criterion.

Proposition (Boundary Stabilization via Krishna Perturbation)**.** *Let* $\mathcal{Y}^{Result}$ *be the structural output of a Strictly Theorgyas Addition, and let* $x_0=val_R(\mathcal{Y}^{Result})$ *be its projected scalar mapping, with units digit* $D_0=\lfloor x_0\rfloor \bmod 10$ *and tenths digit* $D^1_-=\lfloor 10\{x_0\}\rfloor \bmod 10$.

To ensure algorithmic viability for subsequent genetic sequencing, the stable representational state $\mathcal{E}_{stable}$ is governed by the following conditional filter:

$$\mathcal{E}_{stable} = \begin{cases} \mathcal{Y}^{Result}, & \textit{if } D_0 \neq D_-^1 \\ val_R(\mathcal{Y}^{Result}) + \mathcal{K}(\Psi, 0), & \textit{if } D_0 = D_-^1 \end{cases} \tag{66}$$

where $\Psi \in \Sigma_{\{+11\}} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11\}$ *is the deterministic Krishna trajectory state chosen to break the boundary symmetry such that the perturbed units and tenths digits satisfy* $D_0 \neq D_-^1$.

Once the boundary constraint $D_0 \neq D_-^1$ is verified or established via the additive force of the Krishna operator, the stable structural word $\mathcal{E}_{\text{stable}}$ can be successfully processed by the losslessness windowing routines (*e.g.*, the `tenta` routine) to generate a completely new genetic partition sequence under any newly prescribed arithmetic property π_{new}.

Appendix(e): For all these reasons, the Author remains Ignored

This section provides a streamlined roadmap to transition the manuscript into a rigorous, peer-review-ready framework by unifying syntactic word monoids with non-standard hyperreal fields.

1. Core Theorems, Proof Strategy, and Scope

Lemma 1 (Strict Injectivity of the Augmented Valuation Mapping). Let Σ^* be the free monoid over the decimal alphabet, and let $\mathcal{I}\colon \Sigma^* \to \mathbb{N}$ be the augmentation mapping defined by:

$$\mathcal{I}[\mathcal{E}_N] = k \cdot 10^k + \text{val}(\mathcal{E}_N) \cdot 10^{-D_0} \tag{67}$$

where $k = \mathcal{C}(\mathcal{E}_N)$ represents the exact word length.

Then, the operator $\mathcal{I}$ is strictly injective, such that $\forall \mathcal{E}_1, \mathcal{E}_2 \in \Sigma^*, \mathcal{I}[\mathcal{E}_1] = \mathcal{I}[\mathcal{E}_2] \implies \mathcal{E}_1 = \mathcal{E}_2$.

Lemma 2 (Exact Linear Scaling of the Factorized Floor Operator). Let $\mathcal{S} \subset \mathbb{C}$ be the subset of structured symbolic expressions of the form $Z = A \cdot B$, where $A \in \mathbb{R} \setminus \mathbb{Q}$ represents a non-square irrational component and $B \in \mathbb{Z}_{>0}$ parameterizes an underlying digit block. The factorized floor operator $\lfloor \cdot \rfloor_f\colon \mathcal{S} \to \mathbb{Z}$ satisfies the exact linear scaling property:

$$\lfloor AB \rfloor_f = \lfloor A \rfloor \cdot \sqrt{B^2} = \lfloor A \rfloor \cdot B \tag{68}$$

which is preserved strictly under hyperfinite decimal scaling expansions within ${}^*\mathbb{R}$.

Lemma 3 (Finite Hyper-Step Termination of the Krishna Perturbation). For any fixed coordinate trajectory $x \in \mathbb{R}$ introduced into the decimal system, there exists at least one deterministic Krishna trajectory state Ψ within the finite state space $\Sigma_{\{+11\}} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11\}$ capable of inducing a perturbation such that the resulting units digit D_0 and tenths digit D_-^1 satisfy the strict non-mirroring boundary condition (guaranteeing the algorithmic termination and deterministic partition of any real or non-Archimedean pathological path) $D_0 \neq D_-^1$.

Lemma 4 (Continuity of Structural Embeddings under the Cantor Product Topology). Let Σ^ω be the space of one-sided infinite word expansions generated by the alphabet Σ, endowed with the canonical Cantor metric $d(x, y) = 2^{-\min\{i : x_i \neq y_i\}}$. The structural embedding mapping $\Phi\colon \mathbb{C} \to \Sigma^\omega \times {}^*\mathbb{R}^2$, which projects complex coordinates onto the joint space of genetic word trajectories and dynamic boundary compensation variables $(0_{Rg}, 0_{Lf})$, is continuous with respect to the topology induced by the Cantor metric and the non-Archimedean hyperreal order topology.

---

2. **Theoretical Rigor & Mathematical Foundations**

- **Symbolic Spaces & Valuation Maps:** Formally define whether operators work on Σ^* (finite), Σ^ω (one-sided infinite), or $\Sigma^{\mathbb{Z}}$ (bi-infinite). For infinite structures, induce the product topology via the Cantor metric $d(x, y) = 2^{-\min\{i: x_i \neq y_i\}}$, leveraging its completeness. Strictly separate purely syntactic equalities over Σ^* from numeric equalities over $^*\mathbb{R}$ using a explicit representation operator $\mathrm{rep}(w)$.

- **Theorgyas Algebraic Structure:** Define the exact homomorphism rules governing concatenation, val: $(\Sigma^*, \circ) \to (\mathcal{O}_T, +)$. Theorgyas is formally classified as an Extended Syntactic Algebra because the concatenation of numerical genes ($E_n \circ E_{n+1}$) is translated into the ring not as a simple multiplication or addition, but as a positional radix shift:

$$\mathrm{val}(E_n \circ E_{n+1}) = \mathrm{val}(E_n) \cdot 10^m + \mathrm{val}(E_{n+1}), \text{ where } m = \mathcal{C}(E_{n+1}) + D_0 \in \mathbb{Z} \tag{69}$$

  This structural dynamic couples word morphology with scalar valuation, preventing the syntactic collapse of leading zeros that occurs in standard algebraic ring definitions.

- **Operator Mechanics:** Formally map the Factorized Floor ($\lfloor \cdot \rfloor_f \colon \mathbb{R} \times \mathbb{N} \to \mathbb{Z}$) and the deterministic Krishna operator (κ: Parameters $\to \Sigma$). Prove their monotonicity, subadditivity, injectivity, and surjectivity across the 11 trajectory states.

3. **Empirical Validation, Literature, and Presentation**

- **Literature Integration & Transfinite Frameworks:** Explicitly contextualize the Krishna operator against β-expansions (Rényi/Parry), complex radix bases (Knuth, Penney), and canonical number systems (Akiyama). For infinite genes and primes (P_∞), substitute loose conceptual metaphors with rigorous Robinson/Goldblatt hyperreal citations to enforce non-Archimedean validity.

- **Reproducibility & Worked Traces:** Maintain a public repository containing dependencies (`requirements.txt`), execution scripts (`README.md`), and deterministic seeds. Include a step-by-step trace (input $\to$ algorithm $\to$ output) using the manuscript's sample path ($z = 16.75111213\ldots$) to verify losslessness.

- **Algorithmic Benchmarking:** Benchmark the framework against baseline methods (bijective base-k, LZ77/LZ78, or suffix arrays) across public datasets, measuring bits per symbol, encoding/decoding times, and retrieval speeds.

- **Structural Reorganization:** Restructure the paper into standard journal sections: Abstract, Introduction, Related Work, Preliminaries, Main Results, Algorithms, Experiments, Discussion, and Conclusion.

Criticism: State University of Southwestern Bahia (UESB) Jequié Campus

I would very much like to be part of the academic community in my city, but the UESB is an institution that neither wishes to nor has shown any interest in engaging in dialogue with me.

At this moment – July 11, 2026 – a team of 25 scientists is putting the finishing touches on **Theorgyas.** Retired Professor, Funprev – Bahia, Brazil. **Contact:** euevansouza@gmail.com.

[GREAT INVISIBLE TRADITION CITY SUN JEQUIÉ AND REGION I&II]