# Entacuum Theory: A Novel Mathematical Framework

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**Abstract**

Entacuum Theory introduces a new mathematical framework centered on the properties and interactions of "Entacuums." This document defines Entacuums within a specially constructed algebra, explores their applications in number theory, and presents new notations and operations.

## 1 Introduction

Entacuum Theory is an entirely new branch of mathematics focusing on the properties and interactions of Entacuums, which are unique mathematical entities that extend beyond traditional numbers, sets, and functions.

## 2 Entacuum Algebra

**Definition 1** (Entacuum Algebra)**.** *The* ***Entacuum Algebra*** $\mathbb{E}$ *is a non-commutative algebra over the reals defined by the basis elements* $e_0, e_1, e_2, e_3, e_4$ *with real coefficients. An Entacuum* $E \in \mathbb{E}$ *is expressed as:*

$$E = a_0e_0 + a_1e_1 + a_2e_2 + a_3e_3 + a_4e_4$$

*where* $a_i \in \mathbb{R}$*.*

## 3 Entacuum Space

**Definition 2** (Entacuum Space)**.** *An* ***Entacuum Space*** $\mathcal{E}^n$ *is an* $n$*-dimensional vector space over the Entacuum Algebra* $\mathbb{E}$*, defined as:*

$$\mathcal{E}^n = \left\{ \sum_{i=1}^{n} E_i \mathbf{e}_i \mid E_i \in \mathbb{E}, \mathbf{e}_i \text{ are basis vectors} \right\}$$

# 4 Entaglyphs

**Definition 3** (Entaglyphs)**.** ***Entaglyphs*** *(denoted $\mathcal{G}(E)$) are visual representations of Entacuums in $\mathcal{E}^n$. These graphs illustrate the structure and properties of individual Entacuums and their interactions.*

# 5 Entafields

**Definition 4** (Entafields)**.** *An* ***Entafield*** *is a function mapping points in Euclidean space to Entacuums, defined as:*

$$\mathcal{F}_E : \mathbb{R}^n \to \mathbb{E}$$

*For example, $\mathcal{F}_E(x, y, z) = E_{x,y,z}$ where $E_{x,y,z}$ is an Entacuum dependent on coordinates $(x, y, z)$.*

# 6 Entamorphisms

**Definition 5** (Entamorphisms)**.** ***Entamorphisms*** *are transformations within the Entacuum Algebra that preserve the algebraic structure, defined as:*

$$\eta : \mathbb{E} \to \mathbb{E}$$

*For example, $\eta(E) = E'$ where $E'$ is another Entacuum.*

# 7 Applications in Number Theory

## 7.1 Entacuum Primes

**Definition 6** (Entacuum Primes)**.** *An* ***Entacuum Prime*** *in $\mathbb{E}$ is an Entacuum that cannot be decomposed into a product of two non-unit Entacuums. Denoted as $\mathbb{E}_p$.*

**Example 1.** *Consider $E = e_0 + e_1$ in $\mathbb{E}$. If $E$ cannot be factored into non-unit Entacuums, it is an Entacuum Prime.*

## 7.2 Entacuum Factorization

**Definition 7** (Entacuum Factorization)**.** *Given an Entacuum $E \in \mathbb{E}$, its factorization into Entacuum Primes is expressed as:*

$$E = P_1 P_2 \cdots P_k$$

*where $P_i$ are Entacuum Primes.*

**Example 2.** *Factor $E = (e_0 + e_1)(e_2 + e_3)$ and verify that $(e_0 + e_1)$ and $(e_2 + e_3)$ are primes.*

### 7.3 Entacuum Cryptography

**Definition 8** (Entacuum Cryptography)**.** *Utilizing the difficulty of Entacuum Prime factorization for cryptographic systems.*

**Example 3.** *Construct a public key based on a product of large Entacuum Primes and analyze the complexity of factorization.*

## 8 Conclusion

Entacuum Theory extends existing mathematical concepts by introducing new entities, operations, and applications, particularly in number theory. This framework offers a fertile ground for further exploration and development in mathematics.