



Dimensional Analysis Demystified

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Abstract: This exploration delves into dimensional analysis, emphasizing relationships between dimensions and events. Foundational attributes like length, width, height, and time are scrutinized. The study introduces dimensions (L^1 , L^2 , L^3 , and L^4) and 'p' positions. It explores transitions between dimensions, enhancing comprehension. The paper links previous equations with new dimensions, focusing on the distinction between abstract and real values. Mathematical equations in quantum mechanics and quantum gravity illustrate dimension-event interplay, offering insights into fundamental laws. In summary, it bridges theory and practical applications in physics, deepening our understanding of dimension-event relationships.

Comment: This version-3 of the initial paper (<https://easychair.org/publications/preprint/kWV5>) significantly improves depth and clarity. It introduces a comprehensive framework, explicit dimension references, explores event transitions, clarifies abstract vs. real values, refines math presentation, and fosters holistic understanding. It encourages further exploration in this dynamic field, enhancing its value and insight for interested readers.

Keywords: Abstract vs. Real Values, Conceptual Framework, Dimensional Transition, Event Position, Quantum Gravity, Powers of Dimensions,

1. Introduction:

This paper explores the fundamental attributes of dimensions in mathematics and physics, such as length, width, height, and time, which underpin our understanding of the physical world. It delves into dimensional analysis, drawing inspiration from a theoretical framework to define the relationships between dimensions and events. The study's core objective is to provide a systematic approach to understanding how physical quantities are interconnected, offering a deeper comprehension of the universe. It emphasizes the powers of dimensions

and the transition of events between dimensions, elucidating how these attributes influence the world. Dimensions, including L^1 (one-dimensional space for linear events), L^2 (two-dimensional space for planar events), L^3 (three-dimensional space for spatial events), and L^4 (four-dimensional hyper-space for hyper-spatial events), form a structured framework for examining abstract and real values in dimensional analysis.

A central theme is the exploration of transitions between dimensions, akin to the transition of 'p' as an abstract or real value within defined dimensions. These transitions introduce new dimensions and powers, increasing the complexity of understanding the physical world. The text uncovers the implications of distinguishing between abstract (dimensionless or dimensionless contexts) and real values for events. It reflects on previously explored equations, explicitly referencing dimensions like L^1 , L^2 , L^3 , and L^4 , highlighting their roles in equations and the transition of events, enriching the understanding of how these equations relate to the defined framework.

Subsequently, the text presents mathematical equations central to quantum mechanics and quantum gravity, revealing the intricate relationship between energy, length scales, and fundamental constants. This demonstrates the interplay of dimensions and powers, enhancing the understanding of the physical world and how dimensions relate in the physical universe. The overarching goal is to demystify dimensional analysis by providing a comprehensive understanding of the interconnectedness of dimensions, events, and their values. It bridges the gap between theoretical frameworks and practical applications, shedding light on how dimensions, events, and their values contribute to understanding the fundamental laws governing the universe. The text invites readers to embark on this journey, exploring the complexities of dimensional analysis and its applications, while emphasizing the interplay between abstract and real dimensions in mathematical and physical equations. [1-5, 7-14].

2. Mechanism:

The enhancements in this version-3 signify a substantial improvement, elevating the paper's depth

and clarity. These refinements introduce a novel comprehensive framework that elucidates the relationships between dimensions and events, providing a clear roadmap for understanding dimensional analysis. Explicit references to defined dimensions enhance reader clarity, and the exploration of the transition of events between dimensions adds depth and context. The clarification of abstract vs. real values and the revised mathematical presentation improve precision and comprehension. The paper's focus on a holistic understanding broadens horizons, while the encouragement for future exploration acknowledges the dynamic nature of the field. These enhancements collectively make the paper a more valuable and insightful resource for those interested in the subject.

The realms of mathematics and physics are inherently governed by the fundamental attributes of our physical world, known as dimensions. These dimensions encompass the very essence of our existence, including length, width, height, and time. As we embark on this journey, we delve deep into the intricacies of dimensional analysis, drawing inspiration from a theoretical framework that defines the relationships between dimensions and the positions of events within them. This exploration aims to unravel the complex interplay of dimensions, events, and their values, bridging the gap between theory and practice.

At its core, dimensional analysis provides a systematic approach to examining how physical quantities are connected, offering a deeper understanding of the intricate tapestry of the universe. The powers of dimensions, as well as the transition of events between dimensions, form the basis of this study, shedding light on how these attributes influence the world around us [1-3, 6-9].

A. The Dimensions Defined:

Incorporating the dimensions defined within our theoretical framework— L^1 , L^2 , L^3 , and L^4 —we lay the groundwork for understanding the relationships between dimensions and their powers. These dimensions offer a structured framework for examining abstract and real values within the context of dimensional analysis. L^1 , representing one-dimensional space, is applicable to linear events, while L^2

signifies two-dimensional space, relevant to planar events. L^3 , the three-dimensional space, finds its application in spatial events, and L^4 represents the abstract realm of four-dimensional hyperspace for hyper-spatial events. These dimensions, as defined, provide a canvas on which we explore the relationships between dimensions and events.

B. Transition of Events between Dimensions:

One of the most intriguing aspects of this analysis is the examination of transitions between dimensions, akin to the transition of 'p' as an abstract or real value within the defined dimensions. These transitions introduce novel dimensions and powers, adding layers of complexity to our comprehension of the physical world. The exploration of dimensions goes hand in hand with understanding how events transition from lower to higher dimensions or vice versa. As we delve deeper, we'll reveal the mathematical challenges these transitions present and the depth of insight they provide.

C. Abstract vs. Real Values for Events:

The concept of abstract vs. real values for events takes center stage in this exploration. Just as 'p' can take on abstract values, denoting dimensionlessness or dimensionless contexts, it can also represent specific points or events in spacetime, taking on real values. Our journey uncovers the implications of these distinctions within the realm of dimensional analysis, allowing us to consider both the theoretical and practical dimensions of events.

D. Relations of the Equations from the original paper:

Reflecting on the previously explored equations from the original paper, we delve into their deeper relationships with our newly introduced framework. These equations now explicitly reference dimensions like L^1 , L^2 , L^3 , and L^4 , highlighting their role in the equations and the transition of events. This connection enriches our understanding of how these fundamental equations relate to the dimensions within our framework.

In the coming sections, we'll showcase mathematical equations central to quantum mechanics and

quantum gravity, elucidating the intricate relationship between energy, length scales, and fundamental constants. The interplay of dimensions and powers in these equations will unveil a profound understanding of the physical world and enhance our ability to explore the relationships between dimensions in the physical universe.

This work aims to demystify dimensional analysis by providing a comprehensive understanding of the interconnectedness of dimensions, events, and their values. It bridges the gap between theoretical frameworks and practical applications, shedding light on how dimensions, events, and their values contribute to our comprehension of the fundamental laws that govern our universe. Join us on this journey as we unveil the complexities of dimensional analysis and its applications, exploring the abstract and real dimensions of our physical reality and their role in mathematical and physical equations [5-12, 15-19].

3. Construction:

A. Introduction to Dimensions and Dimensional Analysis:

The methodology of our exploration begins by introducing the fundamental concept of dimensions, inspired by the dimensions defined in our theoretical framework — L^1 , L^2 , L^3 , and L^4 . These dimensions serve as the foundational attributes of our physical world and provide the framework for examining the relationships between dimensions and events. Dimensional analysis serves as a bridge between these dimensions and their powers, aiding in understanding their relationships.

B. Defining the Problem: A Transition between Different Dimensions:

Our analytical approach revolves around a central theme—the examination of transitions between dimensions, mirroring the transition of events between dimensions as per our formulation. Whether transitioning from lower to higher dimensions or venturing on the reverse journey, these transitions introduce new dimensions and powers, adding layers of complexity to our comprehension of the physical world.

C. Planck Equation and Energy-Frequency Relationship:

We dive into the Planck equation, paralleling our theoretical framework, and its significance in quantum mechanics. This equation relates energy (E) to the frequency of particles or quanta, akin to the relationship between dimensions and events. The Planck equation, expressed as $E = hf$, plays a fundamental role in unveiling the intricate relationships between dimensions, events, and their values. The mathematical representations are harmonious, serving to enrich our understanding.

D. Planck Length Conversion:

Exploring the Planck Length Conversion equation considering our formulation, we link the Planck length (ℓ_P) to essential constants, providing a fundamental length scale within the context of quantum gravity. This equation captures the essence of dimension transitions, as events traverse between dimensions, shedding light on the interconnectedness of length scales and dimensions.

$$\ell_P = \sqrt{(\hbar G/c^3)}$$

E. Conceptual Framework Equation:

Analogous to our formulation, the Conceptual Framework Equation connects energy (E) to the Planck length (ℓ_P), the speed of light (c), and fundamental constants, mirroring the relationships between dimensions and events. This equation exemplifies the profound relationship between energy, length scales, and fundamental constants within the context of quantum gravity, expanding our comprehension of dimensional analysis.

$$E = \ell_P c^3 / \sqrt{(\hbar G)}$$

F. Boundaries of Perception and the Fourth Dimension Equation:

Introducing the concept of the fourth dimension, associated with time, aligns with our formulation. The Fourth Dimension Equation captures the transition of events from three-dimensional space to the fourth-dimensional time, underlining the interconnectedness of spatial and temporal dimensions.

This dimension transition mirrors the transitions of 'p' as events move between dimensions, enriching our understanding of the interplay between dimensions and events.

$$\sqrt{(\hbar G/c^5)}$$

G. Analyzing Powers and Dimensional Changes:

In line with our theoretical framework, we delve into the intertwined relationship between dimensions, their powers, and the transition of events between dimensions. We provide examples, such as the transition from one-dimensional length (L^1) to two-dimensional space (L^2) and the return journey, reflecting the mathematical representations that capture these dimensional changes.

H. Application to Quantum Mechanics and Quantum Gravity:

Our exploration extends to the application of dimensional analysis in quantum mechanics and quantum gravity, aligning with the framework of our formulation. We discuss the variation in the power of the speed of light (c) between equations related to spatial and temporal dimensions, parallel to the transition of events between dimensions. These variations are tied to the number of spatial dimensions considered, enriching our understanding of dimensional analysis.

I. Dimensional Transitions in Quantum Gravity:

Within the context of quantum gravity, our study delves into scenarios where the power of the speed of light (c) differs between spatial dimensions and the time dimension, akin to the transition of events between dimensions. The transition from a four-dimensional time frame to a three-dimensional space, representing a change in dimensionality, aligns with the transitions of 'p' as events move through dimensions. These scenarios serve to highlight the dimensional relationships, unifying the concept of dimensions and events.

In summary, our methodology aligns with the relationships between dimensions and the positions of events within them, as per the formulation. It also addresses the concept of abstract vs. real values for

events, enriching our understanding of dimensional analysis and its applications. The harmonious interplay of dimensions, events, and their values is central to our exploration, providing a comprehensive understanding of the interconnectedness of dimensions, events, and their values [1, 3-5, 7-9, 12-17].

4. Mathematical Presentation:

A. Introduction to Dimensions and Dimensional Analysis:

Incorporating the dimensions defined in our theoretical framework— L^1 , L^2 , L^3 , and L^4 —we embark on a mathematical journey that mirrors the relationships between dimensions and events as per our formulation. Dimensions, such as length (L), width (W), height (H), and time (T), lay the foundation for our mathematical exploration. The powers of these dimensions, represented by our defined dimensions L^1 , L^2 , L^3 , and L^4 , play a pivotal role in understanding how physical quantities interact and relate to one another.

B. Dimensional Framework:

Our formulation introduces a dimensional framework in which each dimension has a distinct role:

L^1 (Linear Dimension): L^1 represents the one-dimensional space ('x' position) applicable to abstract and physical linear events. It aligns with our mathematical representation of one-dimensional real space as $L^1 \in \mathbb{R}^1$. This dimension serves as a cornerstone for understanding abstract and real linear events within our framework.

L^2 (Planar Dimension): L^2 symbolizes the two-dimensional space ('y' position) relevant to abstract and physical planar events. Corresponding to our mathematical definition of two-dimensional real space as $L^2 \in \mathbb{R}^2$, it encompasses the world of abstract and real planar events within our framework.

L^3 (Spatial Dimension): L^3 defines the three-dimensional space ('z' position) associated with abstract and physical spatial events. Mirroring our mathematical representation of three-dimensional real space as $L^3 \in \mathbb{R}^3$, it encapsulates the realm of ab-

stract and real spatial events in our dimensional framework.

L⁴ (Hyperspatial Dimension): L⁴ serves as the four-dimensional hyperspace ('t' position) connected to abstract hyper-spatial events. In parallel with our mathematical notation of four-dimensional hyper-space as $L^4 \in \mathbb{R}^4$, it offers a portal to abstract hyper-spatial events within our framework.

C. Location of 'p' Within Dimensions:

As per our formulation, 'p' represents the location of events within dimensions. The value of 'p' is specified by coordinates that mirror the transitions of events between dimensions. These equations help define the location of 'p' in different dimensions, reflecting the relationship between dimensions and events:

i. When abstract 'p' is located at 'x' position in one-dimensional space ($L^1 \in \mathbb{R}^1$), that specific location can be represented as a point along a linear dimension with a value of (o → x). In this case, 'p' is a point in a one-dimensional space, and it can be equated as $p = (o \rightarrow x)$.

ii. When abstract 'p' is located at 'y' position in two-dimensional space ($L^2 \in \mathbb{R}^2$), that specific location can be represented as a point in a two-dimensional plane having a value of (o → x, y). 'p' in this context can be equated as $p = (o \rightarrow x, y)$.

iii. When abstract 'p' is located at 'z' position in three-dimensional space ($L^3 \in \mathbb{R}^3$), that specific location can be represented as a point in three-dimensional space with a value of (o → x, y, z). Therefore, 'p' in this case can be equated as $p = (o \rightarrow x, y, z)$.

iv. When abstract 'p' is located at 't' position in four-dimensional time ($L^4 \in \mathbb{R}^4$), that specific location can be represented as an abstract point in four-dimensional time with a value of (o → x, y, z, t). In this scenario, 'p' can be equated as $p = (o \rightarrow x, y, z, t)$.

D. Abstract vs. Real Values for Events:

Our formulation addresses the concept of abstract vs. real values for events. In alignment with this concept, if an event at 'p' location represents a real value in a given dimension, it takes precedence over an abstract or empty set value (\emptyset). In the mathematical representation, the real value (0 → x) dominates, emphasizing the significance of real values in understanding events within dimensions.

E. Transition of Events between Dimensions:

As events transition between dimensions in our formulation, this transition mirrors the mathematical representations of 'p' as it moves through dimensions. The transition from one-dimensional space (L^1) to two-dimensional space (L^2) and beyond echoes the journey of events as they traverse through dimensions, offering a comprehensive view of the relationships between dimensions, events, and their values.

In summary, our mathematical presentation seamlessly integrates the relationships between dimensions, events, and the concept of abstract vs. real values. It provides a comprehensive understanding of how events move through dimensions, reflecting the interconnectedness of dimensions and events within our framework [8-14, 15-20].

5. Discussion:

A. Dimensions and Their Role:

Our journey through dimensional analysis, as expanded upon in our formulation, underscores the foundational importance of dimensions. Length (L), width (W), height (H), and time (T) are the bedrock attributes that define the physical universe. These dimensions act as the building blocks of our reality, both in their abstract and real manifestations.

Incorporating the dimensions defined in our framework— L^1 , L^2 , L^3 , and L^4 —we recognize that each dimension carries its distinct significance. L^1 , our one-dimensional space, represents the 'x' position and forms the primary dimension applicable to abstract and physical linear events. L^2 , the two-dimensional space or 'y' position, encompasses secondary di-

mensions applicable to abstract and physical planar events. L^3 , representing the three-dimensional space or 'z' position, deals with tertiary dimensions applicable to abstract and physical spatial events. Lastly, L^4 , our four-dimensional hyperspace related to the 't' position, delves into quartary dimensions, primarily engaged in abstract hyper-spatial events. This structured framework serves as a key to comprehending the relationships between dimensions and the position of events within them.

B. Location of Events within Dimensions:

As established in our formulation, 'p' signifies the location of events within dimensions. The coordinates assigned to 'p' mirror the transitions of events between dimensions, providing a mathematical understanding of how events navigate and find their position in the dimensionality. Whether it's 'p' at 'x' in one-dimensional space (L^1), 'y' in two-dimensional space (L^2), 'z' in three-dimensional space (L^3), or 't' in four-dimensional time (L^4), these representations illuminate the dynamic relationship between dimensions and events.

C. Abstract vs. Real Values for Events:

Our formulation introduces the intriguing concept of abstract vs. real values for events. We emphasize that if an event at 'p' location represents a real value in a given dimension, it takes precedence over an abstract or empty set value (\emptyset). This notion aligns with the fundamental principle that in mathematics, a "real value" holds dominance when there is a dual derivation or representation. The real value becomes the primary descriptor of the event within a particular dimension, reflecting its tangible presence within the framework.

D. Transition of Events between Dimensions:

The transition of events between dimensions, as elucidated in our formulation, mirrors the mathematical journey of 'p' as it traverses through the dimensional landscape. The transition from one-dimensional space (L^1) to two-dimensional space (L^2), and further to three-dimensional space (L^3) or four-dimensional time (L^4), offers a comprehensive view of how events navigate and interact with dimensions. It exemplifies the dynamic nature of the di-

mensional relationships and emphasizes the interconnectedness of dimensions and events.

E. Comprehensive Understanding:

Incorporating the relationships between dimensions, the position of events within them, and the distinction between abstract and real values enhances our comprehensive understanding of dimensional analysis. This approach allows us to unravel the mysteries of the universe and decipher the intricate relationships between dimensions in the physical world. Our formulation, when merged with traditional dimensional analysis, provides a holistic perspective on the role of dimensions in mathematical and physical equations, offering a powerful tool for exploring and understanding the fundamental laws of physics.

F. Reflection on 'Relations of the Equations':

The reflection provided in 'Relations of the Equations' further highlights the enhancements made in this version, emphasizing the structured approach to exploring the relationships between dimensions and the position of events within them. The addition of clear references to dimensions, elaboration on the transition of events between dimensions, and clarification of the concept of abstract vs. real values enhances the reader's grasp of these fundamental concepts. This comprehensive understanding complements the existing content, offering a deeper exploration of the intricacies of dimensions and their role in mathematical and physical equations [12-17, 19, 20].

6. Conclusion:

A. Unraveling the Complexity of Dimensions:

In our journey through the depths of dimensional analysis, as expanded upon in this version, we have successfully unveiled the intricate relationships between dimensions, events, and the abstract vs. real values assigned to these events. The dimensionality of our physical universe, including length (L), width (W), height (H), and time (T), forms the very fabric of reality. Within this framework, the dimensions defined as L^1 , L^2 , L^3 , and L^4 play distinct roles in shaping our understanding of the physical world.

B. Dimensions and Their Role:

Our formulation enriches the narrative by emphasizing the role of each dimension within our structured framework. L^1 , our one-dimensional space, stands as the primary dimension, applicable to both abstract and physical linear events. L^2 , the two-dimensional space or 'y' position, introduces secondary dimensions, pertinent to planar events. L^3 , our representation of three-dimensional space or 'z' position, encompasses tertiary dimensions, and relates to spatial events. Lastly, L^4 , our four-dimensional hyperspace in relation to the 't' position, delves into quartary dimensions, primarily linked to abstract hyper-spatial events. This framework acts as a guidepost for understanding the dynamic relationships between dimensions.

C. Abstract vs. Real Values for Events:

Our formulation challenges the traditional dichotomy of abstract vs. real values for events. It asserts that if an event at 'p' location represents a real value within a given dimension, that real value takes precedence over an abstract or empty set value (\emptyset). This principle aligns with mathematical conventions, where real values dominate in dual derivations, ensuring that tangible representations hold primary importance within the framework.

D. Transition of Events between Dimensions:

The dynamic transitions of events between dimensions, as outlined in our formulation, reflect the mathematical journey of 'p' as it navigates through the dimensional landscape. These transitions showcase how events move from one-dimensional space (L^1) to two-dimensional space (L^2), and further to three-dimensional space (L^3) or four-dimensional time (L^4). They underscore the fluidity and interconnectedness of dimensions and events within our physical universe.

E. Holistic Understanding and Future Exploration:

By integrating our formulation with traditional dimensional analysis, we have achieved a holistic understanding of the role of dimensions in mathematical and physical equations. This integrated approach serves as a powerful tool for unraveling the

mysteries of the universe and comprehending the fundamental laws of physics. It provides a structured and comprehensive framework for exploring the relationships between dimensions, the position of events within them, and the concept of abstract vs. real values.

F. The Journey Continues:

As we conclude our exploration of dimensional analysis, we recognize that the journey is far from over. The world of dimensions remains a fascinating and ever-evolving field of study, where new insights and discoveries await. The integration of our formulation with traditional approaches opens the door to further exploration, challenging the boundaries of our understanding and offering a deeper appreciation of the interconnectedness of dimensions within our physical reality.

G. Reflection on 'Relations of the Equations':

The reflection provided in 'Relations of the Equations from version -1 of the paper' further highlights the enhancements made in this version, emphasizing the structured approach to exploring the relationships between dimensions and the position of events within them. The addition of clear references to dimensions, elaboration on the transition of events between dimensions, and clarification of the concept of abstract vs. real values enhances the reader's grasp of these fundamental concepts. This comprehensive understanding complements the existing content, offering a deeper exploration of the intricacies of dimensions and their role in mathematical and physical equations. The journey continues as we invite researchers, scholars, and enthusiasts to delve deeper into the realm of dimensional analysis, working together to unravel the complexities of dimensions and their profound influence on the fabric of our universe.

7. **Declaration:** The author declares no conflict of interests.

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