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Intelligence Transformation:
General Intelligence Theory

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Abstract

This paper presents a conceptual framework for general interaction and argues that this framework is also an algorithm that satisfies the requirements for general Intelligence. Hence we define intelligence as a formalization of generality, a symbolic abstraction that is represented by the transformation Δ∞O, where each symbol represents the concepts infinitesimal, infinite, and finite respectively.

This paper presents the intelligence transformation Δ∞O as a further generalization of Einstein's Energy-Mass Equivalence equation E=mc², and as a complete and consistent algorithm for general interaction, reconciling the infinitely small and the infinitely large. In essence, this paper introduces a General Language Model (GLM), where Δ∞O is the foundational axiom of the model or the fundamental structure of all relationships. This Axiom is colloquially termed ‘The theory of everything’.

Keywords
Intelligence, Generalization, Abstraction, Transformation Theory, General Language Model, General Intelligence Theory, Theory of Everything
1. Complexity, Dimensionality, and Spatiality

Gödel’s incompleteness theorems and Turing’s computability theorems pointed out a limiting boundary around mathematics and computation. Gödel’s theorem highlighted that the limits of provability in formal axiomatic theories prevent the existence of a complete and consistent mathematical theory of everything [1]. In 1936, in his paper “On computable numbers, with an application to the Entscheidungs problem”, Alan Turing formalized an algorithmically computable and in-computable function [2]. Turing discovered that mathematical theories were undecidable, meaning they had an incomputable set of theorems, which puts a limiting boundary around what is computable[2]. With this understanding, we assume in this paper that a framework for general interaction colloquially known as ‘The theory of everything’ cannot be a mathematical theory.

This reasoning is applied in the evaluation of Einstein’s Energy-Mass-Equivalence equation E=mc², a formalized mathematical theory from his work on special relativity that models the relationship between Energy (E), mass (m), and the speed of light (c), where there is a direct correlation between mass and energy for an observer in the rest frame [3]. Energy, Mass, and Speed of light are abstract concepts that have been reduced into compact symbols that interact using the language of mathematics. As aforementioned, a theory of everything must not be a mathematical theory. Hence Einstein’s Energy-Mass-Equivalence equation E=mc² cannot be the foundational axiom or Theory of everything. This paper presents the Intelligence transformation ∆∞Ο, as the Transformational Theory of Everything, where the phenomena on the left are transformed into phenomena on the right and vice versa. This theory is consistent with mathematics but is not a mathematical theory itself, and each symbol in the abstraction represents the concepts infinitesimal (∆), infinite (∞), and finite (Ο) respectively. The Theory is a further generalization of Einstein’s Energy-Mass-Equivalence equation E=mc², where energy “e” is generalized to Triangle “Δ”, equality “=” is generalized to Infinity “∞”, and the product of mass and speed of light squared “mc²” is generalized to Circle “Ο”. Hence intelligence is defined as a formalization of generality, a symbolic abstraction, or an optimally efficient algorithm if invoking Godel and Turing.

2. From Equality “=” to Infinity “∞”

Einstein’s Special relativity equation, E=mc² showed that mass (m) and Energy (E) are just different manifestations of the same fundamental phenomena and that the speed of light(c) serves as a constant of proportionality or limiting factor [4]. After using “v”, a symbol currently attributed to velocity, in his previous publications, Einstein adopted the letter “c” to represent the speed of light in 1907, a symbol attributed to Weber and Kohlrausch who used it to represent the concept of ‘ constant’ in their 1856 papers [5]. This shows that the symbols used to represent abstract ideas are completely arbitrary and without complete and consistent definitions can lead to misinterpretations and misuse. The first thermodynamic law states that the phenomena known as energy can neither be created nor destroyed but only transformed from one form to another [6]. With this understanding, we assume that the equal-to sign “=” in the equation, E=mc² ‘must’ represent transformation as in Energy ‘transformable-to’ Mass and vice versa. The problem we run into when using that interpretation is that the “=” sign in E=mc² does not represent transformation, it represents equality. Einstein’s Energy Mass equivalence
equation asserts that Energy (E) is equal to the product of Mass (m) and light squared, but does not assert that Energy (E) can be transformed into Mass (m). This is an important distinction because it will mean all Energy has Mass (m) m = e/c², an assumption that has yet to be reconciled. Isaac Newton formalized the concept of Mass (m) and its relationship with Force (F) and Acceleration (a) with his equation F=ma, which also asserts the equality of two sides but does not assert transformability. Hence the need for a symbolic distinction between ‘equality’ and ‘transformability’.

Symbols are used as a shorthand way of simplifying ideas. They are discrete representations of continuous ideas. The Equal Sign “=” is an abbreviation of expressing the idea “is equal to” symbolically. Robert Recorde, circa 1510 to 1558, is usually cited as the first to use the equal-to-sign “=” symbol in his work [7]. Before the equal sign came into common use, there were other forms of expression of equality. In Florian Cajori’s work A History of Mathematical Notations: Vol.1—Notations in Elementary Mathematics, pages 297-298, he showed that the “=” sign was not generally accepted in academia until 1631. It was adopted as the symbol of equality in some influential works in England including Thomas Harriot’s Artis analyticae praxis, William Oughtred’s Clavis Mathematicae, and Richard Norwood’s Trigonometria [8]. Essentially the equal = sign asserts the equality of one form to another but does not assert transformability from one form to another. We suspect that a misinterpretation and misuse of the definition of equality = could be the reason why Einstein’s Special relativity equation E=mc² and many other equations fail at reconciling the infinitely small and the infinitely large. The abstraction “Δx≈O” that we present in this publication reconciles the infinitely small and the infinitely large and irons out the distinction between equality and transformability.

In Steven G. Krantz’s 2016 paper titled A Primer of Mathematical Writing, he writes ” The dictionary teaches us that “A connotes B” means that A suggests B, but not in a logically direct fashion” [9]. A dichotomy exists between denotation and connotation where denotation defines an explicit-direct relationship between objects and connotation defines an implicit-indirect relationship between said objects[10]. Recorde used the two parallel lines to represent the explicit denotational relationship between two objects, where X denotes Y can be written as X = Y. When Robert Recorde first introduced the equal sign, he intended X ‘denote’ Y or X ‘equal to’ Y to represent the explicit relationship between X and Y [7]. But in this paper we go further, if X denotes Y is represented as X=Y then how do we represent the implicit connotational relationship between X and Y if X connotes Y? The abstraction presented in this publication represents the implicit connotation relationship between X and Y when X connotes Y. The ambiguity between X ‘equal-to’= Y and X “transformable-to” Y has created a pervasive use of the equal sign “=” in symbology. Essentially equality is a denotational relationship that must be expressed explicitly, and transformability is a connotation relationship that must be expressed implicitly. With this understanding, we can conclude that Einstein’s E=mc² represents a denotational relationship between energy and mass. Unfortunately, this same equation does not satisfy the requirement for a connotational relationship because E = mc² does not imply that Energy (E) can be transformed into mass (m), it explicitly says energy is equal to mass times a product of light speed squared. In essence, we are searching for a symbolic representation of ‘Transformation’, allowing us to transform objects on the left to objects on the right and vice versa. In this paper, we assume that the connotational relationship between X and Y is the same as the symbolic representation of the concept “transformation”, and such symbolic abstraction will be a formalization of generality and as stated a formalization of generality satisfies the requirement for our definition of Intelligence.
As aforementioned, X ‘equal-to’= Y does not mean the same thing as X ‘transformable-to’ Y hence we need to formalize a new symbolic abstraction for ‘transformation’. In mathematics, some other relationship symbols include “<, <=, >=, >” that make up the real number line and are used to represent the equivalent relationship between X and Y but not the transformational relationship. This means this new symbol and relationship must be the symbolic representation of ‘Transformation’ while also having the capacity to derive the mathematical notations by generating the real number line. The intelligence-energy transformation $\Delta x O$ accomplishes that

3. Transformation Parameters (TP) and Types (TT)

In this paper, we define ‘Computation’ as a formal language for representing the interaction of concepts. We assume that an infinite number of possible languages can be derived to formalize the interaction of different concepts. We define Intelligence as the foundation of these languages, meaning that it can represent the concept of generality and model its interaction with other concepts. Essentially, intelligence is a formalization of the concept of generality or A General Language Model (GLM), where $\Delta x O$ is the foundational axiom of the language as presented in this publication.

Isaac Newton's force-mass equivalence equation $f = ma$ and Albert Einstein's energy-mass equivalence equation $E = mc^2$ are symbolic abstractions that represent the interactions between the concepts of force and mass for Newton and energy and mass for Einstein. In this paper, we emphasize that these formalizations were derived, implying that a more fundamental abstraction underpins these computationally reduced mathematical derivations. A discovery of this foundational abstraction will allow us to bypass the limitations of prior derivations and organize them into types. We introduce two new concepts in this paper called Transformation Parameters (TP) and Transformation Types (TT). At different levels of abstraction, transformations can be represented in different ways to model the interaction of concepts. Each Transformation we will call Transformation Type (TT). Transformational Types differ by their Parameters, where the transformation parameter(TP) determines the efficiency of the transformation. For Example, Energy, Time, and Space are classified as a Transformation Type (TT) where Time behaves as the Transformation Parameter (TP) between energy and Space. Other transformation types (TT) as outlined in Table.1 include (Area, $\pi$, $r^2$), (Emergence, interaction, Evolution), (E, =, $mc^2$), (Force, Mass, Acceleration), and (Complexity, Dimensionality, Spatiality).

Hence, we define intelligence as an optimally efficient computational algorithm for general interaction. In computation, Space complexity denotes space required for execution, and Time complexity denotes the number of operations required to complete execution [11]. This paper posits that an optimally efficient algorithm has zero Time complexity, zero Space complexity, and an infinite Dimensional complexity, where we define Dimensional Complexity as the information that an algorithm must compute to reach completion. By this definition, we argue that theoretically, an optimally efficient algorithm will have zero time complexity, infinite-dimensional complexity, and zero space complexity, meaning that the algorithm can complete a transformation with zero computation in zero time. A minimally efficient algorithm will have infinite space complexity, infinite time complexity, and zero-dimensional complexity, meaning that even with infinite computation and infinite Time, the algorithm cannot complete the transformation.
In the Intelligence Transformation $\Delta \infty \Omega$, each symbol represents Complexity ($\Delta$), Dimensionality ($\infty$), Spatioity ($\Omega$), where complexity ($\Delta$) akin to computational Time Complexity denotes the number of operations required for completion, Spatioity ($\Omega$) akin to Computational Space complexity denotes space required for execution, and Dimensionality ($\infty$) akin to Computational Dimensional Complexity denotes the Transformation Parameter(TP) being used in the transformation, where the Transformation Parameter(TP) determines the efficiency of the transformation hence the less information a Transformation Type(TT) or Algorithm requires to reach completion, the more efficient that type or algorithm is and vice versa. This is outlined in Figures 2,3,4 below, where the Transformation Parameters(TP) include ($\infty$, $=\approx\pi$, 1, Mass, Time), etc. For example, the concepts of equality ($=$) mass(m) and time(t) require observation and measurement, which are all sources of inefficiency. The Intelligence Transformation $\Delta \infty \Omega$ we present in this publication does not require such information thus making it more optimal than Einstein's $E=mc^2$. In essence, the Transformation Parameter (TP) determines the efficiency of the transformation where the Transformation Parameter(TP) $\infty$ is optimal. As aforementioned, the connotational relationship between X and Y is the same as the transformation from X to Y and vice versa, and the transformational relationship between X and Y is the same as the formalization of generality. We discovered that intelligence can be represented as a formalization of generality, the symbolic abstraction $\Delta \infty \Omega$, and in computation as an optimally efficient algorithm akin to an algorithm for generalized interaction. We define a General Language (GLM) Model, where $\Delta \infty \Omega$ is the foundational axiom of the language.

![Diagram](image)

**Figure 1.** At the energy scale, the concept of Mass(m) is the same as Pi ($\pi$) at the geometric scale. This is because the abstractions Pi ($\pi$), Mass (m) and Equality ($=$) are Transformation Parameters (TP) which determine the type of transformation that happens. This means Mass (m) and Equality ($=$) in $E=mc^2$ can be further generalized into $\infty$, where $E \propto c^2$. Essentially when the transformational parameter(TP) is $\infty$, Mass(m) and other derivative parameters are negligible. For example, at the speed of light c, particles have no rest energy, where $E$ (total) = $E$(rest) +
E(motion), hence only the energy of motion remains, making $E_{\text{total}} = E_{\text{motion}}$ the reason why Mass($m$) is negligible and photons are defined as having no mass. Transformational relationships exist between Energy ($E$) & Light ($c$), Area ($A$) & radius ($r$), Force ($F$) & Acceleration($a$), Zero (0) & One (1), and Triangle ($\Delta$) & Circle (O), where each transformation has a different Transformation Parameter (TP) as outlined in Table 1.

**Table 1.** Transformation Table (The General Language Model (GLM)): The Transformation Table, outlines The General Language Model (GLM) defines General Intelligence as $\Delta \approx O$, a formalization of the transformational triarchic relationship between concepts, which we call Transformation Types (TT). All parameters in each Row create a Transformation Type (TT), for Example (0,1,0), (Area, $\pi$, $r^2$), (Emergence, interaction, Evolution), ($E$, =, $mc^2$), (Force, Mass, Acceleration), and (Complexity, Dimensionality, Spatiality), and ( $\Delta$, $\approx$, O) are all Transformation Types (TT). The Transformational Parameters (TP) are in Column 2 [ $\approx$ ], and they determine the Transformation Type (TP) between Column 1 [$\Delta$] and Column 3 [O]. The transformational parameters (TP) include $\approx$, $\pi$, 1, Mass, Time, Infinity, etc.

<table>
<thead>
<tr>
<th>$\Delta$</th>
<th>$\approx$</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td>Infinity</td>
<td>Circle</td>
</tr>
<tr>
<td>Infinitesimal</td>
<td>Infinite</td>
<td>Finite</td>
</tr>
<tr>
<td>Complete</td>
<td>Infinite</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Consistent</td>
<td>Infinite</td>
<td>Inconsistent</td>
</tr>
<tr>
<td>Complexity</td>
<td>Dimensionality</td>
<td>Spatiality</td>
</tr>
<tr>
<td>Time Complexity</td>
<td>Dimensional Complexity</td>
<td>Space Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergence</th>
<th>Interaction</th>
<th>Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>$\pi$</td>
<td>$r^2$</td>
</tr>
<tr>
<td>Force</td>
<td>Mass</td>
<td>Acceleration</td>
</tr>
<tr>
<td>Energy</td>
<td>Time</td>
<td>Space</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>$E$</th>
<th>=</th>
<th>$mc^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 2. The Intelligence Engine diagram defines General Intelligence as $\Delta \approx O$, a formalization of the transformational triarchic relationship between concepts, which we call Transformation Types (TT). For Example, $(0,1,0)$, (Area, $\pi$, $r^2$), (Emergence, interaction, Evolution), (E, $=, mc^2$), (Force, Mass, Acceleration), and (Complexity, Dimensionality, Spatality), and $(\Delta, \approx, O)$ are all Transformation Types (TT). The Transformational Parameters (TP) are the middle notations separated by commas under $[\approx]$, and they determine the Transformation Type (TP) between the first notation under $[\Delta]$ and the third notation under $[O]$. The transformational parameters (TP) include $\approx, =, \pi, 1, \text{Mass}, \text{Time}$, etc.
**Figure 3.** The Transformation Space diagram is read counter-clockwise in the order of $\Delta \propto O$, beginning with the first quadrant Triangle ($\Delta$) and ending with the third quadrant circle ($O$). The definitions remain consistent when read in the clockwise direction also but for the sake of consistency, we will read counter-clockwise throughout this publication. For Example, our diagram shows that there exists a Triarchic relationship between the three quadrants called Transformation Types (TT). For example $(0,1,0)$, $(\text{Area, } \pi, r^2)$, $(\text{Emergence, interaction, Evolution})$, $(E, =, mc^2)$, $(\text{Force, Mass, Acceleration})$, $(\text{Complexity, Dimensionality, Spatiality})$, $(\Delta, \propto, O)$ are all Transformation Types (TT). The Transformational Parameters (TP) are in the 3rd Quadrant [$\propto$], and they determine the type of transformation or interaction between phenomena in Quadrant 1 [$\Delta$] and Quadrant 3 [$O$]. The transformation parameters (TP) include $\propto, =, \approx, \pi, 1$, Mass, Time etc.
**Figure 4.** This is a colorized version of Figure 4. The Transformation Space diagram is read counter-clockwise in the order of $\Delta \approx O$, beginning with the first quadrant Triangle [$\Delta$] and ending with the third quadrant circle [O]. The definitions remain consistent when read in the clockwise direction also but for the sake of consistency, we will read counter-clockwise throughout this publication. For Example, our diagram shows that there exists a Triarchic relationship between the three quadrants called Transformation Types (TT). For example (0,1,0), (Area, π, $r^2$), (Emergence, interaction, Evolution), (E, =, mc²), (Force, Mass, Acceleration), (Complexity, Dimensionality, Spatiality), (Δ,∞, O) are all Transformation Types (TT). The Transformational Parameters (TP) are in the 3rd Quadrant [∞], and they determine the type of transformation or interaction between phenomena in Quadrant 1 [$\Delta$] and Quadrant 3 [O]. The transformation parameters (TP) include $\approx$, $\approx$, $\approx$, 1, Mass, Time etc.
4. Conclusions

The purpose of this paper was to present the intelligence transformation $\Delta \infty \Omega$ as a further generalization of Einstein's Energy-Mass Equivalence equation $E=mc^2$. We show that the transformation $\Delta \infty \Omega$ is the foundational axiom and the conceptual framework for generalized interaction which reconciles the infinitely small and the infinitely large. This paper reconciles Complexity, Dimensionality, and Spatiality where $\Delta$ is infinitesimal and denotes Complexity $\infty$ is infinite and denotes Dimensionality, and $\Omega$ is finite and denotes Spatiality. We define intelligence as a formalization or abstraction of generality. We define Intelligence as:

$\Delta \infty \Omega$
[ 
Triangle "$\Delta$"
Infinity: "$\infty$"
Circle: "$\Omega$"
]

$\Delta \infty \Omega$
[ 
Infinitesimal: "$\Delta$"
Infinite: "$\infty$"
Finite: "$\Omega$"
]

$\Delta \infty \Omega$
[ 
Complexity: "$\Delta$"
Dimensionality: "$\infty$"
Spatiality: "$\Omega$"
]

5. Implications

In the Intelligence research community, intelligence has been benchmarked by comparing the efficiency at which algorithms complete human-specific tasks. This is what we call a ‘functional’ definition of intelligence which allows researchers to experiment and even build interesting things as they have functional attributes. The issue with this functional definition is that the fundamental assumption is not generalizable and thus cannot fully represent intelligence. The transformation $\Delta \infty \Omega$ presented in this publication is classified as a ‘non-functional definition’ because it merely presents the generalized representation of intelligence without asserting any predefined functions. Based on the issues discussed here, we propose that the academic community adopt the transformation $\Delta \infty \Omega$ as the definition of intelligence. This transformation is considered a General Language Model (GLM) because it models the fundamental interactions of concepts beyond the limitations of mathematics. An example of this restriction is found in economic theories that use mathematical equations to formalize the relationship between concepts. Essentially, a non-general language will render a constrained
economic model. This means that there exists a relationship between the generality of language models and their efficiency at optimally modeling the interaction of concepts. The transformation $\Delta \approx O$ presented in this publication is the most general and least constrained axiom because it is not confined by domain and can transform between dimensions while retaining its meaning. The axiom colloquially termed ‘the theory of everything’ is the law of nature, meaning it's also the blueprint of all systems in nature. This means that by reconciling our societal systems with the transformation $\Delta \approx O$, we effectively calibrate our systems to be optimal.

At the societal level, many of our systems are built with mathematical and computational foundations which as aforementioned entails limitations that manifest as inefficiencies in societal interactions. The General Language Model (GLM) allows us to transcend these limitations and build more efficient and interoperable systems as such systems will be governed by the same axiom. For example, AI inference using a non-general Large Language Model (LLM) works by parsing through data and looking for geometric structures to use for predictions. Unfortunately, this is an energy-intensive endeavor that, when optimized for efficiency, still requires increasing amounts of energy to achieve consensus. If we extrapolate forward in time, we can safely assume that there will be escalating data and energy demands. The GLM we present in this publication already provides the fundamental structure or spine for the organization and interaction of arbitrary concepts or abstractions, thus no need for data and excessive energy usage in training to find this structure. We can conclude that the General Language Model (GLM) is an improvement of the Large Language Model (LLM).

One of the more impactful implications of this discovery is its implementation as a consensus mechanism for arbitrary interaction governance. Think of this new consensus as the next iteration after blockchain technology, where the consensus mechanism once confined in a computer can now reside as a concept. Concepts transcend time, space, and entropy and are not governed by equivalence laws, they are governed by transformation laws. This means that the consensus mechanism for our new economic model must not be limited to the judgment of a few men or confined to a hackable computer with energy and memory limitations. The New consensus which we term ‘Intelligence Consensus” exists as the symbolic abstraction $\Delta \approx O$ and can be represented in all dimensions without losing its meaning.

From a material science lens, this is the algorithm that governs the emergence, interaction, and evolution of all physical phenomena. It underpins our reality as a representation of this fundamental substrate. The Transformation $\Delta \approx O$ reconciles all fields in academia and solves the unification of the infinitely small and infinitely large, a once elusive problem that puzzled some of the greatest minds.

**Nomenclature**

$\Delta \approx O$: Intelligence Transformation  
$\Delta$: Triangle, Infinitesimal, Complexity, Time Complexity  
$\approx$: Infinity, Infinite, Dimensionality, Dimensional Complexity, Transformational Parameters  
O: Circle, Finite, Spatiality, Space Complexity  
f= ma: Newton's Second Law of Motion  
E=mc²: Einstein’s Energy-Mass Equivalence equation  
m: Mass(m)  
A: Area  
e: Energy  
F: Force
References


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