International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 2 (April-June 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I2.672

A Frequency-Based Conceptual Framework for Interpreting Force, Boundary, and Space

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Publication history: Received: May 25, 2026; Revised: June 21, 2026; Accepted: June 25, 2026
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Abstract

This paper develops a frequency-based conceptual framework for interpreting selected relationships among force, boundary formation, and space. The original draft proposed the use of temporal frequency and distance frequency to reformulate classical expressions of velocity, force, boundary, and space. To make the framework suitable for journal presentation, the present version organizes the proposal as an exploratory theoretical model rather than as a replacement for established physical laws. The framework defines temporal frequency as $f_t = 1/t$ and distance frequency as $f_d = 1/d$, allowing velocity to be expressed as $v = f_t/f_d$. From this basis, the paper distinguishes a mass-frequency interaction index, $\Phi = m f_t$, from a dimensionally compatible force expression, $F^* = m f_t^2/f_d$. It also reformulates the proposed boundary equation as a density-related term, $D_B = m f_d^3$, and extends it into a pressure-related proxy when linked with velocity. Finally, the proposed space equation is interpreted as a spatial-energy interaction term, $S_E = m v^2$, rather than as literal geometric space. Through dimensional analysis and conceptual comparison with standard mechanics, the paper identifies the possible usefulness, limits, and validation requirements of the proposed framework. The study concludes that frequency-based notation may serve as a heuristic model for organizing relationships among time, distance, mass, and motion, but further mathematical proof, simulation, and experimental testing are necessary before the framework can be treated as a physical theory.

Keywords: Frequency-Based Framework, Force, Boundary, Space, Dimensional Analysis, Theoretical Physics, Motion

1. Introduction

The mathematical description of physical systems depends on the careful definition of quantities, units, and relationships among measurable variables. Classical mechanics describes force through the relationship between mass and acceleration, while wave mechanics describes propagation through the relationship among wavelength, frequency, and velocity (Feynman et al., 1963; Giancoli, 2014; Halliday et al., 2018; Serway & Jewett, 2018; Young & Freedman, 2020). These relationships are powerful because they are not merely symbolic; they are also dimensionally coherent and experimentally testable. Any new theoretical formulation must therefore clarify the meaning of its symbols, show consistency with accepted dimensions, and state whether the proposed expression is intended as an exact physical law, an approximation, a transformation of notation, or a heuristic model.

The draft manuscript entitled The General Force, Boundary & Space proposed a broad set of equations that attempted to connect velocity, force, boundary, and space through frequency. Its main conceptual starting point was the observation that a visible motion, such as the movement of a clock hand, contains both time and distance. From this observation, the draft proposed two reciprocal quantities: a frequency of time and a frequency of distance. The most promising element of the proposal is the expression of velocity as a ratio between temporal frequency and distance frequency. If temporal frequency is defined as $f_t = 1/t$ and distance frequency is defined as $f_d = 1/d$, then $v = f_t/f_d$ produces the dimension of velocity, $L\ T^{-1}$. This provides a mathematically coherent starting point for further discussion.

The broader claims of the original draft, however, require careful reformulation for scholarly publication. Statements that a new equation "upgrades" Newtonian mechanics or Einsteinian relativity are not appropriate without rigorous derivation, empirical confirmation, and peer review. Similarly, proposed applications to cancer therapy, DNA uniqueness, typhoon force, active fault prediction, and planetary motion cannot be presented as validated results without data, methods, and evidence. For that reason, the present paper does not present the framework as a replacement for classical mechanics, thermodynamics, molecular biology, geophysics, or relativity. Instead, it develops the draft into a conceptual and theoretical article that identifies which proposed relationships are dimensionally coherent and which require reinterpretation.

Dimensional analysis is central to this refinement. The International System of Units provides the reference basis for expressing physical quantities in coherent units (Bureau International des Poids et Mesures, 2019; National Institute of Standards and Technology, 2019), and dimensional analysis remains a basic method for checking whether a proposed equation can represent the quantity it claims to describe (Barenblatt, 1996; Bridgman, 1922; Buckingham, 1914). For instance, force has the dimension M L T^-2, pressure has the dimension M L^-1 T^-2, density has the dimension M L^-3, and energy has the dimension M L^2 T^-2. If an expression produces a different dimension, it may still be useful as an index or construct, but it should not be labeled as an established physical quantity unless additional conversion terms are supplied.

This paper therefore aims to convert the original draft into a publication-ready conceptual framework. Specifically, it seeks to: (1) define the frequency-based quantities used in the model; (2) examine how velocity may be expressed as the ratio of temporal frequency to distance frequency; (3) distinguish between a mass-frequency interaction index and a true force-compatible expression; (4) reinterpret the boundary equation as a density or pressure-related construct; and (5) reinterpret the proposed space equation as an energy-scale interaction term. The goal is not to assert a completed universal law, but to present a clearer theoretical basis that can be evaluated, criticized, refined, and tested in future work.

2. Material and methods

2.1 Research Design

This study used a conceptual-theoretical research design. It did not involve laboratory experimentation, field measurement, human respondents, or statistical testing. Instead, it examined the internal coherence of a proposed set of equations by identifying the intended variables, clarifying their operational meanings, comparing their dimensions with standard physical quantities, and reformulating the equations into a more defensible theoretical model. This design is appropriate for early-stage theoretical work because it allows the proposed constructs to be organized before any empirical validation is attempted.

2.2 Theoretical Scope of the Study

The study was limited to three related constructs from the draft manuscript: general force, boundary, and space. The original paper also discussed examples involving temperature, DNA, medicine, typhoons, fault lines, and planetary motion. These examples were reviewed but were not treated as validated findings because they were not supported by empirical procedures or quantitative data. The present paper retained only the mathematical and conceptual core of the proposal and reframed the wider examples as possible future areas for investigation rather than as established applications.

2.3 Conceptual Sources and Foundational Equations

The theoretical analysis was anchored in standard relationships from classical mechanics, wave mechanics, density and pressure relations, and special relativity. The relevant standard expressions were velocity v = d/t, Newtonian force F = ma, wave velocity v = lambda f, density rho = m/V, pressure P = F/A, and energy-scale expression m v^2. These expressions were used as reference points because they provide well-established dimensional structures for evaluating whether the proposed frequency-based expressions can represent the quantities claimed in the draft (Goldstein et al., 2002; Newton, 1999; Taylor & Wheeler, 1992; Tipler & Llewellyn, 2012).

2.4 Model Variables and Operational Definitions

The framework defines temporal frequency as the reciprocal of time and distance frequency as the reciprocal of distance. Temporal frequency is written as f_t = 1/t and has dimension T^-1. Distance frequency is written as f_d = 1/d and has dimension L^-1. The term “frequency of distance” is not used as a conventional wave frequency; rather, it is treated as a reciprocal length scale. This clarification is necessary because the standard physical meaning of frequency is cycles per unit time, whereas the proposed framework uses the term frequency in an extended conceptual sense (Bureau International des Poids et Mesures, 2019; Feynman et al., 1963).

Table 1. *Symbol definitions and dimensional interpretation of the proposed framework*

Symbol	Operational meaning in the proposed framework	Dimensional expression	Publication-ready interpretation
t	Time interval	T	Duration over which motion or change is described
d or L	Characteristic distance or length scale	L	Spatial interval, body size, wavelength, or path length
f_t	Temporal frequency, defined as 1/t	T^{-1}	Frequency of occurrence, rotation, vibration, or temporal change

Symbol	Operational meaning in the proposed framework	Dimensional expression	Publication-ready interpretation
f_d	Distance frequency, defined as 1/d	L^{-1}	Reciprocal length scale used to represent spatial compression or extent
v	Velocity, represented as f_t/f_d	$L\ T^{-1}$	Dimensionally equivalent to ordinary velocity
Φ	Mass-frequency interaction index, m f_t	$M\ T^{-1}$	Not a newton-force unless converted through an acceleration term
F*	Dimensionally compatible general force form, m f_t²/f_d	$M\ L\ T^{-2}$	Frequency-based expression equivalent in dimension to Newtonian force
D_B	Boundary-density term, m f_d³	$M\ L^{-3}$	Equivalent in dimension to density
P_B	Boundary-pressure proxy, D_B v²	$M\ L^{-1}\ T^{-2}$	Equivalent in dimension to pressure or stress
S_E	Spatial-energy interaction term, m v²	M L^2 T^{-2}	Equivalent in dimension to energy, not literal space

2.5 Analytical Procedure

The analytical procedure followed four steps. First, each draft equation was rewritten using explicit symbol definitions. Second, the dimensions of the left-hand and right-hand sides of each expression were compared. Third, expressions that did not produce the stated quantity were reclassified as indices or constructs rather than as established physical quantities. Fourth, where possible, dimensionally compatible alternatives were formulated while preserving the central idea of the draft: that motion may be represented through the relationship between reciprocal time and reciprocal distance.

2.6 Development of the Frequency-Based Models

The model development began with velocity because this was the strongest mathematical foundation in the draft. From $v = d/t$, defining $f_t = 1/t$ and $f_d = 1/d$ gives $v = f_t/f_d$. The force model was then developed by distinguishing $\Phi = m\ f_t$ from $F^* = m\ f_t^2/f_d$. The former is a mass-frequency interaction index, while the latter has the same dimension as Newtonian force. The boundary model was developed by interpreting $m\ f_d^3$ as a density-related boundary term. The space model was developed by interpreting $m\ v^2$ as an energy-scale term rather than as literal space.

2.7 Data Analysis Techniques

Because the article is theoretical, the analysis used dimensional comparison, conceptual clarification, and consistency checking. No inferential statistics were used. The main analytical criterion was whether each proposed expression generated the correct physical dimension for its intended interpretation. Expressions that passed the dimensional test were retained as possible theoretical constructs, while expressions that did not pass were renamed, limited, or reformulated.

2.8 Ethical Considerations

The study did not involve human participants, animals, biological specimens, patient records, confidential institutional records, or experimental intervention. Therefore, formal research ethics approval was not required for the theoretical analysis itself. Ethical considerations were limited to accurate representation of the proposed framework, avoidance of unsupported claims, respect for established scientific terminology, and proper citation of foundational sources.

3. Results and Discussion

3.1 Velocity as a Ratio of Temporal and Distance Frequencies

The first major result of the conceptual refinement is that the velocity expression proposed in the draft can be retained if the variables are clearly defined. The ordinary velocity relationship is $v = d/t$. If temporal frequency is $f_t = 1/t$ and distance frequency is $f_d = 1/d$, then the ratio f_t/f_d becomes:

$$v = f_t / f_d = (1/t) / (1/d) = d/t$$

This expression is dimensionally coherent because $(T^{-1})/(L^{-1}) = L\ T^{-1}$. In this limited sense, the draft's statement that velocity can be represented using two reciprocal quantities is mathematically defensible. However, the expression does not create a new type of velocity; it restates conventional velocity through reciprocal time and reciprocal distance. Its value lies mainly in its potential as a notational or conceptual bridge between time-based and distance-based descriptions of motion.

This clarification also resolves a problem in the original draft where velocity was sometimes reduced to the unitless value of 1. A ratio may become numerically equal to 1 only under a specific normalization or scaling condition, such as when the chosen temporal and spatial scales are deliberately set to match. In physical modeling, however, velocity normally retains a dimension and a unit. Therefore, the journal-ready model treats $v = f_t/f_d$ as a dimensional expression unless a separate normalization procedure is explicitly introduced.

3.2 Frequency-Based General Force Model

The draft proposed $F = m\ f$ as a general force equation. When f is interpreted as temporal frequency, the right-hand side has dimension M T^-1. This is not the dimension of force, which is M L T^-2. Therefore, the expression $F = m\ f$ cannot be presented as physical force in the Newtonian sense (Newton, 1999; Goldstein et al., 2002). A publishable version must either rename the term or supply the missing length and time terms required to produce acceleration.

The refined framework therefore distinguishes between two expressions. The first is a mass-frequency interaction index:

$$\Phi = m\ f\_t$$

The symbol Φ is used to avoid confusing the index with force. This expression may be useful conceptually when describing how mass is associated with a temporal rate, but it is not a force in newtons. The second expression is a dimensionally compatible force form derived by representing acceleration through frequency terms. Since acceleration has dimension L T^-2, and f_t^2/f_d has dimension (T^-2)/(L^-1) = L T^-2, a compatible force expression is:

$$F^* = m\ (f\_t^2 / f\_d)$$

This expression preserves the core intuition of the draft while remaining compatible with Newtonian dimensional structure. It does not replace F = ma; rather, it represents acceleration through reciprocal time and reciprocal distance. In this interpretation, $a = f\_t^2/f\_d$ and F* = ma. Thus, the proposed model becomes a frequency-based representation of force rather than an independent universal law.

3.3 Boundary as Density and Pressure-Related Interaction

The draft proposed $B = m\ f^3$ and described boundary as a whole body or separated body in unit pressure. The dimensional interpretation depends on the meaning of f. If f represents distance frequency, f_d = 1/d, then $m\ f\_d^3$ has dimension $M\ L^{-3}$. This is the dimension of density, not pressure. Therefore, the proposed boundary equation should be reclassified as a boundary-density term:

$$D\_B = m\ f\_d^3$$

This result is conceptually meaningful because boundaries in physical systems often involve concentration, compactness, density contrast, or spatial separation across a finite region. A body with a larger mass within a smaller characteristic volume has a larger density term. However, pressure requires force per area or energy per volume. To obtain a pressure-compatible form, the boundary-density term may be linked to a velocity scale:

$$P\_B = D\_B\ v^2 = m\ f\_d^3\ v^2$$

This produces dimension $M\ L^{-1}\ T^{-2}$, which is compatible with pressure or stress. The refined boundary model therefore has two layers: D_B as a density-related boundary term and P_B as a pressure-related boundary proxy. This adjustment is essential because it prevents the paper from treating density and pressure as equivalent quantities.

3.4 Space as a Spatial-Energy Interaction Term

The draft proposed S = m v^2 and described it as an equation for space. Dimensionally, however, m v^2 has dimension M L^2 T^-2, which is the dimension of energy. In classical mechanics, kinetic energy is K = 1/2 m v^2, so m v^2 is equal to twice the kinetic energy scale (Halliday et al., 2018; Young & Freedman, 2020). For that reason, S = m v^2 should not be described as literal space or as a replacement for Einstein's mass-energy relation. A more defensible notation is:

$$S\_E = m\ v^2$$

Here, S_E means spatial-energy interaction term. This interpretation allows the model to discuss how mass and motion define an energy scale associated with movement through space without claiming that energy and geometric space are identical. The refined expression also avoids the incorrect implication that replacing the speed of light with ordinary velocity creates a new relativity equation. The mass-energy relation in relativity has a specific theoretical basis and cannot be revised through simple substitution alone (Einstein, 1905; Taylor & Wheeler, 1992; Tipler & Llewellyn, 2012).

The space model may still have heuristic value if used carefully. For example, when a moving body is analyzed through a characteristic velocity, the term $m\ v^2$ expresses the energy scale associated with that motion. If v is written as f_t/f_d, then the spatial-energy term may be expressed as:

$$S\_E = m\ (f\_t / f\_d)^2$$

This form connects the energy-scale term to the same frequency-based variables used in the velocity and force models. It also provides internal coherence across the framework: velocity is based on f_t/f_d, force is based on $m\ f\_t^2/f\_d$, boundary density is based on $m\ f\_d^3$, and spatial-energy scale is based on $m(f\_t/f\_d)^2$.

3.5 Refinement of the Original Draft Equations

The original manuscript contained promising conceptual intuitions but used several terms too broadly. In particular, force, pressure, temperature, DNA, cancer therapy, typhoon strength, fault prediction, and space were treated as if they could all be explained directly by F = m f or related expressions. The journal-ready framework narrows this scope. It retains the frequency-based interpretation of velocity and reformulates the other equations according to their dimensions. This allows the model to be presented as a theoretical framework rather than as an unsupported universal explanation of unrelated phenomena.

Table 2. *Refinement of the draft equations into a journal-ready conceptual model*

Draft expression	Issue in journal presentation	Refined publishable expression	Interpretation
$v = (1/t)/(1/d)$	Acceptable if $f_t = 1/t$ and $f_d = 1/d$ are explicitly defined.	$v = f_t/f_d$	Velocity can be represented as the ratio of temporal frequency to reciprocal distance.
$F = m f$	This has dimension $M T^{-1}$ and is not equal to force in newtons.	$\Phi = m f_t$; $F^* = m f_t^2/f_d$	$m f_t$ is a mass-frequency index; F^* is the dimensionally compatible force form.
$B = m f^3$	This is density if f is reciprocal distance, not pressure.	$D_B = m f_d^3$; $P_B = D_B v^2$	Boundary is first represented as density, then extended to pressure or stress.
$S = m v^2$	This has the dimension of energy, not geometric space.	$S_E = m v^2$	The model is treated as a spatial-energy interaction term related to kinetic energy scale.

3.6 Implications of the Proposed Framework

The framework has three main implications. First, it shows that reciprocal time and reciprocal distance can be combined to restate velocity in a coherent way. Second, it shows that some of the proposed draft equations become meaningful when renamed according to their dimensions. For example, $m f_t$ is not force but a mass-frequency index, while $m f_d^3$ is not pressure but a density-related term. Third, it shows that frequency-based notation may provide a compact way of linking motion, density, force, and energy-scale descriptions under a common conceptual language. This kind of scale-based reformulation is consistent with the broader role of dimensional reasoning in theoretical model construction (Barenblatt, 1996; Bridgman, 1922; Buckingham, 1914).

At the same time, the framework remains exploratory. Its equations do not yet predict new physical phenomena, provide experimental measurements, or outperform existing models. Its present contribution is therefore conceptual rather than empirical. Before the framework can be treated as a physical theory, it must be developed into testable hypotheses. Possible future work may include computational simulation, controlled mechanical experiments, comparison with measured rotational systems, and formal mathematical derivation from accepted principles.

Table 3. *Summary of proposed frequency-based constructs*

Construct	Core expression	Equivalent standard dimension	Main implication
Velocity construct	$v = f_t/f_d$	$L T^{-1}$	Motion can be described using reciprocal time and reciprocal distance scales.
Force construct	$F^* = m f_t^2/f_d$	$M L T^{-2}$	Force requires an acceleration-scale term, not only frequency multiplied by mass.
Boundary-density construct	$D_B = m f_d^3$	$M L^{-3}$	Boundary concentration may be modeled as mass per cubic length scale.
Boundary-pressure construct	$P_B = D_B v^2$	$M L^{-1} T^{-2}$	A boundary becomes mechanically meaningful when density is linked to velocity or stress.
Spatial-energy construct	$S_E = m v^2$	$M L^2 T^{-2}$	The proposed space term should be read as an energy-scale relation.

4. Conclusion & Recommendations

The study converted the draft proposal on general force, boundary, and space into a more coherent frequency-based conceptual framework. The strongest retained expression is the velocity relationship $v = f_t/f_d$, where $f_t = 1/t$ and $f_d = 1/d$. This expression is dimensionally equivalent to ordinary velocity and provides the foundation for the rest of the framework. The proposed force equation was refined by distinguishing the mass-frequency index $\Phi = m f_t$ from the dimensionally compatible force expression $F^* = m f_t^2/f_d$. The proposed boundary equation was reinterpreted as a density-related term, $D_B = m f_d^3$, and extended to a pressure-compatible proxy, $P_B = D_B v^2$. Finally, the proposed space equation was reframed as a spatial-energy interaction term, $S_E = m v^2$, rather than as literal space or as a replacement for relativity.

It is recommended that future studies develop the model through formal mathematical derivation, simulation, and empirical testing. The most appropriate first step is to test the frequency-based velocity and force expressions in simple mechanical systems where time, distance, mass, acceleration, and force can be measured directly. The boundary model may be tested using density and pressure systems, while the spatial-energy term may be compared with kinetic energy calculations. Future researchers should also define clear limitations for the use of the term "frequency" so that temporal frequency and reciprocal length are not confused with conventional wave frequency.

The main limitation of the present paper is that it remains conceptual and does not provide experimental validation. The model also depends heavily on dimensional reinterpretation, meaning that its usefulness depends on whether future studies can show predictive value beyond standard notation. Several broad applications from the original draft, including medicine, DNA, typhoon force, and fault prediction, were excluded from the final framework because they require independent data and discipline-specific validation. Therefore, the paper should be understood as a refined theoretical proposal rather than a completed scientific law.

Compliance with ethical standards

This article is a theoretical and conceptual manuscript and did not involve human participants, animals, patient information, biological specimens, confidential organizational records, or experimental intervention; therefore, institutional ethics approval and informed consent were not required. The author affirms that the manuscript was prepared with due regard for scholarly integrity, accurate representation of the proposed framework, confidentiality of any non-public material, and proper acknowledgement of foundational scientific sources. The author retains responsibility for the originality, accuracy, and final content of the manuscript and declares no known conflict of interest, no external funding, and no competing financial or personal relationships that could have influenced the preparation of this work.

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