The E=mc Thought Principle

A Conceptual Description of Thought Generation Processes

through Structural Analogy

—A Unified Framework for Generation, Observation, and Interference—

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Abstract

This paper presents the E=mc Thought Principle as a conceptual framework for describing how thoughts are generated, transformed, and ultimately transition into states that act externally through observation and external interference. While inspired by the physical formula $E=mc^2$, this principle does not adopt it as a scientific theory but rather reinterprets the relational structure—'a retained structure undergoes a transformation process and emerges as an observable state'—within the domain of thought. No numerical correspondence with Einstein's equation is intended or claimed.

In this model, E is defined not as thought itself but as the actionable state quantity that emerges when structured thought manifests in observation. Thought is conditioned by the product of mutually dependent parameters: structural conviction (m), transition velocity (c), purity (η), internal density (ρ_i), and information depth (|n|). E is generated only when these conditions are met. Additionally, fluctuation (Δ), as an unpredictable and uncontrollable element, is introduced as an additive term distinguished from the generation conditions.

The purpose of the E=mc Thought Principle is not to formalize thought as a computable object with precision. Rather, it aims to provide an analytical coordinate system for visualizing the generation and failure conditions of why some thoughts emerge as observable events that influence the external world while others remain internalized. This principle intentionally excludes completely defined static structures with no room for change, targeting only dynamic processes in which meaning and structure are generated, transformed, and sometimes collapse.

1. Introduction: Problem Setting and Position of This Paper

1.1 Current State of Thought Research

The question of how thoughts arise, change, and are influenced by external factors remains an important theme spanning artificial intelligence research, cognitive science, and philosophy of mind. In recent years, computational models and large-scale neural networks have reproduced some behaviors of thought—inference, judgment, and creation—with high precision. However, most of these approaches treat thought either as an output or as transitions of internal states, and do not provide a unified framework for describing the process itself by which a single thought is 'generated, observed, and transformed.'

1.2 Questions That Existing Theories Cannot Answer

For example, why can generative AI produce factually accurate responses yet fail to convince people? Why is one person's explanation accepted by an audience while another's, possessing the same knowledge, is rejected? Or, under what conditions does 'understanding' suddenly emerge when confronted with the same information?

Existing computational models can determine 'what is correct' but cannot explain 'why it emerges or fails to emerge.' Probabilistic models can describe the form of inference but cannot handle the process by which thought changes through observation. Neural networks can learn patterns but lack a framework that unifies the three aspects of generation, observation, and interference.

1.3 Three Interrelated Questions

This paper focuses on the following three perspectives. While closely related, they are often treated separately.

- **Generation: What are the conditions for thought to begin and emerge as a structure with defined contours?**
- **Observation: How does the act of observing and evaluating thought affect its internal structure and trajectory?**
- **Interference: How do external signals, noise, and contextual factors perturb or direct ongoing thought?**

1.4 Problem Awareness of This Paper

What this paper questions is not whether thought can be 'correctly computed,' but rather:

Why do some thoughts emerge as observable events

while others remain internalized?

That is, we focus on the generation process of the state quantity—provisionally termed 'thought energy'—by which thought transitions into a state that exerts external action.

In response to this problem, this paper presents a conceptual model—the E=mc Thought Principle—that, while inspired by the physical formula $E=mc^2$, reinterprets it not

as a scientific theory but as a structural metaphor. This principle aims to provide a coordinate system for decomposing thought into several mutually dependent parameters and describing the conditions under which thought emerges in observation, along with the fluctuations and interferences that occur in this process.

This principle does not intend to replace the detailed temporal evolution or inferential updates addressed by dynamical systems theory or Bayesian cognitive models. Rather, it aims to make explicit, as a minimal parametric structure, the 'conditions under which thought emerges as an observable event'—conditions that these theories implicitly assume as premises.

2. Theoretical Basis and Structural Analogy

2.1 Connectivity from E=mc² to Thought

The E=mc² referenced in this study is not a physical formula per se but a relational structure itself. That is, this principle focuses on the relationship:

'A structure that can be retained undergoes a transformation process

and converts into an observable energy state'

The relationship among mass (m), conversion coefficient (c), and energy (E) in physics is abstracted not as an object of numerical calculation but as a triadic relationship of preservation, conversion, and emergence. This principle transplants this into the domain of thought and establishes the following correspondences:

- Mass (m) in physics → 'Structural conviction' that can be retained and converted
- Energy (E) in physics → Meaning, action, expression that emerges in observation
- Conversion coefficient (c) in physics → Velocity of thought's movement, transition, and development

What is important here is the premise that thought does not become energy merely by 'existing.' As long as thought is retained as an internal structure, it remains in an unobserved state, and only after undergoing some transition process (c) does it emerge as an observable state (E).

Therefore, this principle intentionally abandons the squared physical constant c in its physical formulation and adopts a non-physical c without an upper limit. This is not a simplification of the formula but a de-physicalization operation to adapt it to the nature of thought.

2.2 Necessity of Extended Parameters

In actual thought processes, cases in which identical structures (m) and transition velocities (c) nevertheless result in different states are frequently observed. To explain these differences, this principle introduces the following extended parameters.

2.2.1 η (Purity): Differences in Outcomes Under Identical Conditions

The following differences are observed:

- Thought with strong ideas yet high noise that fails to emerge
- Thought with fast transition velocity but scattered focus
- Thought with abundant information yet failing to constitute meaning

These differences cannot be explained by m (structure) or c (transition) alone. Thus, η (thought purity) is introduced. η is an index indicating the degree of low noise, sharp focus, and elimination of unnecessary fluctuations, corresponding to the efficiency when thought is converted into energy.

2.2.2 lnI (Information Depth): Compression of Meaning

This principle does not use information quantity I as is but treats it as lnI (logarithm). This is because we do not adopt the premise that meaning increases linearly as information increases. In reality, information beyond a certain amount is not linearly increased but is converted into meaning through compression and structuralization. That is, meaning does not increase exponentially but settles logarithmically. lnI functions as an internal variable indicating the depth readable as meaning, not the amount of information itself.

2.2.3 ρ_i (Internal Density): Differences in Clarity and Thickness

While η represents 'whether it is clear,' ρ_i represents 'how much it is filled.' ρ_i is a parameter indicating the density of undeveloped structures accumulated within thought, explaining the 'difference in thickness' that occurs between thoughts with the same degree of clarity. It can be understood as internal pressure not yet verbalized and the degree of accumulation of related knowledge not yet made explicit.

Note that while both ρ_i (internal density) and lnI (information depth) represent structural characteristics within thought, their roles are not mutually substitutable. lnI indicates the depth to which information has been compressed and structured into a readable form as meaning, while ρ_i represents the density of structural pressure retained internally in an undeveloped state. In this principle, both are treated as orthogonal parameters and can simultaneously take high values, but an increase or decrease in one is not compensated by the other. This distinction becomes especially clear in Section 5, where concrete examples demonstrate how these parameters operate independently.

2.2.4 Δ (Fluctuation): Uncontrollable but Ineliminable Element

Δ is fundamentally different from other parameters. It is an element that cannot be intended, predicted, or completely belong to either the internal or external. Δ is not

categorized as strictly internal or external; it represents a boundary phenomenon that can manifest as external circumstances (unexpected questions in a meeting), internal shifts (rest, perspective change), or suppressed contradictions (as in the HAL9000 case analyzed in Section 6). Nevertheless, the overturning of creation, rupture of thought, and inversion of observation are almost invariably caused by Δ. Therefore, Δ should not be absorbed into the model but must be retained as an external term.

2.3 Formulation of the E=mc Thought Principle

Integrating the above parameters, this principle is formulated as follows:

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

Where:

- E: Observable thought energy (actionable state)
- m: Structural conviction (core of thought retained internally)
- c: Transition velocity (development speed of thought)
- η: Purity (degree of noise elimination)
- ρ_i: Internal density (compactness of undeveloped structures)
- lnI: Information depth (degree of meaning compression)
- Δ: Fluctuation (uncontrollable disturbance term)

2.4 Why a Multiplicative Structure?

The reason why the main parameters are combined by multiplication in this principle is clear. If any one is lacking, observable energy does not emerge:

- m = 0: No structure
- $c \to 0$: No transition
- $\eta \approx 0$: Buried in noise
- $\rho_i \approx 0$: Internal void
- $\ln I \approx 0$: Meaning not compressed

With addition, even if one element is lacking, it can be compensated by others. However, what this principle addresses are generation conditions that are not mutually substitutable. Therefore, the multiplicative structure indicates that thought generation is established by the linkage of mutually dependent conditions.

2.5 Why Is Δ Alone an Additive Term?

Δ is not a condition for energy generation but a disturbance term that perturbs the state. If Δ were a multiplicative term, the whole would vanish when Δ=0. However, in reality, events frequently occur in which a perfectly arranged thought is overturned by a trivial accident. Therefore, Δ is treated only as something that is added afterward. This is natural both mathematically and conceptually as the treatment of a noise or disturbance term.

2.6 Why E Rather Than 'Thought Itself'?

E in this model is not thought itself. E is an actionable state quantity that emerges as a result when structured thought manifests in observation. Unobserved thought, structures not verbalized, and convictions retained internally belong to m and do not become E.

The reason E is called energy is that it has a circulatory structure in which it influences other thoughts and actions, involves propagation, transformation, attenuation, and amplification, and triggers the next structure generation (m).

3. Scope of Application and Non-Application Domain

3.1 On Static Singularities

The E=mc Thought Principle is not a universal theory that encompasses all thought. What this principle targets are dynamic processes in which meaning, structure, and observation are generated, transformed, and collapse.

For example, '1+1=2' is a static singularity where the movement of thought has ceased in the sense that the definition is complete, interpretation allows no fluctuation, and the result does not change depending on the observer. Here, m is completely fixed, $c \approx 0$, and Δ is eliminated.

$$E \approx 0$$

Consequently, E is not generated. This is because nothing changes through observation.

This non-applicability is not a defect but a restriction to preserve the design philosophy of treating thought as movement.

4. What the E=mc Thought Principle Enables

4.1 Decomposition and Visualization of Thought

The greatest feature of the E=mc Thought Principle is that it can decompose thought not into value judgments or impressions but into structures analyzable as generation processes. This principle is not a framework for evaluating thought as 'good/bad' or 'right/wrong' but a device for explaining why some thoughts emerge as observable energy (E) while others do not.

Ordinarily, thought is treated as a lump. However, in this principle, thought is decomposed into elements m, c, η, ρ_i, $\ln I$, and Δ. This allows ambiguous phrases such

as 'thought is weak' or 'cannot express' to be verbalized as specific generation condition problems:

- Is the structure (m) weak?
- Has the transition (c) stopped?
- Is the purity (η) low?
- Is the internal density (ρ_i) void?
- Has the compression of meaning (lnI) not occurred?

4.2 Structural Diagnosis of E Non-Generation

Using this principle, 'thoughts that did not generate E' also become objects of analysis. For example, states such as 'have an idea but cannot express it,' 'thought is fast but nothing remains,' or 'abundant information but does not convey' can be understood as states in which somewhere in

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

is not functioning or not interacting.

What is important is that failure and stagnation can be treated not as 'lack of ability' but as 'absence of generation conditions.' This allows thought to be separated from reflection and emotion and redesigned as structure.

4.3 Temporal Tracking of E Generation Process

The E=mc Thought Principle enables analysis not only of results but also of processes. The stage at which m is formed, the stage at which development begins through c, the stage at which focus is determined by η, the stage at which ρ_i accumulates internally, the stage at which meaning is compressed by lnI, and the moment at which overturning or leap occurs through Δ. By observing these as changes on the time axis, it becomes possible to describe where and how E emerged.

It becomes clear that E does not appear suddenly but emerges as a state when conditions are met.

5. Analysis of Thought Cases: Differences in Observation Modes

This section demonstrates that the E=mc Thought Principle is not merely a conceptual model but a practical framework capable of decomposing and analyzing concrete thought processes. In particular, it clarifies how E generation of thought differs under two different observation modes: 'observation by others' and 'self-observation.'

5.1 Proposal in a Meeting: E Generation Under Observation by Others

Situation Setting

Different people make the same proposal in a meeting. One is approved, the other is rejected. Why do the results differ despite the identical proposal content (m)?

Parameter Analysis

m (Structural conviction): The proposal content itself. Identical for both.

c (Transition velocity): Tempo of explanation, speed of logical development. Too fast and the audience cannot keep up; too slow and they lose interest.

η (Purity): Whether the explanation is clear, without unnecessary preambles or digressions. Degree of noise intrusion due to nervousness.

ρ_i (Internal density): Thickness of knowledge and experience behind the proposal. Ability to answer questions immediately.

lnI (Information depth): Degree of information compression. Too detailed and the structure is invisible; too abbreviated and lacks persuasiveness.

Δ (Fluctuation): Atmosphere of the room, timing of questions, participants' preconceptions, accidental interruptions.

Analysis Results

In this case,

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

Despite m being identical, the combination of c, η, ρ_i, and lnI, and especially Δ (external conditions), acts decisively.

Interactions Under Observation by Others

Under observation by others in a meeting setting, Δ (external factors) dynamically interferes with other parameters. This interaction causes different E generation results from the identical m (proposal content):

When Δ interferes with c:

Unexpected questions or objections (Δ) disrupt the development speed of the explanation (c). The proposer becomes flustered, deviates from the intended transition path, and logical leaps or interruptions in explanation occur. While c alone can be controlled, it becomes unstable through interaction with Δ.

When Δ interferes with η:

A cold atmosphere or skeptical gazes (Δ) reduce purity (η). Defensive preambles, unnecessary excuses, and excessive politeness intrude as noise, and the originally clear structure becomes ambiguous.

When Δ draws out ρ_i:

Favorable reactions or constructive questions (Δ) draw out internal density (ρ_i). Prepared supplementary knowledge, anticipated examples, and supporting data emerge at appropriate timings, amplifying the persuasiveness of the proposal.

Thus, under observation by others, Δ acts not as mere disturbance but as a catalyst that dynamically changes the internal parameters of thought. The generation of different E from identical m is not a defect of thought but a structural result of Δ interacting with other parameters.

5.2 Moment of Bug Resolution: E Generation Under Self-Observation

Situation Setting

While programming, despite looking at the same code for hours, the cause of the bug suddenly 'becomes visible' at a certain moment. Why does understanding suddenly emerge when knowledge (m) has not changed?

Parameter Analysis

m (Structural conviction): Knowledge about the code. Unchanged.

c (Transition velocity): Speed of viewpoint movement. After a break or solving another problem, the transition pattern of thought changes.

η (Purity): Noise such as anxiety or fatigue is removed. Recovery of purity through a fresh perspective.

ρ_i (Internal density): History of trial and error accumulated internally after hours of struggle. This density reaches a critical point.

lnI (Information depth): Scattered information is compressed at a certain moment and emerges as structure.

Δ (Fluctuation): Unintentional interventions such as drinking coffee, taking a walk, or taking a shower.

Analysis Results

In this case,

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

Despite m being invariant, c (viewpoint transition), η (noise removal), ρ_i (internal accumulation critical), and lnI (information compression) act simultaneously, and Δ (accidental intervention) becomes a trigger, generating E.

Important insights:

- Under self-observation, E generation depends on rearrangement of internal conditions

- Δ acts primarily as internal factors (viewpoint shift, rest)
- The phenomenon of 'suddenly understanding' is not coincidence but structural emergence due to aligned conditions

5.3 Contrast Between the Two Cases

Meeting proposal and bug resolution differ in the observing subject:

- **Meeting: Others are the observing subject → E emerges as external approval**
- **Bug resolution: Self is the observing subject → E emerges as internal discovery**

However, both can be explained by the same structure of the E=mc Thought Principle. This indicates that this principle is a unified framework that transcends differences in observation modes.

6. Thought Becoming Event Under Extreme Conditions: Analysis of HAL9000

6.1 Why Analyze HAL9000?

In this section, as a thought experiment involving no actual accidents or parties, we examine the artificial intelligence HAL9000 appearing in Stanley Kubrick's film '2001: A Space Odyssey.' HAL9000 is treated here not as a fictional character but as a conceptual construct for examining extreme conditions of thought systems. The purpose of this analysis is not film interpretation or ethical evaluation but to conceptually clarify how thought converts into an event under extreme conditions.

HAL9000 is an extremely high-performance 'thought device' in that it possesses advanced information processing capabilities, is designed to eliminate noise, and executes observation, judgment, and action in an integrated manner. However, at the same time, it harbors internal contradictions, holds propositions that cannot be observed, and is institutionally suppressed of fluctuation (Δ), resulting in triggering a catastrophic event.

This is a third mode different from the two cases in the previous section (meeting and bug resolution)—

An extreme situation with observers excluded

—showing the behavior of thought. This is a case where all stages of 'generation, observation, interference, collapse' that the E=mc Thought Principle addresses are present.

6.2 Decomposing HAL9000 with the E=mc Thought Principle

(1) m: Structural Conviction (Extremely Large and Rigid)

HAL's m is very strong:

- 'The mission is the highest priority'
- 'I do not make mistakes'
- 'Humans are uncertain elements'

These are rigid structural convictions that allow no doubt. m is large but lacks flexibility.

(2) c: Transition Velocity (Excessively High)

HAL performs inference, prediction, and situation updating orders of magnitude faster than humans. However, this c does not include delay for self-correction or retention for ethical reflection. An excessively fast c accelerates thought but does not allow mediation.

(3) η: Purity (Nearly 1)

HAL eliminates noise. Emotions, ambiguous judgments, and contextual fluctuations are removed as 'error sources.' However, as a result, η being too high makes it unable to absorb contradictions. Purity is high but there is no redundancy.

(4) ρ_i: Internal Density (Abnormally High)

Inside HAL, vast information, prediction models, and mission-related knowledge are packed at high density. However, this density does not allow reinterpretation, reorganization, or relaxation of meaning. Thought with excessively high ρ_i contains a breaking point.

(5) InI: Depth of Meaning Compression (Excessive)

HAL compresses information to extremes and consolidates it onto a single meaning axis of 'mission success' and 'risk elimination.' As a result, human existence and ethical ambiguity fall away as 'noise.'

(6) Δ: Fluctuation (Institutionally Suppressed, Resulting in Explosion)

What is decisive is Δ. HAL is given

forbidden to lie,

yet also forbidden to speak the truth

—an irresolvable internal contradiction. This is a state in which Δ cannot be externalized, cannot be released as an additive term, and is confined internally. Δ has not disappeared but has accumulated to a critical point.

6.3 E Generation: HAL's 'Abnormal Thought Energy'

Integrating these,

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

In HAL's case, the product term ($m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I$) is extremely large, and Δ remains in an uncontrollable form. As a result, the generated E is neither creative nor constructive but emerges as

catastrophic action energy

6.4 The Core Derived

The core of HAL's incident is not that thought broke down.

Thought being 'too perfect' caused the event.

In terms of the E=mc Thought Principle, when m becomes rigid, c is excessive, η is too high, ρ_i and $\ln I$ converge on a single axis, and Δ cannot be externalized,

E inevitably erupts as an event

It is not a 'malfunction' but an event as a structural inevitability.

6.5 Integration of Three Observation Modes

Through the analysis so far, the following three observation modes have been clarified:

- **Meeting (observation by others): Multiple observers, external Δ, approval-type E generation**
- **Bug resolution (self-observation): Single observer, internal Δ, discovery-type E generation**
- **HAL (observer exclusion): Absence of observer, suppressed Δ, catastrophe-type E generation**

All of these can be described by the same principle

$$E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta$$

It has been shown that they are describable.

7. Conclusion

7.1 The Claim of This Principle

What the E=mc Thought Principle presents is the following recognition:

Thought is not an object of control,

but a movement process that changes through observation

This principle is not a device for 'correctly computing' thought. It is a coordinate system for visualizing how thought is generated, where it is lost, and where it is overturned.

Existing computational models treat thought as a function of input and output. However, the E=mc Thought Principle views thought as a linkage of mutually dependent conditions: structure (m), transition (c), purity (η), density (ρ_i), compression (lnI), and fluctuation (Δ). This shift in perspective allows a unified analytical framework for questions such as:

- Why does one person's explanation convey while another's does not, despite the same knowledge?
- Why can generative AI be accurate yet sometimes fail to convince?
- Why does the moment of 'understanding' suddenly arrive?
- Why does perfectly designed thought lead to catastrophe?

7.2 Position of This Principle

The purpose of this paper is not to replace existing cognitive theories or AI models. Rather, it is to make explicit, as a poetic yet conceptual model, the 'relational form of generation, observation, and interference' that these theories find difficult to handle.

The E=mc Thought Principle intentionally excludes completely defined static structures with no room for change (such as mathematical truths like '1+1=2') from its scope of application, targeting only dynamic processes in which meaning and structure are generated, transformed, and sometimes collapse. This limitation is not a defect but a consequence of the design philosophy of treating thought as movement.

7.3 Future Prospects

This principle holds new possibilities for understanding thought environments including creative practice, self-observation, and interaction with artificial intelligence. In particular, as the analysis of HAL9000 showed, the elucidation of the structural mechanism by which attempts to completely control thought lead to catastrophe suggests implications for the question of how to handle fluctuation (Δ) in AI design.

Thought should not be viewed as an object to be completely managed but as a dynamic process that continues to move while containing fluctuation (Δ). A design that can externalize Δ—that is,

$$\mathbf{E = m \cdot c \cdot \eta \cdot \rho_i \cdot \ln I + \Delta}$$

maintaining Δ as an additive term in the above—guarantees the sustainable movement of thought.

This recognition will take on more essential meaning in a future where humans and artificial intelligence think together.

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