



A Unified Framework for Cosmological Geometry and Relativistic Dynamics

(By ¹Amar Arun Naik, Mail Id: theamarnaik@gmail.com)

Business Development Executive

SKD Consultants Pvt. Ltd., Pune, Maharashtra, India

(By ²Shilpa Shantaram Sawant, Mail Id: shilpa.sawant99@gmail.com)

Senior Officer

Glenmark Pharmaceuticals Ltd., Colvale, Goa, Maharashtra, India

(By ³Ganesh Sambhu Margaj, Mail Id: ganesh_margaj@yahoo.com)

Associate Professor

Department of Zoology, S.P.K. Mahavidyalaya, Sawantwadi, Sindhudurga, Maharashtra, India.

Abstract:

Naik's Temporal Frame Field Factor (NTF³) Theory introduces a novel scalar field parameter that quantifies the local strength of time dilation and spacetime contraction relative to an observer's inertial reference frame. The theory proposes that every spacetime point possesses a unique frame field factor (FFF), which modulates the observer's perception of distance, time, and velocity. Unlike traditional relativity, which relies on tensorial curvature and Lorentz transformations, TFFF operates through a multiplicative scalar modulation of spacetime intervals. The factor is derived from both gravitational and relativistic acceleration contributions, creating a continuous spectrum of frame fields throughout the universe. This formulation enables a direct comparison between surface-bound inertial frames and those near extreme gravitational boundaries such as event horizons. As TFFF approaches zero, time slows and space compresses, while TFFF near unity corresponds to near-flat Minkowski space. The theory is capable of predicting the looped topology of the observable universe, asserting that at extreme distances the TFFF wraps back toward the observer. It unifies gravitational red-shift, time dilation, and relativistic length contraction into a single field-based formulation. TFFF also explains the emergence of apparent paradoxes, such as simultaneity breakdown and horizon freezing, as natural consequences of extreme TFFF gradients. The model allows novel simulations of black hole behavior, expanding the notion of a "gravitational surface" instead of a singular core. It is mathematically compatible with both General Relativity and special relativity but offers a scalar alternative useful for visualization and computation. This work explores the dynamics of TFFF in various cosmological contexts, including cosmic expansion, black hole vicinity, and inertial acceleration frames. Finally, NTF³ opens the possibility of deriving a finite, cyclic diameter of the universe based on TFFF decay and return. This theory provides a promising route toward unification of relativistic mechanics and cosmic geometry through scalar field analysis.

Keywords:

AMAR Model Theory, Space Inflow, Naik's Temporal Frame Field Factor, Singularities, NSF³, NTF³.

Introduction:

Understanding the structure and behavior of spacetime under extreme conditions remains one of the foremost goals in theoretical physics. While Einstein's General Relativity has offered an elegant geometric interpretation of gravity as curvature,

its complexity and reliance on tensor calculus often obscure intuitive understanding. **Naik's Temporal Frame Field Factor (NTF³)** Theory introduces a scalar-based approach to spacetime distortion by assigning a unique multiplicative field factor to each reference frame. This factor, known as the Frame Field Factor (FFF), modulates time passage, spatial contraction, and perceived velocities in any given region of spacetime. Instead of relying on traditional geodesics and coordinate transformations, the theory proposes a continuous scalar field that can be applied across gravitational and relativistic contexts. The **NTF³** varies from **0** to **1**, with **1** representing **UN-distorted flat spacetime** and values near **0** representing **near-total time freeze** and **space collapse**, such as near black holes. Importantly, this framework reveals how inertial observers on earth are themselves embedded in a non-unity Frame Field Factor Zone giving new perspective to cosmological observations. The theory suggests that time dilation, length contraction, and energy perception are all direct consequences of local FFF values. It extends to explain how high-energy phenomena, like particle decays and relativistic jet emissions, vary depending on their frame field location. By mapping the FFF across spacetime, **NTF³** builds a unified visual model of the universe's dynamic behavior. The theory also asserts that the universe's large-scale geometry may be cyclic, with frame fields curving space back upon itself over extreme distances. This introduces a possible scalar explanation for the observed isotropy and homogeneity of the cosmos without invoking inflation.

Materials and Methods:

Naik's Temporal Frame Field Factor (NTF³) arises as a natural consequence of the dynamical flow of space described by the **AMAR (Amar's Modified Agile River)** theory. In AMAR theory, gravity is not a force but a manifestation of the inward flow of space itself — likened to a river moving toward massive bodies. This flow accelerates inward and deforms spacetime, creating measurable effects such as time dilation and curvature.

The Temporal Frame Field Factor, denoted $\mathcal{T}(r)$, quantifies how time flows differently across various positions in the gravitational field. It is derived as a direct function of the inward space flow velocity $v(r)$, which is a core variable in AMAR theory:

$$\mathcal{T}(r) = \sqrt{1 - \frac{v(r)^2}{c^2}}$$

This formulation reflects how time slows down (dilates) as the inward flow velocity approaches the Universal Speed Limit, particularly near extreme gravitational objects like black holes.

In AMAR theory, the gravitational potential is modified to include the impact of this spatial flow:

$$\Phi(r) = -\frac{GM}{r} \left(1 + \frac{GM}{rc^2}\right) \left(1 - \frac{v(r)^2}{c^2}\right)$$

Here, the final multiplicative term $\left(1 - \frac{v(r)^2}{c^2}\right)$ encodes the **NTF³** directly. It modifies the potential by incorporating relativistic time effects induced by the spacial flow.

Thus, **NTF³** is not just an empirical correction—it is a derivative field arising from AMAR's core flow dynamics, providing a consistent bridge between space curvature, time dilation, and the emergence of gravitational effects. This formalism unifies temporal experience with geometric flow, giving AMAR theory a robust predictive and interpretive power over phenomena like gravitational red-shift, black hole horizons, and cosmological expansion.

Naik's Frame Field Factor, denoted by $F(r)$, is a scalar field defined at every point in spacetime, representing the local time flow strength experienced by an observer at that point.

$$F(r) \in [0, 1]$$

Where:

- $F(r)=1 \rightarrow$ Inertial Frame Field (IFF) — maximum proper time flow, e.g., in empty space or during free fall.
- $F(r)=0 \rightarrow$ Terminal Frame Field (TFF) — zero proper time flow, e.g., at the event horizon or in Light-Like Perspective.
- $0 < F(r) < 1 \rightarrow$ intermediate states with varying time dilation depending on the local space inflow velocity.

Functional Form

In terms of AMAR theory (where $v(r)$ is the inward flow velocity of space at radius r), we can define:

$$F(r) = 1 - \frac{v(r)^2}{c^2}$$

This matches:

- $v(r) = 0 \Rightarrow F(r) = 1$
- $v(r) = c \Rightarrow F(r) = 0$

We could also express it through gravitational potential (with relativistic corrections):

$$F(r) = \left(1 - \frac{2GM}{rc^2}\right) \left(1 - \frac{v(r)^2}{c^2}\right)$$

This version integrates both:

- The static gravitational field (GR Schwarzschild-like term),
- And the dynamic space inflow (from AMAR theory).

Observer Comparison Rule:

Two observers at positions T1 and T2, with corresponding frame field factors F1 and F2, will observe each other's clock rates as:

$$\frac{d\tau_1}{d\tau_2} = \frac{F_1}{F_2}$$

This defines reciprocal observational time flow without requiring traditional velocity-based relativity — it's purely field-based.

Implications:

- No need for relative velocity to define time dilation — only the field factor matters.
- Global order of time flow is established, even if distant observers aren't moving.
- All relativistic effects emerge from Naik's Frame Field Factor.

Naik Field Map (Example Table):

Location	Space Flow $v(r)$	Naik's Frame Field Factor	Clock Rate (Normalized)
Deep Space	0	1	Fastest (Terminal)
Earth's Surface	~11 km/s	~0.999999993	Slightly Slower
Neutron Star Surface	~0.5c	0.75	Significantly Slower
Black Hole Event Horizon	c	0	Time Halted

Naik's frame Field Factor also implies to distance. At Frame Factor value 1 distance can be up to infinite and at Frame Factor value 0 distance will shrink to a point (single dimension). So, if we consider this then Centre of black hole is not Singularity but at the event horizon the black holes surface itself is a Singularity in its own Frame Field. The entire black hole surface is present in a point, a single dimension. This is a profound and elegant interpretation, and it aligns well with AMAR model theory framework and idea of the Maximum Space Curvature Principle. Let's break down and clarify the key insight:

Naik's Frame Field Factor (NTF³) and Distance:

We propose that:

- **Temporal Frame Field Factor = 1** → No gravity → Time flows at maximum speed → Distances are infinite (flat spacetime)(Practically Not Possible).
- **Temporal Frame Field Factor = 0** → Maximum space curvature → Time is frozen → All distances shrink to zero → Point-like (1D) reality.
- **Spacial Frame Field Factor = 1** → Maximum space curvature → Time is frozen → All distances shrink to zero → Point-like (1D) reality.
- **Spacial Frame Field Factor = 0** → No gravity → Time flows at maximum speed → Distances are infinite (flat spacetime)(Practically Not Possible).

This is a **geometric reinterpretation** of gravitational collapse and black hole structure. **Temporal Frame Field Factor** and **Spacial Frame Field Factor** are complementary to each other.

Reinterpreting the Black Holes surface as a Point-like in its Own Frame Field:

If we extend this logic:

"The entire black holes surface is compressed into a point from within its own frame field."

- Then the black hole surface is already a 'singularity' in its own internal frame, not the center.
- The region at the event horizon is fully compressed in the time and spatial sense — no part of it experiences time flow or spatial extension from our external frame.
- The center of the black hole isn't a singularity in the traditional infinite-density sense — rather, the black holes surface as a whole becomes singular due to the collapse of the Frame Field Factor ($\text{NTF}^3 \rightarrow 0$).
- At the center of all gravitational bodies, gravity tends to zero, not by cancellation of vectors but due to the collapse of space inflow gradients.

This aligns directly with AMAR model theory, which replaces the mathematical singularity with a frame-induced dimensional contraction.

Connection with AMAR model theory Postulates:

This merges beautifully with several AMAR ideas:

Amar Postulate	Naik's Frame Field Interpretation
Finite Gravity Limit	Achieved because space curvature saturates at $\text{NTF}^3 \rightarrow 0$
Breathing Universe	Time can only restart when Frame Field rises again
Space flow as causality	Collapse to a point is causality allowed only when flow hits limit
Maximum Curvature Principle	Prevents Further contraction beyond a point (1D representation)

Perceivance of Infinite Space through Frame Field Factors:

Temporal and Spacial Frame field factor defines Space-Time as devided in 0 to 1, so space becomes point for NTF^3 value accurately 0 or NSF^3 value accurately 1, whereas space becomes infinite for NTF^3 value accurately 1 or NSF^3 value accurately 0. For other infinite fractions of Frame Field Factors that comes between 0 & 1, space will always be finite i.e. if $1 > \text{NTF}^3 > 0$ or $0 < \text{NSF}^3 < 1$, space will always be finite.

This is how space feels infinite as there are infinite fractions between 0 & 1 i.e. Space is finite but it is infinitely divisible.

Final Thought:

"The black hole centre is not a singularity at a point — it is a point in its own frame at its surface. Null Point is a Actual Singularity"

We redefined the singularity not as a failure of physics but as a transition in dimensional perception driven by frame field collapse. This provides a geometrically intuitive and causally consistent model of black holes in AMAR model theory.

“A black hole is a 3D object, but due to its extreme nature at its surface, it loses all its dimensions and appears point-like to itself on its surfaces perspective— just as light, traveling at the Universal Speed Limit, experiences itself as everywhere at once. At the centre of black hole, gravity becomes zero due to zero flow of space inward. No Singularity at the black hole’s centre instead completely opposite plane space.”

This comparison between:

Black Hole	Light
Collapses all space and time at surface	Experiences no time and no distance
Feels like a point due to $\text{NTF}^3 \rightarrow 0$	Feels omnipresent due to $\Delta t = 0, \Delta x = 0$
Internal frame has zero extension	Light’s own frame has no passage of time
Appears extended externally (mass, spin, horizon)	Appears as wave-packet externally
Causally Disconnected interior	Causally Disconnected worldline

Gravitational collapse and relativistic motion are two ends of a Frame Field Spectrum:

- At $v = 0$ (absolute rest), experiences full space and full time.
- At $v = c$ (light), space and time collapse into instantaneity.

At gravitational collapse ($\text{NTF}^3 = 0$), the same thing happens — but due to space flow, not motion.

Philosophical & Physical Depth:

This connects with deeper idea in AMAR model theory:

Perception of dimensionality is not absolute. It is dictated by the frame field created by space flow and causality.

It implies that:

- The surface of a black hole as light, is timeless and dimensionless, not due to some mystical singularity, but due to frame-induced perception collapse. As we go towards centre of the Black Hole Frame Field Factor increases and finally becomes 1. No Gravity at the Center of Black hole due to mass surface area reduces to 0.
- No Singularity, only maximum gravity present on the surface of Black Hole.
- The photon is always a wave, not particle. It has nothing to do with the observation and QED supports this.

This is the unification of mass and light, gravity and motion, under a single principle:

- The Frame Field defines the felt reality of space and time.
- In this view, perception itself becomes a function of gravitational and velocity-induced frame distortion.
- **For light like entities, no time exists and space is a 1D point. Everything present at the same place at all instances. This explains Quantum Entanglement, Quantum Tunneling, Hawking Radiation. No action at a distance as there is no any space to travel.**

References:

- Misner, C. W., Thorne, K. S., & Wheeler, J. A. (1973). *Gravitation*. W. H. Freeman and Company.
- Hawking, S. W., & Ellis, G. F. R. (1973). *The Large Scale Structure of Space-Time*. Cambridge University Press.
- Carroll, S. M. (2019). *Spacetime and Geometry: An Introduction to General Relativity*. Cambridge University Press.
- Bekenstein, J. D. (1973). "Black Holes and Entropy." *Physical Review D*, 7(8), 2333–2346.
- Penrose, R. (1965). "Gravitational Collapse and Space-Time Singularities." *Physical Review Letters*, 14(3), 57–59.
- Einstein, A. (1916). "The Foundation of the General Theory of Relativity." *Annalen der Physik*, 354(7), 769–822.
- Thorne, K. S. (1994). *Black Holes and Time Warps: Einstein's Outrageous Legacy*. W. W. Norton & Company.
- Verlinde, E. (2011). "On the Origin of Gravity and the Laws of Newton." *Journal of High Energy Physics*, 2011(4), 29.
- Naik, A. A., & Margaj, G. S. (2025). Novel Reformulation of Gravity as Spatial Flow Under Curvature Constraints reinterpreted by Amar's Modified Agile River Model Theory. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 12(7), JETIR2507045.

