Discovery of dark energy and dark matter: Expansion force

Seojoon Lee
seojoon1118@gmail.com

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Abstract

We present a novel classical field theory in which the gravitational field g is dynamically coupled to an auxiliary expansion field D, forming a unified framework capable of replicating the physical roles of both dark matter and dark energy. This theory is governed by a Maxwell-like system of equations that introduces rotational feedback between the gravitational field and the expansion field. In this formulation, mass flows—especially rotating and accelerating distributions—generate a dynamic response in D, which in turn influences the large-scale and local motion of matter. At galactic scales, the expansion field enhances orbital velocities in the outer regions of galaxies, reproducing flat rotation curves without the need for invisible mass. At cosmological scales, the cumulative growth of D, induced by the time-varying curl of g, drives accelerated expansion without invoking vacuum energy or negative-pressure fluids.

This unified model provides a purely classical, field-theoretic alternative to dark matter and dark energy, offering a coherent explanation of gravitational phenomena across scales using only observable mass and its motion. The framework introduces a new feedback loop within gravity itself, capable of explaining cosmic acceleration and halo dynamics as emergent effects of matter-induced spacetime structure.

Contents

1 Introduction

In classical physics, the formulas for Coulomb's force and gravitational force are similar, and the electric and magnetic fields mutually induce each other. This naturally raises the question: is there a force that interacts with gravity? To answer this question, I will introduce a new force, the expansion force.

2 Gravitational-Dark Field Equations

We know that the following equation holds. Gravitational force:

$$F = m\mathbf{g} \text{ where } \mathbf{g} = \frac{GM}{r^2}$$

Electric force:

$$F = q\mathbf{E} \text{ where } \mathbf{E} = \frac{kQ}{r^2}$$

We know that a moving charge generates a magnetic field, which exerts a magnetic force on other charges.

Magnetic force:

$$F = q\mathbf{v} \times \mathbf{B}$$

Similarly, let's assume that a moving mass generates an expansion field, which exerts an expansion force on other masses. We then agree that the following equation holds.

Expansion force:

$$F = m\mathbf{v} \times \mathbf{D}$$

(D is the first letter of 'dark')

$\mathbf{g}$ and $\mathbf{D}$ are described by the following equations:

$$\nabla \cdot \mathbf{g} = -4\pi G\rho$$

$$\nabla \cdot \mathbf{D} = 0$$

$$\nabla \times \mathbf{g} = -\frac{\partial \mathbf{D}}{\partial t}$$

$$\nabla \times \mathbf{D} = \frac{\kappa G\rho\mathbf{v}}{c^2} + \frac{1}{c^2}\frac{\partial \mathbf{g}}{\partial t}$$

where the mass flow $\rho\mathbf{v}$ is denoted as $\mathbf{L}$. (κ is constant)

This equation takes the same form as the existing gravitational electromagnetic theory (GEM) equations, so the gravitational magnetic field can be redefined as an expansion field. Therefore, if we rewrite the equation to match its consistency with GEM,

$$\nabla \cdot \mathbf{g} = -4\pi G\rho$$

$$\nabla \cdot \mathbf{D} = 0$$

$$\nabla \times \mathbf{g} = -\frac{\partial \mathbf{D}}{\partial t}$$

$$\nabla \times \mathbf{D} = \frac{-16\pi G\rho \mathbf{v}}{c^2} + \frac{1}{c^2}\frac{\partial \mathbf{g}}{\partial t}$$

Here, GEM is a theory derived from the weak field approximation of general relativity, and it is a theory that aligns well with relativity theory.

3 Derivation of Hubble-Lemaître law

$$F = m\mathbf{v} \times \mathbf{D}$$

$$F = m\mathbf{v} \times \mathbf{D} = m\mathbf{a}$$

$$a = vD$$

$$\frac{dv}{dt} = vD$$

$$dv = vD\ dt$$

$$\int dv = \int vD\ dt$$

$$v = \int vD\ dt$$

$$v = \int r'D\ dt$$

$$v = rD - \int rD'\ dt$$

Here, if we substitute $D' = -\nabla \times \mathbf{g}$

$$v = rD + \int r(\nabla \times \mathbf{g})\ dt$$

In this case, we can observe that it resembles Hubble's law, $v = Hr$. Of course, the terms on the right-hand side are different, but this can serve as a tool to explain an accelerating expanding universe.

In the above equation, for galaxies with rotating masses, the cumulative effect of the rotation of the gravitational field is significant. This allows for the explanation of galaxy rotation speeds, which could not be explained by Keplerian rotation, through this equation.

And also, through this, we can compare the predicted rotation velocity curve of the Milky Way based on this law with the actual rotation velocity curve, using data on distance, density distribution, and the rotating mass.

At,

$$\nabla \times \mathbf{g} = -\frac{\partial \mathbf{D}}{\partial t}$$

$$\nabla \times \mathbf{D} = \frac{-16\pi G\rho \mathbf{v}}{c^2} + \frac{1}{c^2}\frac{\partial \mathbf{g}}{\partial t}$$

We can conclude that accelerating mass generates the rotation of the gravitational field. so, Through this, we can understand why the rotation velocity-distance curve of the Milky Way takes its particular shape. To explain further, because the second term of $v = rD + \int r(\nabla \times \mathbf{g})\, dt$ takes negative or positive values when the mass undergoes accelerated motion, it results in a curve where the velocity increases with distance and then becomes constant at very large distances.

4 Wave equations

$$\nabla^2 \mathbf{g} - \frac{1}{c^2}\frac{\partial^2 \mathbf{g}}{\partial t^2} = \nabla(4\pi G\rho) + \frac{16\pi G}{c^2}\frac{\partial(\rho \mathbf{v})}{\partial t} \tag{G-Wave}$$

$$\nabla^2 \mathbf{D} - \frac{1}{c^2}\frac{\partial^2 \mathbf{D}}{\partial t^2} = \frac{16\pi G}{c^2}\nabla \times (\rho \mathbf{v}) \tag{D-Wave}$$

Through this, we can conclude that this wave has a propagation speed of c.

5 Black hole singularity avoidance

Through the theory that the gravitational field and expansion field induce each other, we can conclude that singularities do not form in black holes. Traditionally, the reason black holes form is that the density of the existing mass is so large that the feedback loop of continuous distortion of spacetime due to gravitational warping repeats. However, in this theory, since changes in the gravitational field induce changes in the expansion field, this feedback loop can be halted.

6 Conclusion

We propose that the gravitational–expansion field framework, governed by the following set of equations,

$$\nabla \cdot \mathbf{g} = -4\pi G\rho \tag{1}$$

$$\nabla \times \mathbf{g} = -\frac{\partial \mathbf{D}}{\partial t} \tag{2}$$

$$\nabla \times \mathbf{D} = \frac{-16\pi G}{c^2}\rho \mathbf{v} + \frac{1}{c^2}\frac{\partial \mathbf{g}}{\partial t} \tag{3}$$

$$\nabla \cdot \mathbf{D} = 0 \tag{4}$$

naturally unifies the physical roles of both dark matter and dark energy without introducing any unknown particles or exotic forms of energy.

Galactic-Scale Dynamics (Dark Matter Analogy)

At galactic scales, this theory explains the flat rotation curves of spiral galaxies not by invoking dark matter halos, but by introducing a dynamic expansion field $\mathbf{D}$ that emerges from rotating mass flows. The effective orbital velocity of stars becomes:

$$v = rD + \int r(\nabla \times \mathbf{g})\, dt$$

This implies that the rotational motion of mass induces a persistent expansion field $\mathbf{D}$, leading to additional tangential acceleration that compensates for the lack of visible mass—mirroring the effects attributed to dark matter.

Cosmological Dynamics (Dark Energy Analogy)

On cosmological scales, the feedback mechanism between gravitational field rotation and expansion field growth leads to an accelerating universe. The time evolution of $\mathbf{D}$ is governed by:

$$\frac{\partial \mathbf{D}}{\partial t} = -\nabla \times \mathbf{g}$$

Thus, as large-scale mass flows evolve, they generate cumulative expansion effects that mimic the repulsive acceleration typically ascribed to dark energy.

Interpretation

In this framework, the expansion field $\mathbf{D}$ functions as a *dynamical mediator* that:

- enhances rotational velocities in galaxies (dark matter behavior), and
- drives large-scale accelerated expansion (dark energy behavior),

all emerging solely from classical mass distributions and their motions.

So, in conclusion The expansion field theory provides a unified and purely classical explanation for the phenomena currently attributed to dark matter and dark energy. It does so by incorporating rotational gravitational feedback and dynamically generated repulsive fields, eliminating the need for non-baryonic matter or vacuum energy assumptions.