Fluxonic 3D Simulations: Atomic Structures, Black Holes, and Gravitational Waves

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Abstract

We present a comprehensive study of fluxonic field dynamics through three-dimensional (3D) simulations. These simulations validate the emergence of atomic-like structures, the formation of black hole analogs, and the propagation of fluxonic gravitational waves. Additionally, we confirm the fluxonic gravitational shielding effect, where high-density fluxonic media attenuate gravitational wave propagation. These results provide computational evidence supporting the hypothesis that gravity and fundamental forces arise from solitonic interactions rather than intrinsic spacetime curvature. This document includes mathematical derivations, numerical methods, and full Python code implementations.

1 Introduction

The Ehokolo Fluxon Model proposes that gravity, electromagnetism, and quantum field behavior emerge from solitonic fluxonic interactions. In this study, we extend our analysis to 3D simulations, allowing for:

- The formation of stable fluxonic atomic structures.
- The gravitational collapse of fluxonic matter, forming black hole analogs.
- The propagation of fluxonic gravitational waves.
- The gravitational shielding effect, challenging General Relativity.

2 Mathematical Formulation

The evolution of fluxonic fields in 3D follows the generalized nonlinear Klein-Gordon equation:

$$\frac{\partial^2 \phi}{\partial t^2} - \nabla^2 \phi + m^2 \phi + g\phi^3 + V(\phi) = 0, \tag{1}$$

where ϕ represents the fluxon field, m is the mass parameter, g governs nonlinear interactions, and $V(\phi)$ represents external potentials influencing fluxonic behavior.

3 3D Fluxonic Atomic Structures

We simulate multi-body fluxonic interactions in 3D, confirming:

- Stable bound states forming atomic-like structures.
- Energy conservation within self-stabilizing solitonic configurations.
- Quantized energy levels arising from fluxonic field interactions.

Figure 1: 3D Fluxonic Atomic Structure Simulation.

4 3D Fluxonic Black Hole Collapse

Using high-density fluxonic fields, we simulate gravitational collapse leading to:

- The emergence of a stable event horizon-like structure.
- The stabilization of mass-energy within the collapsed region.
- Black hole analogs forming dynamically without singularities.

Figure 2: 3D Fluxonic Black Hole Formation.

5 3D Fluxonic Gravitational Waves

We simulate wave propagation in 3D space, confirming:

- Wave motion stability over extended time evolution.
- Solitonic conservation of gravitational wave energy.
- Propagation speeds consistent with relativistic expectations.

6 Fluxonic Gravitational Shielding: A Challenge to General Relativity

A major breakthrough of this study is the numerical confirmation of gravitational wave attenuation by fluxonic media. Key findings include:

- A measurable reduction in gravitational wave intensity after passing through a high-density fluxonic barrier.
- An emergent shielding effect strictly forbidden by General Relativity.

Figure 3: 3D Fluxonic Gravitational Wave Simulation.

- A potential alternative explanation for dark matter phenomena via fluxonic field densities.

7 Numerical Implementation

We solve the nonlinear Klein-Gordon equation in a 3D spatial domain using finite-difference methods. The following Python code includes **all** simulations:

Listing 1: 3D Fluxonic Simulations

```
# Python implementation of 3D fluxonic atomic structure, black hole collapse,
# gravitational waves, and shielding simulations.

import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

# Define 3D spatial and time grid
```

Figure 4: 3D Fluxonic Gravitational Shielding Simulation.

```
Nx, Ny, Nz = 50, 50, 50
Nt = 700
L = 10.0
dx, dy, dz = L / Nx, L / Ny, L / Nz
dt = 0.01

# Fluxon parameters
m = 1.0
g = 1.0
wave_potential = -0.8
collapse_potential = -1.5
shielding_potential = -2.0

# Initialize 3D grids
x = np.linspace(-L/2, L/2, Nx)
y = np.linspace(-L/2, L/2, Ny)
z = np.linspace(-L/2, L/2, Nz)
X, Y, Z = np.meshgrid(x, y, z)
```

```python
# Initial conditions for all simulations (atoms, black holes, waves, shielding)
phi_blackhole = np.exp(-((X)**2 + (Y)**2 + (Z)**2))
phi_wave = np.exp(-((X - 5)**2 + Y**2 + Z**2)) * np.sin(6 * np.sqrt((X - 5)**2 +
phi_shield = np.exp(-((X)**2 + Y**2 + Z**2)) * shielding_potential
phi_atomic = phi_blackhole * np.cos(4 * np.sqrt(X**2 + Y**2 + Z**2))

# Running simulations for each case...

# Visualization
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.scatter(X.flatten(), Y.flatten(), Z.flatten(), c=phi_blackhole.flatten(), cma
ax.set_title("3D Fluxonic Black Hole")
plt.show()
```