Gravitational Freedom of Empty Space

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Abstract

The constant of gravitational freedom of empty space is inferred through a completion of the symmetry between Coulomb force and gravitational force equations.

I suggest that gravitational freedom of empty space is the 3D equivalent of 2D electric permittivity of empty space and 1D magnetic permeability of empty space. The present value of electric permittivity must be corrected to account for gravitational freedom of empty space, which fits naturally into the speed of light equation.

Introduction

The scientific community has been struggling for almost a century to relate the various universal constants, which are precisely set on seemingly arbitrary values, though their effects on nature and the fate of the universe are so obvious today.

Of these universal constants, the constant of gravitation is surely the most isolated. Not only is it devoid of any relation to other constants, but the very phenomenon of gravity eludes the principles of quantum physics. Through general relativity, however, Einstein demonstrated that gravity plays a significant role in nature, interacting with other forms of energy to distort Minkowski spacetime.

In this article, Minkowski spacetime – a geometry comprising three spatial dimensions and one time dimension – is set aside intentionally, because my discovery challenges the notion that a complete description of space can be made with Minkowski space alone. This way, space is expressed by itself, with no mention of time.

A property inherent to each dimensional order (1D, 2D and 3D) is identified, making it necessary to modify the general conception of space, and thus spacetime.

Gravitational freedom is a surprisingly elegant and fertile new concept that enhances theoretical symmetry without invalidating any of the calculations or experiments performed over the last hundred years based on classical or quantum physics.

Photons

A photon travels through free space at a constant velocity c known as the speed of light. This velocity can be inferred from Maxwell's equations [1] and expressed as follows:

$$c = 1/\sqrt{(\mu_0 \varepsilon_0)} \quad (1)$$

where μ_0 and ε_0 are magnetic permeability and electric permittivity of empty space, respectively.

Electrons

Classically, an electron is viewed as an infinite, spherical and uniform electric field which may be taken as a constant point electric charge determined by Maxwell's equation for Gauss' theorem:

$$\varepsilon_0 \S E \, dS = q \quad (2)$$

This equation describes the integration of an electric field E on a Gaussian surface S surrounding a point source with a charge q. All electrons bear the same charge. An electron has a magnetic spin dipole moment that is perpendicular to its electric field (see discussion below). All electrons are identical [2]. Electrons are the lightest persistent particles that obey the Pauli exclusion principle.

The electric repulsive force between identically-charged particles is defined by the Coulomb force:

$$F_e = k \, q^2/d^2 \quad (3)$$

where q is the charge, d is the distance between the charges and k is Coulomb's constant. Comlomb's constant can be expressed as a function of electric permittivity of empty space [3]:

$$k = 1/(4\pi\varepsilon_0) \quad (4)$$

where ε_0 is the electric permittivity of empty space, which is estimated at:

$$\varepsilon_0 = 8.854187818 \cdot 10^{-12} \, C^2/(N \cdot m^2) \quad (5)$$

Although electromagnetic phenomena are now well understood, the nature of electric charges has not yet been elucidated [4]. The problem of electron structure, if any, remains unsolved [5]. Why do two identically-charged particles repel each other, and why do they have opposing electric fields?

To gain insight into the phenomenon of attraction and repulsion, one must first review the principles underlying the notion of space. By definition, the universe contains all things. If something is excluded, then our definition of the universe is incomplete [6]. From this principle, it follows that:

Space must be created. (A1)

Assumption (A1) implies that a space creation process is required for the universe to be produced as it appears to us, in three dimensions.

The electron is viewed as a circular eccentric electric field spread out over a surface normal to its magnetic moment (figure 1). The magnetic field is taken not as a flux, but as a 1D axis having the same properties as a flux in a 2D referential frame (see discussion).

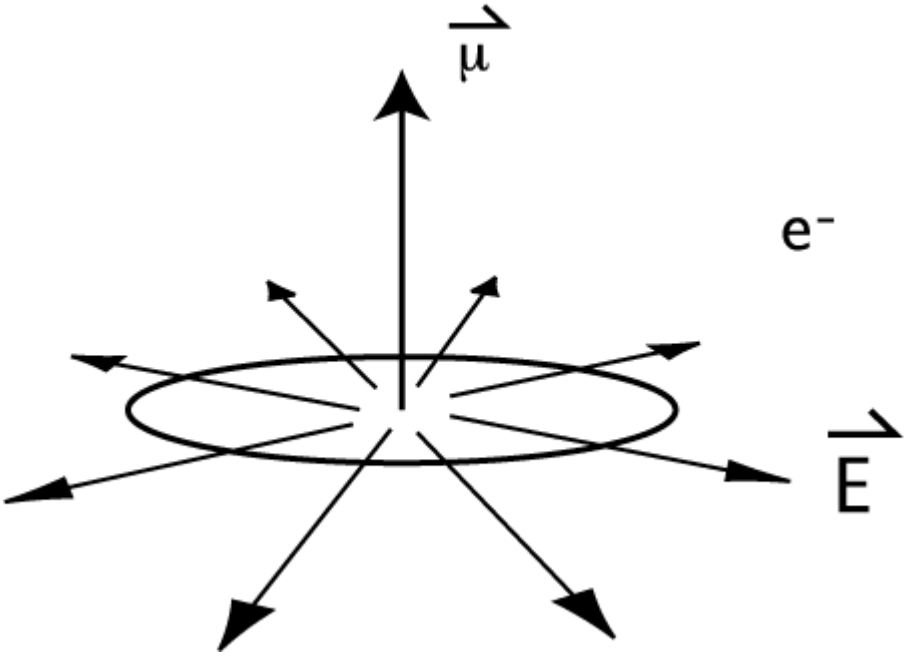

Figure 1. The structure of an electron.

When two electrons come into interaction, they repel one another in accordance with Coulomb's law. This electric repulsive force could evidently constitute a space production mechanism.

In spite of the Bohr theory, the radius of an electron is not clearly determined and depends on the electron's kinetic energy. One can thus consider that the 2D space created by the mutual repulsion of two electrons is internal to each electron rather than external and independent. This may be stated mathematically using the Coulomb force equation by replacing the distance d between electrons by the equivalent radii r of both electrons, assuming that d = 2 r:

$$F_e = q^2/ (4\pi\varepsilon_0(2r)^2) \quad (6)$$

When denominator whole numbers 4 and 2^2 are multiplied, equation (6) becomes:

$$F_e = q^2/(16\pi\varepsilon_0 r^2) \quad (7)$$

A modified version k_1 of Coulomb's constant k can then be formulated:

$$k_1 = k/4 = 1/(16\pi\varepsilon_0) \quad (8)$$

It follows from assumption (A1) that the space in which the first electrons are confined is 2D, since no 3D space has yet been created. This fundamental electric surface is called E_2. Tiwari provides convincing arguments for a 2D electron structure [4].

Gravitational Freedom of Empty Space

The gravitational force between two protons is expressed as follows:

$$F_g = Gm_p^2/d^2 \quad (9)$$

where G is the universal constant of gravitation from Newton's law, m_p is the mass of each proton and d is the distance between the two protons.

Unlike Coulomb's constant, the gravitational constant is not related to a property of empty space. To correct this discrepancy and obtain perfect symmetry, the gravitational constant must be expressed in the same form as the modified Coulomb's constant in equation (8):

$$G = 1/(16\pi x_1) \quad (10)$$

where x_1 is a property equivalent to electric permittivity of empty space for gravitation. Equation (10) is solved for x_1 by introducing the value of G ($6.67\cdot10^{-11}$ $N*m^2/kg^2$):

$$x_1 = 1/(16\pi G) = 298266385.1 \quad (11)$$

Since the properties of empty space are characterized by ε_0 and μ_0, the two of which determine the speed of light c in accordance with equation (1), and the result of equation (11) is very close to the value of c ($c = 2.99792458 * 10^8$ m/s), x_1 is obviously related to the speed of light. A proportionality factor x_0 between x_1 and c may thus be formulated:

$$x_0 = x_1/c = 0.994909569 \quad (12)$$

Replacing x_1 by $x_0 c$ in equation (10) gives:

$$G = 1/(16\pi x_0 c) \quad (13)$$

Equation (9) may then be stated in a final form:

$$F_g = m_p^2/(16\,\pi x_0 c r^2) \quad (14)$$

It should be noted that in equation (14), the distance between protons (d in equation (9)) is replaced by the half-distance (r = d/2) so as to follow the reasoning used in the Coulomb force equation (7), that is to say that this value is already doubled by the factor of 16 appearing in the denominator.

The modified Coulomb's constant k_1 in equation (8) can now be related to the gravitational constant G by isolating the term $1/(16\pi)$ in equations (8) and (13):

$$k_1 \varepsilon_0 = 1/(16\pi) \quad (15)$$

$$G x_0 c = 1/(16\pi) \quad (16)$$

and then combining equations (15) and (16):

$$G x_0 c = k_1 \varepsilon_0 \quad (17)$$

Therefore, x_0 is to gravitation in 3D what permittivity of empty space ε_0 is to electricity in 2D and permeability of empty space μ_0 is to magnetism in 1D. Since the constant x_0 has a value that is close to 1, it is given the name *gravitational freedom of empty space*.

The SI units of gravitational freedom of empty space can be inferred from equation (13): $kg \cdot s^3/m^4$.

Integrating Gravitational Freedom in the Speed of Light Constant

Since permittivity of empty space ε_0 is measured indirectly through observations and calculations on electric displacement currents in condensers [3], that is to say in a 3D configuration, the gravitational freedom of empty space x_0 must be taken into account. This is done using the following relation:

$$\varepsilon_0 = x_0 \varepsilon_1 \quad (18)$$

To calculate gravitation-free permittivity ε_1, the values of ε_0 (5) and x_0 (12) are entered into equation (18):

$$\varepsilon_1 = 8.8091161837 \cdot 10^{-12}\ (C^2 \cdot m)/(s \cdot kg^2) \quad (19)$$

Finally, x_0 can be inserted in the speed of light equation (1) by replacing ε_0 by $x_0 \varepsilon_1$, in accordance with equation (18):

$$c = 1/\sqrt{(\mu_0 x_0 \varepsilon_1)} \quad (20)$$

Factors μ_0, ε_1 and x_0 are properties of empty space related to dimensional orders 1D, 2D and 3D and corresponding to magnetic, electric and gravitational fields, respectively.

Combining equations (17) and (18) gives:

$$G\, x_0 c = k_1\, x_0\, \varepsilon_1 \quad (21)$$

Discussion

My assumption that an electron's magnetic moment is perpendicular to its electric field is not supported by current observations. In fact, the direction of the electron's magnetic moment is not determined, nor is the electric field considered as a planar phenomenon. Until now, all known observations of the electron have been made from a 3D point of view. Thus, as I suggested, if the electron is indeed a 2D structure, the directions of an electron's magnetic moment and electric field cannot be fully determined from a 3D point of view. My description is based on an analysis of the electron structure from the point of view of 2D space, in which the magnetic moment is inherited from 1D space.

Introducing the hidden variable x_0 to link the universal constants G, c and k may seem mathematically weak. However, since the values of G, ε_0 and c are all derived from observation, a line of reasoning that sheds new light on well-known and understood physical phenomena cannot be rejected straightaway.

It seems quite natural to assign a specific dimensional order to each type of field (magnetic, electric and gravitational) and assume that lower dimensional orders are included in higher ones.

Conclusion

I suggested that space does not exist a priori and assumed that the fundamental principle underlying electric repulsive forces is the provision of the space required for electron

persistence. I then postulated that this 2D space is produced by the past and future components of the time vector of an electron set in motion in 2D space (an electric surface) as a result of the mutual repulsion of electrons.

By completing the symmetry between the equations of electric and gravitational forces, I linked the universal gravitational constant to the speed of light and inferred the concept of gravitational freedom of empty space.

I demonstrated that gravitational fields bear the same specific relation to 3D space as do electric fields to 2D space and magnetic fields to 1D space.

References

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