

An Explanation of Gravitation without Recourse to Relativity

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Abstract

A neutral body is considered as composed of an equal number of positive and negative electric charges, whose fields exist in space but cancel out at every point except on the location of other charges. Mass and Newton's universal law of gravitation are expressed in terms of the numbers of electric charges constituting two separate bodies in space. An electric field, emanating from one charge in a body, is supposed to cause a small deformation on a charge encountered in another body, giving rise to an "electro-gravity" field, such that force of repulsion is slightly reduced and force of attraction similarly increased.

Keywords: Electric charge, field, Coulomb's law, gravitation, relativity,

1 Introduction

Since Sir Isaac Newton enunciated the universal law of gravity around 1687 [1], the cause of gravitation had defied explanation until Professor Albert Einstein came up with the theory of general relativity in 1915 [2]. General relativity, it was believed, explained gravitation in the context of curvature or warping of four-dimensional space-time continuum. Curved space pushes (accelerates) objects, like the Earth, to follow a particular path in the universe. This was a brilliant and revolutionary theory but devoid of any electrical implications.

In this paper it is shown that gravitation is electrical in nature. The mass of a body is expressed in terms of the electrical charges composing the body [3]. The expression for mass is used to give Newton's universal law of gravity. Gravitation is explained as the result of a small deformation of an electric charge, caused by the impact of an electric field on the charge. The encounter creates a small electric field, an "electro-gravity" field such that force of repulsion is slightly decreased and force of attraction similarly increased.

2 Electrostatic and Gravitational Forces between Electric Charges

Figure 1 below shows two isolated electric charges of magnitudes Q and K respectively in the form of spherical shells of radii a and b and masses m_1 and m_2 . The charges are separated by a distance Z in space. The separation Z is very much larger than the radius a or b . The force f between the stationary charges, a combination of electrostatic and gravitational forces, is:

$$\mathbf{f} = \pm \frac{QK}{4\pi\epsilon_0 Z^2} \hat{\mathbf{u}} - G \frac{m_1 m_2}{Z^2} \hat{\mathbf{u}} \quad (1)$$

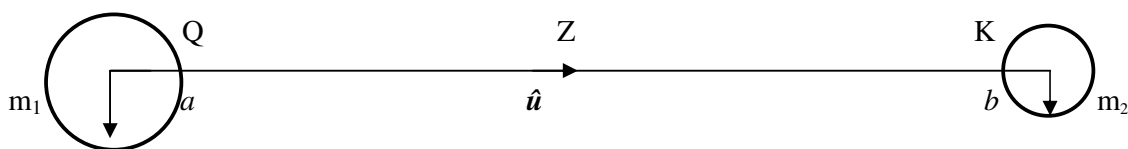


Figure 1. Electrostatic and gravitational forces between two charges Q and K separated by distance Z .

where $\hat{\mathbf{u}}$ is a unit vector in the direction of force of repulsion and G is the gravitational constant. The first term on the right-hand side of equation (1) is the electrostatic force of repulsion or attraction between isolated electric charges of magnitudes Q and K , in accordance with Coulomb's law of electrostatics. The second term of the equation is the gravitational force of attraction f_G , between masses m_1 and m_2 , as given by Newton's universal law of gravity. Equation (1) gives the gravitational force f_G as:

$$\mathbf{f}_G = -\frac{G}{Z^2} m_1 m_2 \hat{\mathbf{u}} \quad (2)$$

3 Gravitational Force of Attraction between Electric Charges

The author [3] showed that the mass m of an isolated electric charge (positive or negative) of magnitude Q , in the form of a spherical shell of radius a in free space of permeability μ_o , is given by the equation:

$$m = \frac{\mu_o Q^2}{4\pi a} \quad (3)$$

Substituting for the mass m_1 (of electric charge Q) and mass m_2 (of another electric charge K) from equation (3) into (2), gives the gravitational force of attraction. The gravitational force of attraction between two isolated electric charges, where the separation Z is much larger than the radius a or b , is given by the equation:

$$\mathbf{f}_G = -\frac{G}{Z^2} m_1 m_2 \hat{\mathbf{u}} = -\frac{G}{Z^2} \left(\frac{\mu_o Q^2}{4\pi a} \right) \left(\frac{\mu_o K^2}{4\pi b} \right) \hat{\mathbf{u}} \quad (4)$$

$$\mathbf{f}_G = -\frac{G}{abZ^2} \left(\frac{\mu_o}{4\pi} \right)^2 Q^2 K^2 \hat{\mathbf{u}} = -\frac{\zeta}{Z^2} Q^2 K^2 \hat{\mathbf{u}} \quad (5)$$

$$\zeta = \frac{G}{ab} \left(\frac{\mu_o}{4\pi} \right)^2 \quad (6)$$

where ζ (zeta) is the "electro-gravity" constant. Thus f_G , the force of attraction due to gravity, being electrical in nature, is proportional to the product of square of the electric charges. This force is always negative (attractive) because the square of an electric charge (positive or negative) is always positive.

4 Gravitational Force of Attraction between Neutral Bodies

For a neutral body containing equal numbers or equal amounts of positive and negative electric charges the electrostatic forces of repulsion and attraction cancel out exactly at any point in space, but the gravitational forces of attraction add up. From equation (5), the gravitational force of attraction $\mathbf{F}_G$ between two bodies of masses M_1 and M_2 one containing N_1 identical charges each of magnitude Q and the other containing N_2 charges each of magnitude K , is obtained as:

$$\mathbf{F}_G = -G \frac{M_1 M_2}{Z} \hat{\mathbf{u}} = -\zeta \frac{N_1 N_2 Q^2 K^2}{Z^2} \hat{\mathbf{u}} \quad (7)$$

The numbers N_1 and N_2 may, of course, be infinitely large.

5 Deformation of an Electric Charge by an Electric Field.

Gravitational force of attraction between two electric charges is attributed to reflection, deflection or bending of an electric field whenever it encounters an electric charge at a point in space. The deflection is such that the deflecting electric charge is somewhat deformed and its electric field somehow affected. The result is that force of repulsion is slightly decreased and, force of attraction similarly increased. The effect of gives rise to equations (5) and (7).

Equation (5) can be derived by assuming that an electric field from charge Q , being deflected by charge K , causes an electric field $\mathbf{g}_k$ at the location of charge K , such that:

$$\mathbf{f}_G = -\frac{\zeta}{Z^2} Q^2 K^2 \hat{\mathbf{u}} = \mathbf{g}_k K \quad (8)$$

$$\mathbf{g}_k = -\frac{\zeta Q^2 K}{Z^2} \hat{\mathbf{u}} \quad (9)$$

The “electro-gravity” field $\mathbf{g}_k$ acts at the location of charge K . This field is supposed to be the result of reflection, deflection or bending of the electric field $\mathbf{E}_q$ from the charge Q on encountering the charge K (Figure 1) and may also be the consequence of deformation of the charge K . The corresponding “electro-gravity” field $\mathbf{g}_q$ due to the electric field from charge K encountering charge Q , is:

$$\mathbf{g}_q = \frac{\zeta K^2 Q}{Z^2} \hat{\mathbf{u}} \quad (10)$$

The gravitational force of attraction on charge Q is:

$$-\mathbf{f}_G = \mathbf{g}_q K = \frac{\zeta}{Z^2} Q^2 K^2 \hat{\mathbf{u}} \quad (11)$$

For two neutral bodies of masses M_1 and M_2 , containing N_1 and N_2 positive and negative electrical charges each of magnitude Q and K respectively, separated by a distance Z in space, the force of attraction is given by equation (7). In this case the positive and negative “electro-gravity” fields act on the respective individual charges composing the body, with the fields cancelling out exactly at other points. In other words, each “electro-gravity” field acts at the location of the same charge producing it, but the fields together cancel out at other locations. Thus, gravitation (like inertia) is an internal electrical effect on the individual electric charges constituting a body.

The “electro-gravity” fields $\mathbf{g}_k$ and $\mathbf{g}_q$ in equation (9) and (10), depend only on the positions of the charges K and Q . The gravitational force of attraction between two bodies (like inertial force due to acceleration), acting on the respective individual charges inside the body, is independent of relative velocity between the bodies but the effect should be transmitted with the speed of light. The “electro-gravity” fields $\mathbf{g}_k$ and $\mathbf{g}_q$ being the outcome of a small deformations of the charges, move with the respective charges K and Q and, as such, motion due to a gravitational field should be without radiation.

6. Conclusion.

Mass is quantity which can be expressed in terms of the number and quantities of electric charges constituting a body. As such, Newton’s universal law of gravitation can be expressed in terms of electrical quantities. Gravitational force of attraction is attributed to reflection, deflection or bending of an electric field from one electric charge on encountering another charge. The deflection is supposed to cause a small deformation of the charge thereby

creating an “electro-gravity” field such that force of repulsion is slightly decreased and force of attraction similarly increased. This notion affords a means of unification between electrostatic and gravitational forces, in contradistinction to general relativity.

7. References

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