Inertia as a Net Magnetic Effect and Gravity as a Net Electrostatic Force

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Abstract

This paper reveals the long standing mysteries of inertia and gravity, based on Weber's electrodynamics formula. Conventionally it is presumed that the electrical and magnetic force of interaction between opposite charges is equal in magnitude to the force of interaction between similar charges. Changing this view leads to a very compelling theory of inertia and gravity.

Introduction

Two of the physical mysteries of the universe that have not been revealed to date are inertia and gravity. Why do objects have inertia ? What *is* gravity ? Newton gave only a description of gravity and did not explain what gravity *is*. Albert Einstein made an attempt to explain gravity as a warping of space-time in his general theory of relativity. It is increasingly being realized that Einstein's theories of relativity are wrong.

Inertia is even more mysterious. Only Ernest Mach made some progress to understand inertia. He suggested that inertia of a body arises from interaction of that body with all matter in the universe. However, he could not reveal the nature of that interaction.

In this paper we propose a new hypothesis regarding the origins of gravity and inertia.

Gravity as a net electrostatic force

Gravity has been considered to be a force fundamentally different from the electromagnetic and nuclear forces. In this paper, we propose a simple, compelling theory of gravity as follows.

Gravitational force is a difference between attractive electrostatic force and repulsive electrostatic force. The attractive electrostatic force between opposite charges of two bodies is slightly greater than the repulsive electrostatic force between similar charges of the bodies.

This hypothesis contrasts the conventional belief (presumption) that the attractive forces are equal to the repulsive forces. Consider two electrically neutral bodies A and B. Each of the bodies is made up of negatively charged electrons, positively charged protons and neutral neutrons.

The new theory is formulated as follows:

Gravity = (attractive force between electrons in A and protons in B + attractive force between

protons in A and electrons in B)

MINUS

(repulsive force between electrons in A and electrons in B + repulsive force

between protons in A and protons in B)

In the above formulation, we haven't mentioned neutrons because a neutron is made of a proton and an electron. Therefore, neutrons have been accounted for in the above formula.

Inertia as a net 'magnetic' effect

To explain inertia, we start from Weber's electrodynamics formula. The Weber's formula for electrical attraction between two moving point charges is given by [2] :

$$F = \frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2} \left[1 + \frac{u^2}{c^2} - \frac{3}{2}\frac{\dot{r}^2}{c^2} + \frac{\vec{r}.\vec{a}}{c^2} \right]$$

where r is the distance between the charges, u is the relative velocity of the charges.

$$\dot{r} = \frac{dr}{dt}$$

is the rate of change of distance between the charges, a is the relative acceleration of the charges.

$$u = \frac{\overrightarrow{dr}}{dt} \quad and \quad a = \frac{\overrightarrow{du}}{dt}$$

We propose here that inertia of a body arises from the fourth term of Weber's electrodynamics formula, which is written in **bold** as shown below.

$$F = \frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2} \left[1 + \frac{u^2}{c^2} - \frac{3}{2}\frac{\dot{r}^2}{c^2} + \boldsymbol{\frac{\vec{r}.\vec{a}}{c^2}} \right]$$

The fourth term,

$$\frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2} \left[\boldsymbol{\frac{\vec{r}.\vec{a}}{c^2}} \right]$$

is responsible for the inertia of physical bodies. According to this term, the acceleration a is positive for a charge accelerating away from another charge. In this case an attractive force

arises. If charge Q_2 accelerates away from charge Q_1 , an attractive reactive force will arise due to the fourth component of Weber's formula. This is the fundamental explanation of inertia.

Note that here we have assumed Q_1 and Q_2 to of opposite sign. Weber's formula suggests that for opposite charges the reactive force is attractive, whereas for similar charges the reactive force is repulsive.

The fourth term of Weber's formula can be rewritten as

$$\frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2}\left[\frac{\vec{r}.\vec{a}}{c^2}\right] = \frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2}\, \frac{r\, a\, \cos\theta}{c^2} = \left(\frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2}\, \frac{r\, \cos\theta}{c^2}\right) a \; = m\, a$$

where

$$m = inertial\ mass = \left(\frac{Q_1 Q_2}{4\pi\varepsilon_0\, r^2}\, \frac{r\, \cos\theta}{c^2}\right) = \left(\frac{Q_1 Q_2}{4\pi\varepsilon_0 r}\, \frac{\cos\theta}{c^2}\right)$$

We see that inertia of Q_2 decreases inversely with distance r from Q_1.

This is in fact the origin of electrical self inductance of a current carrying coil. Therefore, inertia and electrical self inductance are fundamentally the same phenomenon. Self inductance in electric circuit theory arises from interaction of the electrons with all matter in the universe. The reason why current in an electrical circuit cannot change instantaneously is the same reason why velocity of a physical cannot change instantaneously. A reactive force arises from the fourth component of Weber's electrodynamics formula.

The question arises: if inertia arises when a charged particle accelerates relative to another charged particle, then how can this explain the inertia of a neutral body ?

Consider two neutral physical bodies A and B .

Assume that force is applied to physical object B to accelerate it away from body A. If we make the conventional assumption that the interaction between opposite charges is equal in magnitude to the interaction between similar charges, the fourth component of Weber's formula would not predict inertia for neutral bodies.

Thus, just as for gravitational force, we make the hypothesis that the reactive force arising from interaction of opposite charges is slightly greater in magnitude than the reactive force arising from interaction of similar charges. Here we are talking about the fourth component of Weber's formula. This will give rise to inertia of a neutral body.

Thus the inertia of a physical object is such interactions of the object with all matter in the universe.
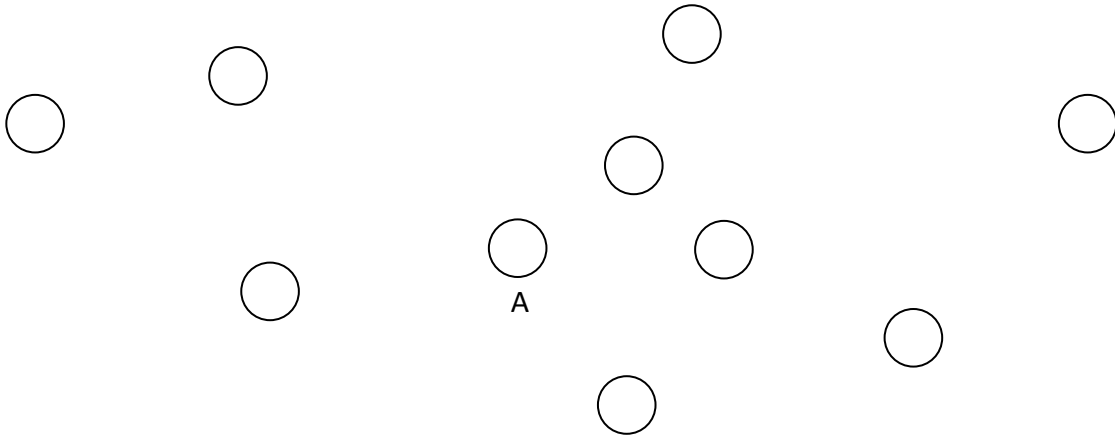
Note that the title of this paper ' inertia as a magnetic effect ' is not strictly accurate because there is no such thing as magnetic field in Weber's electrodynamics.

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Discussion

The new theory of inertia may solve the long standing mysteries of Pioneer anomaly and cosmological acceleration. The small anomalous deceleration of Pioneer spacecraft towards the Sun may be due to a continuous decrease of inertial mass of the spacecraft with distance from the Sun. The Earth flyby anomaly may also be explained based on the new theory introduced in this paper which consists of two key concepts. That is, adoption of Weber's electrodynamics formula (hence rejecting Maxwell's magnetic field concept) and a new hypothesis that the force of interaction between opposite charges is slightly greater than the force of interaction between similar charges.

Conclusion

Conventionally it is assumed that the magnitude of the interaction force between opposite charges is equal to the magnitude of interaction between similar charges. By changing this view, we have presented very compelling explanations of inertia and gravity based on Weber's electrodynamics formula. For all the four components of Weber's electrodynamics formula, the force of interaction between opposite charges is slightly greater than the force of interaction between similar charges.

Thanks to God and His Mother Our Lady Saint Virgin Mary

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