Analogy of Weber's Electrodynamics Formula for Gravitation may Explain Dark Matter, Dark Energy, Hubble's Law and Pioneer Anomaly

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Abstract

Weber's electrodynamics formula for the force of interaction between moving charged particles, which is a modification of Coulomb's law, may solve many of the paradoxes and puzzles in classical and relativistic electromagnetism. In this paper we propose modification of Newton's law of gravitation according to Weber's formula. This may solve many of the outstanding problems in cosmology such as dark matter, dark energy and the Pioneer anomaly.

Introduction

In my paper [1], I have proposed a new theory known as Apparent Source Theory that can explain many of the light speed experiments, such as the Michelson-Morley experiment, Sagnac effect, moving source, moving observer and moving mirror experiments and the Silvertooth experiment. However, I was unable to solve the paradoxes in classical magnetism theory in terms of Apparent Source Theory.

This led me to adopt Weber's formula [2] , which is a modification of Coulomb's law. I have found Weber's formula promising, not only in view of the failure of classical and relativistic electromagnetism to resolve the puzzles of magnetism, but also because of its own successes [2]. Weber's formula gets rid of magnetic force as a separate phenomenon and explains it as a form of electrical force. However, Weber's formula cannot explain some exotic phenomenon such as the Biefeld-Brown effect, which is one of the profound predictions of Apparent Source Theory. Therefore, I have combined Weber's formula with Apparent Source Theory in my paper [1].

I have proposed that gravity is an electrostatic phenomenon [1], based on interpretation of astronomical experiments, according to Apparent Source Theory. This assertion is also supported by the fact that gravitational and electrostatic forces have some common characteristics such as inverse square distance law and instantaneous action at a distance. Therefore, if gravity is an electrostatic phenomenon, then it is possible to formulate analogous Weber's formula for gravitation that may explain many of the problems in gravitation such as 'dark matter', Hubble's law, 'dark energy' (or cosmological acceleration) and Pioneer anomaly.

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.

$$\boldsymbol{u} = \frac{\overrightarrow{d\boldsymbol{r}}}{dt} \qquad and \quad \boldsymbol{a} = \frac{\overrightarrow{d\boldsymbol{u}}}{dt}$$

We may formulate analogous formula for gravitation as follow.

$$F = G\frac{Mm}{r^2}\left[1\ +\ \frac{u^2}{c^2} - \frac{3}{2}\frac{\dot{r}^2}{c^2} + \frac{\vec{r}\,.\,\vec{a}}{c^2}\right]$$

The first term is the usual Newton's law of gravitation. The second, third and fourth terms may be related to the cosmological phenomena of 'dark matter', Hubble’s law , 'dark energy' and Pioneer anomaly.

The first two components are attractive gravity. The third component is repulsive gravity. The fourth component is attractive gravity when the two bodies have receding relative acceleration and repulsive for approaching relative acceleration.

The first component of the force, which is Newton's law of gravitation, varies inversely with the square of the distance *r*.

From Hubble's law we know that:

$$\dot{r} = Hr$$

where *H* is Hubble's constant.

Therefore, the third component of the force *F* will be:

$$G\frac{Mm}{r^2} * \left(-\ \frac{3}{2}\frac{\dot{r}^2}{c^2}\right) = G\frac{Mm}{r^2} * \left(-\ \frac{3}{2}\frac{H^2 r^2}{c^2}\right) = -\ \frac{3}{2} G\ Mm\ (\frac{H^2}{c^2})$$

This component is independent of distance *r* !

The second component must also be constant independent of distance r . This is because the velocities u and $\dot{r}$ in the second and third components, respectively, must have the same relationship with distance r, otherwise a contradiction will arise. Therefore,

$$u = Hr$$

where H is Hubble's constant.

If u is radial, then $u = \dot{r}$, the second and third components together form a repulsive gravity:

$$G\frac{Mm}{r^2}\left[\frac{u^2}{c^2} - \frac{3}{2}\frac{\dot{r}^2}{c^2}\right] = -\frac{1}{2}\frac{\dot{r}^2}{c^2}G\frac{Mm}{r^2} = -\frac{1}{2}\frac{(Hr)^2}{c^2}G\frac{Mm}{r^2} = -\frac{1}{2}\frac{H^2}{c^2}GMm$$

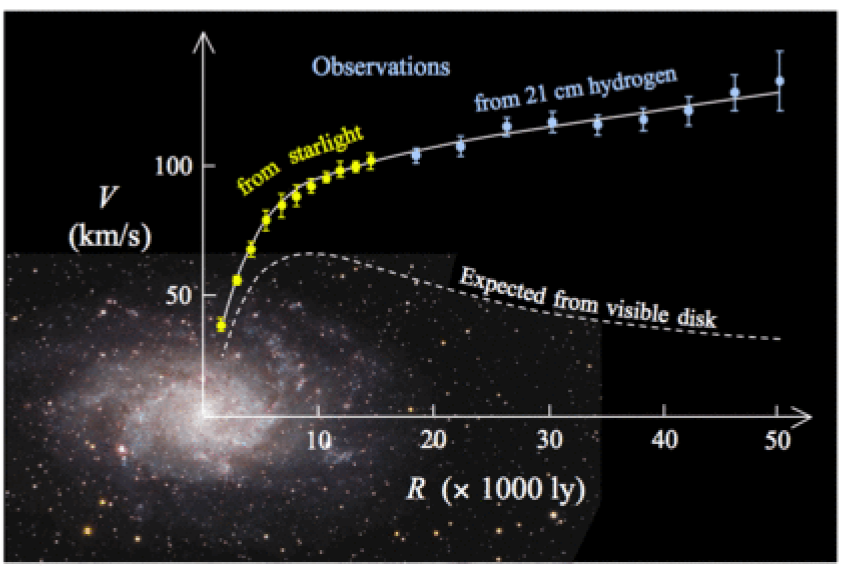
The repulsive gravitational force is constant independent of distance r for a given mass m.

Therefore, the second and third components can explain Hubble's law.

The second component may also be related to the phenomenon of dark matter. Since the third and fourth components depend only on radial motion, they are zero for purely transverse motion, so they are less related to dark matter, assuming that the velocity u in spiral galaxies is mainly transverse.

$$u = Hr$$

The constant H may be the slope of galaxy rotation curve, as shown below.



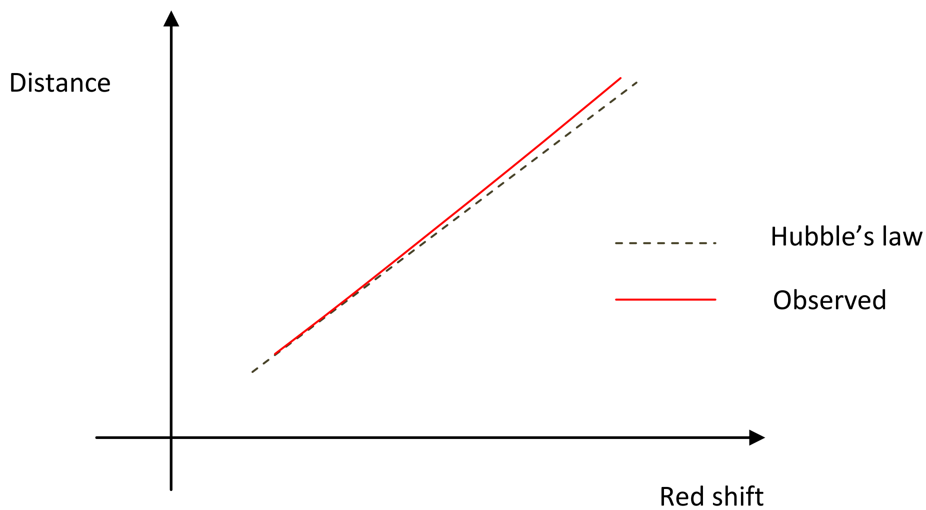
So, in the case of dark matter, the gravitational force will be:

$$G\frac{Mm}{r^2}\,\frac{u^2}{c^2} \;=\; G\frac{Mm}{r^2}\,\frac{(Hr)^2}{c^2} = GMm\;\frac{H^2}{c^2}$$

The force for a given mass is constant independent of distance r .

Therefore, Hubble's constant may also be related to dark matter.

Observations show that the red shift of distant galaxies deviates from Hubble's law. The fourth component may be somehow related to this phenomenon, dark energy.



The fourth component is given by:

$$G\frac{Mm}{r^2}\,\frac{\vec{r}\,.\,\vec{a}}{c^2}$$

The fourth component is related to cosmological acceleration (actually deceleration), which is constant a. From Pioneer anomaly we know that this is a deceleration, not acceleration. Therefore a is negative.

Therefore, for receding relative accelerated motion, the fourth component can be written as:

$$G\frac{Mm}{r^2}\,\frac{r\,(-a)}{c^2} \;=\; -G\frac{Mm}{r}\,\frac{a}{c^2}$$

where the minus sign shows deceleration and a is the magnitude of the deceleration.

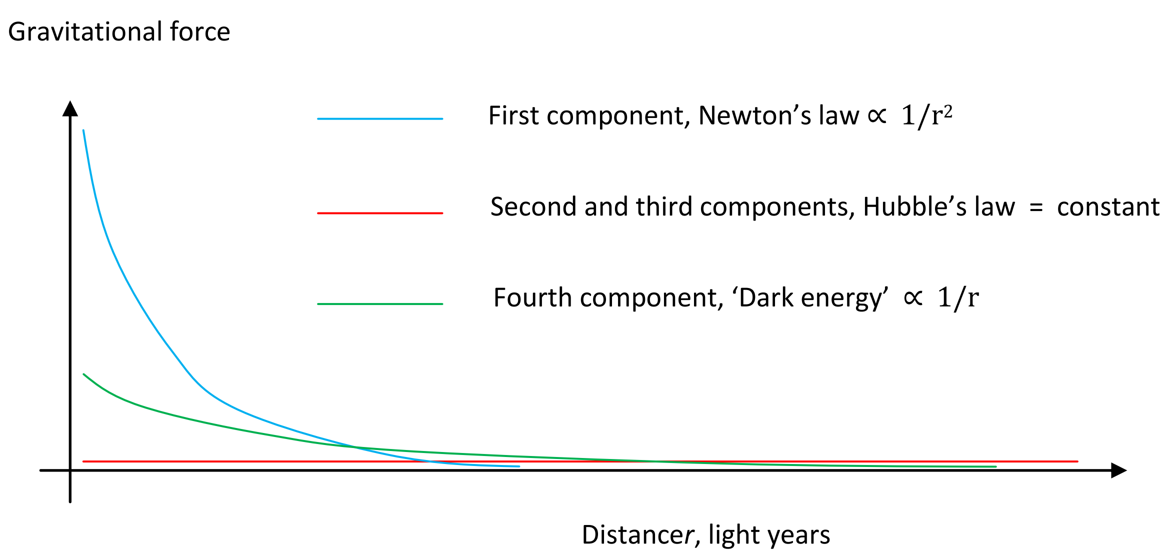
The fourth component in this case is repulsive gravity which is proportional to 1/r. It should be noted that the acceleration is negative even though the gravity is repulsive. This is due to the law of the fourth component.

Therefore, the deviation of distant galaxies from Hubble's law is because they have been under constant deceleration for a longer time than relatively near galaxies. This is why relatively near galaxies follow Hubble's law and distant galaxies deviate from it.

The 'coincidence' of the magnitude of anomalous negative acceleration in the Pioneer anomaly with the magnitude of cosmological acceleration (deceleration) is a hint that Pioneer anomaly is due to the fourth component, i.e. due to cosmological deceleration.

The different components of gravitation act at different distances. Newton's law of gravitation will act up to some distance, diminishing towards zero at sufficiently large distances. Then the fourth component which is proportional to 1/r dominates Newton's gravitation after sufficiently large distance. Beyond this point, constant cosmological acceleration will prevail. The second and third components are constant independent of distance, resulting in Hubble's law : V = H r.

We notice that, due to the laws of the second and third components, constant (gravitational) force component will result in Hubble's law, i.e. velocity proportional to distance. Due to the law of the fourth component, repulsive 1/r gravity causes constant (cosmological) deceleration.



Conclusion

We have seen how Weber's formula can be applied to gravitation to solve many of the outstanding problems in cosmology, such as dark matter, dark energy and Pioneer anomaly. In this paper we have presented only a preliminary qualitative treatment. However, we have seen that this approach is promising to resolve these long standing problems in cosmology.

Thanks to God and His Mother Our Lady Saint Virgin Mary

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