Gravity is similar to dispersive adhesion among macroscopic objects

Ashraful Islam, Bachelor of Science in Civil Engineering,
Rajshahi University of Engineering & Technology, Bangladesh.

Corresponding Author: Ashraful Islam, Bachelor of Science in Civil Engineering,
Rajshahi University of Engineering & Technology, Bangladesh.

Phone: +8801715534617, Email: ashrafulce06@gmail.com

Abstract

Gravity is a universal and inherent attraction among the masses. In this article here I propose gravity is similar to adhesiveness among masses. Among different adhesive mathematical models, I will prefer here the dispersive adhesion. For making an equation of motion due to the gravity concept of the "London Van der Waals attraction between macro particles" by H.C. Hamaker will be used. Photons or light particles can be agglomerated and can result in mass.

Keywords: Dispersive adhesion, Gravity, Inertia, London Van der Waals forces, macro objects, Lagrangian function.

1. Introduction

Any physical phenomenon can be modeled in different ways. Gravity is classically modeled as force and since the gravitational field is centrally symmetric, therefore in different mathematical ways we can deduce the gravitational force as proportional to the inverse square of the interacting masses.

While in general relativity, gravity is modeled in a completely different way, considering space-time is curved around the masses.

Here gravity is modeled as a similar attraction, as adhesion, however valid in the large distance. Moreover, an equation of the third degree of time is considered for the distance. An equation for distance of the third degree of time is possible since higher order time differentiable Lagrange function can be plausible avoiding non-degenerate Lagrange and corresponding unbounded Hamiltonian.

2. The Hamaker equation:

The total energy of interaction of London Van der Waals force originally derived by H.C. Hamaker which is treated here as gravitational interaction E between two spherical particles having radius R_1 and R_2 and having distance r between surfaces such,

$$E = \frac{-\pi^2 q^2 \lambda}{6}\left\{\frac{2R_1R_2}{C^2-(R_1+R_2)^2}+\frac{2R_1R_2}{C^2-(R_1-R_2)^2}+ln\frac{C^2-(R_1+R_2)^2}{C^2-(R_1-R_2)^2}\right\}$$

Where, $C=R_1+R_2+r$; and q is the common mass density of particles and λ is London –Van der Waals constant. Now rewriting the above equation for different mass densities, i.e. q_1 and q_2 respectively we got

$$E = \frac{-\pi^2 q_1 q_2 \lambda}{6}\left\{\frac{2R_1R_2}{C^2-(R_1+R_2)^2}+\frac{2R_1R_2}{C^2-(R_1-R_2)^2}+ln\frac{C^2-(R_1+R_2)^2}{C^2-(R_1-R_2)^2}\right\}$$
$$= \frac{-\pi^2 q_1 q_2 \lambda}{6}\left\{\frac{2R_1R_2}{2r(R_1+R_2)+r^2}+\frac{2R_1R_2}{2r(R_1+R_2)+r^2+4R_1R_2}+ln\frac{2r(R_1+R_2)+r^2}{2r(R_1+R_2)+r^2+4R_1R_2}\right\}$$

Now we can get the interaction force by making a derivative with respect to r

$$F = -\frac{d}{dr}E(r)$$

After doing some basic mathematical operations:

$$F = \frac{-\pi^2 q_1 q_2 \lambda (R_1+R_2+r)}{6}\left\{\frac{4R_1R_2}{r^2(2R_1+2R_2+r)^2} + \frac{4R_1R_2}{\{4R_1R_2+r(2R_1+2R_2+r)\}^2} - \frac{8R_1R_2}{(2R_1+2R_2+r)\{4R_1R_2+r(2R_1+2R_2+r)\}}\right\}$$

3. **Gravity is similar to the London Vander Waals dispersive adhesion between macro particles:**

By considering a system of two masses having radius r_1 and r_2 and separation between them is x; again if they have mass density ρ_1 and ρ_2 respectively then the gravitational force between them is

$$F = \frac{-2\pi^2 \rho_1 \rho_2 K R_1 R_2 (R_1+R_2+r)}{3}\left\{\frac{1}{r^2(2R_1+2R_2+r)^2} + \frac{1}{\{4R_1R_2+r(2R_1+2R_2+r)\}^2} - \frac{2}{(2R_1+2R_2+r)\{4R_1R_2+r(2R_1+2R_2+r)\}}\right\}$$

After some algebra, the above equation becomes:

$$F = \frac{-2\pi^2 \rho_1 \rho_2 K r_1 r_2 (r_1+r_2+x)}{3}\left\{\frac{1}{x^2(2r_1+2r_2+x)^2} + \frac{1}{\{4r_1r_2+r(2r_1+2r_2+x)\}^2} - \frac{2}{(2r_1+2r_2+x)\{4r_1r_2+x(2r_1+2r_2+x)\}}\right\} \ldots\ldots\ldots\ldots (1)$$

Here "K" is the modified constant to the London-Van der Waals constant, for gravitational force, which will be valid for all distance scales. Therefore it is plausible for being the constant K is a function of distance x.

Now let their initial separation "x_0" and after a certain period "t" they are separated at distance "x" due to gravitational attraction "F_{grav}".So gravitational force needs to act against their different inertia. For balancing different forces and inertia we can get the equation of motion due to gravity.

3.1 Distance as a third-degree function of time:

Before writing the equation of motion, assuming a displacement as a function of time is crucial. For the Lagrangian which is a function of the higher order time differentiable coordinates describing the position and so displacement, the displacement shall be a function of a higher degree of the time variable. The displacement shall not be a function of a sufficiently higher degree of time variable, if so, for any finite value of time, the displacement will be infinite. The better choice is to take a cubic function of time.

Let $x=n_0+n_1t+n_2t^2+n_3t^3$

Where $n_{0\ldots}$ n_3 are constant coefficients. After applying some initial values we have the solution for x such as:

$x=x_0+ v_0t + \frac{1}{2}a_0t^2 + \frac{1}{6}a_1t^3$ ……………… (2)

While the above equation is an expansion of the conventional distance equation.

Now instantaneous velocity, $v = \frac{d}{dt}x(t)=v_0 + a_0t + \frac{1}{2}a_1t^2$…………….(3)

Acceleration, $a = \frac{d}{dt}v(t) = a_0 + a_1t$……………….. (4)

Rate of change of acceleration, $a_1 = \frac{d}{dt}a(t)$…………….. (5)

In the case of interaction between highly dense masses, displacement should be taken as the higher-order equation of time.

4. Equation of motion due to gravity:

Neglecting higher order term of time in displacement function, or neglecting higher order inertias related with time derivatives an equation of one dimensional or single degree of freedom motion for balancing different forces, concluded as:

$m_1\frac{d^3x}{dt^3} + m_0\frac{d^2x}{dt^2} + c\frac{dx}{dt} +kx = F_{grav}$………………….(6)

Where m_1 is the inertia against the rate of change of acceleration.

m_0 is the inertia against the rate of change of velocity, which is known as mass.

c is the inertia against the rate of change of position.

k is the inertia against the change of position.

In case of interaction between high densities masses equation 6 will become with higher order differential term:

$m_{n-2}\frac{d^nx}{dt^n}+\ldots\ldots+m_1\frac{d^3x}{dt^3} + m_0\frac{d^2x}{dt^2} + c\frac{dx}{dt} +kx = F_{grav}$………………….(7)

Now expressing F as a function of t :

$$F_{grav}= \frac{-2\pi^2\rho_1\rho_2\lambda r_1 r_2\left(r_1+r_2+x_0+ v_0 t+\frac{1}{2}a_1t^2+\frac{1}{6}a_2t^3\right)}{3}\left\{\frac{1}{x^2\left(2r_1+2r_2+x_0+ v_0 t+\frac{1}{2}a_1t^2+\frac{1}{6}a_2t^3\right)^2}+\right.$$

$$\frac{1}{\{4r_1r_2+r\left(2r_1+2r_2+x_0+ v_0 t+\frac{1}{2}a_1t^2+\frac{1}{6}a_2t^3\right)\}^2}-$$

$$\left.\frac{2}{\left(2r_1+2r_2+x_0+ v_0 t+\frac{1}{2}a_1t^2+\frac{1}{6}a_2t^3\right)\{4r_1r_2+x\left(2r_1+2r_2+x_0+ v_0 t+\frac{1}{2}a_1t^2+\frac{1}{6}a_2t^3\right)\}}\right\}\text{.........}(8)$$

It is certain that inertias k, c, m_0 …….. Are constants. Therefore equation 7 becomes the nth-order nonhomogeneous differential equation.

Another proposition based on the aforementioned concept is, Light particles or photons are the most fundamental particles.

From different experiments, it is confirmed that photons are also attracted by strong gravity. In fact photons cannot escape from the black hole's vicinity. Only one inertia is present that is related to the photon's speed. By applying strong gravitational potential, the photon's speed can be retarded and then consequently other inertias will result. So under strong gravitational or other photon interacting potential, photons can be confined and can be conglomerated as mass. In a reciprocal sense, it can be said that masses are conglomerates of photons, that is photons or light particles are the most elementary particles. Hence first existence among everything is light.

References

[1] Hamaker, H.C. –"The London-Van Der Waals Attraction between Spherical Particles", Physica, 1937.

[2] Lei Zhang –"The Van der Waals force and gravitational force in matter", arXiv.org, 2013.

[3] Edward Waring –"Problem concerning interpolations", Philosophical Transactions of the Royal Society of London Series I, 1779.

[4] Erwin Kreyszig – "Advanced Engineering Mathematics", John Wiley & Sons, Inc. 2011

[5] Rashid, M.S., and Khalil, S.S. – "Hamiltonian Description of Higher Order Lagrangian", International Center for theoretical physics, 1993.