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Outside Gravity of Spherically Symmetric Body Is Not As Entire Mass Were Concentrated At Its Center.

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Abstract:*Earth gravity calculated as per the Newton's law of gravitation. It states that a spherically symmetric mass distributive body attracts outside object, as entire mass were concentrated at its center. All That derivations have explained with shell theorem, superb theorem and theorem XXXI. In the present investigation focused on geometrically proofs as above and analyzed again geometrically with same concept and different views, which gives us a new result as hypothesis.*

Keyword:*Acceleration, Classical Mechanics, Gravitation, Euclidean Geometry, Gravity measurement.*

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I. Introduction

The aim of the present investigation is to prove that, gravitational field outside spherically symmetric mass distributive body is not as entire mass were concentrated at its center, as explained by Kolte [1]. This explanation is more authentic and easy to understand. Outside gravity has explained with various methods. Initially it has explained with Newton' proposition LXXI and theorem XXXI, same as concept of theorem XXX. Concept state that, Gravity exerted on outside object, from mass of shell segment enclosed in same solid angle is as ratio $1/r^2$ and hence entire mass ware as $1/r^2$ [2, 3& 6]. As theorem XXX, state that acceleration due to gravity inside the shell is zero,because of in same solid angle both side ratios are equal and opposite at any place inside the shell [2, 3& 6]. But as Kolte [8] explained that there is not zero gravity and acceleration producetoward inner surface of the shell, therefore checked this concept for outside object.

In the present investigation, we have explained that as vectorial contribution of gravitational field exerted by mass of shell, enclosed in same solid angle is not same as ratio $1/r^2$ and then not too applicable for sphere. Here is investigated above explanation and we have explained with our different views which is easily understand and evaluate result as geometrical and authentic proof.

In the shell theorem shows that the rings of shell which is located at r – d and r + d [4, 5] having same mass and same distance from center, exerting gravityoutside shell as concentrate atcenter. Shell theorem, superb theorem and theorem XXXI are big proof of proposition LXXI. Explanation of shell theorem with the help of rings located at r – d and r + d [4, 5]. Then the shell theorem is suffering with questioning. In the theorem XXXI, there is considering solid angle for explanation of outside gravity, that is natural and basis of inverse square law, which gives us result more authentic. However, it is not totally out of questioning. Hence here is studied and found that result is different from existing.

II. Experimental

We have assumed spherical uniform mass distributed shell, point mass and solid angle same as superb theorem and theorem XXXI, [2, 3 & 6].We have taken point mass outside the shell. Observed logically mass and distance square ratio and those methods, which have used in superb theorem and theorem XXXI, [2, 3 & 6] for variable solid angel and it gives us justification ratio for the analysis.

We have to prove that, total mass of shell enclosed in solid angel and cut into two part, dS_1 and dS_2 exerted gravity as < r distance,

$$\text{i.e.}\frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} > \frac{M_{shell}}{r^2} \qquad \text{---------------- (1)}$$

Here, the mass of shell which has distance less than r from point mass is called dS_1 and greater than r is called dS_2. In contraction of both the masses dS_1 and dS_2 at the center of shellis exerting gravity with changing it distances.

III. Explanation and Results

Our analysis begins called most reliable result for outside gravity of spherically symmetric mass distributive body and understands the formation of gravity equation.
i.e., of the following

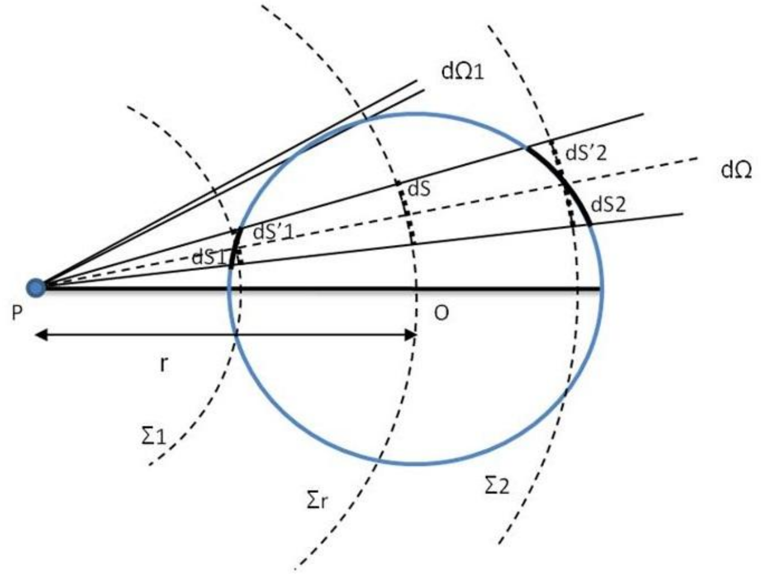

Figure 01: Spherical Shell and point mass P outside it.

3.1: Proof 1: Figure 01.Shows, observation point P is located at the distance r from the center of shell, which is outside the shell. (r = OP > R).Similarly, consider two infinitesimal surface elements dS_1 and dS_2 on the shell, subtending the same solid angle dΩ at P. The r_1 and r_2 is the distance of P from dS_1 and dS_2 respectively.

From the existing theorem, it is stated that,

$$d\Omega = \frac{dS_1}{r_1^2} = \frac{dS_2}{r_2^2} \qquad \text{------------------------ (2)}$$

Then it states that the resultant force of dS_1 and dS_2 at distance r from center is equal to the total mass of dS_1 and dS_2 concentrating at the center of shell.

$$\text{i.e.,} \frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} = \frac{dS_1}{r^2} + \frac{dS_2}{r^2}\left(\frac{dS_1 + dS_2}{r^2}\right) \qquad \text{------------------------ (3)}$$

Finally state that outside gravity of shell as well as sphere is equal to total mass divided by Square of distance from the center.

$$i.e., \quad \frac{GM}{r^2} \qquad \text{------------------------ (4)}$$

Without any calculations and conclusions suppose equation (3) is authentic for outside gravity. If only dS_1 or dS_2 are concentrated at the center of shell that cannot maintain the ratio of equation (3).i.e.

Only mass of dS_1 concentrated at the center then,

$$\frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} > \frac{dS_1}{r^2} + \frac{dS_2}{r_2^2} \qquad \text{------------------------ (5)}$$

And only mass of dS_2 concentrated at the center then,

$$\frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} < \frac{dS_1}{r_1^2} + \frac{dS_2}{r^2} \qquad \text{------------------------ (6)}$$

But concentration of mass dS_1 and dS_2 at the center (entire mass concentrate at center) that can maintain the ratio and we can say that in any solid angle cutting off the shell segment as above $dS_1$and dS_2 its gravity outside the shell is as entire mass concentrated at itscenter, as equation (3).

$$\text{i.e. } \frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} = \frac{dS_1 + dS_2}{r^2} \quad \text{------------------------ (7)}$$

Solid angel dΩ can vary, increasing from zero sr to maximum that is increasing dS_1 and dS_2, gradually and suppose ratio maintained constant as equation(7). However, at the end of shell, there is tinny solid angle $d\Omega_1$ which increases only dS_1 and absent of dS_2 as equation (5 - 7).Unsurprisingly we can't use r for entire mass of the shell.

Thus the total mass of shell or sphere enclosed with solid angle and cutting off $dS_1$and dS_2 are exerting gravity is different from they are concentrated at the center. This state that the hypothesis.

∴ Outside Gravity of shell $\neq$ Entire mass concentrated at it center.

From the equation, (5 - 7) shell gravity is greater than its mass concentrated at the center.

$$i.e. \quad \frac{dS_1}{r_1^2} + \frac{dS_2}{r_2^2} > \frac{M_{shell}}{r^2} \quad \text{------------------------ (8)}$$

3.2: Proof2: Figure 2. Consider a shell having spherically symmetric mass distributed and observation point outside it as above. Observer making solid angel dΩ is cutting off dS_1 and dS_2 in maximum amount and there is a tinny solid angel $d\Omega_1$ outside the solid angel dΩ, which contains only dS_1. When observer goes away from shell as distance R, 2R, --- up to infinite distance, the related tinny solid angel $d\Omega_1$ containing dS_1 become minimal as seen in figure 2and shell gravity becomes more efficient with r.

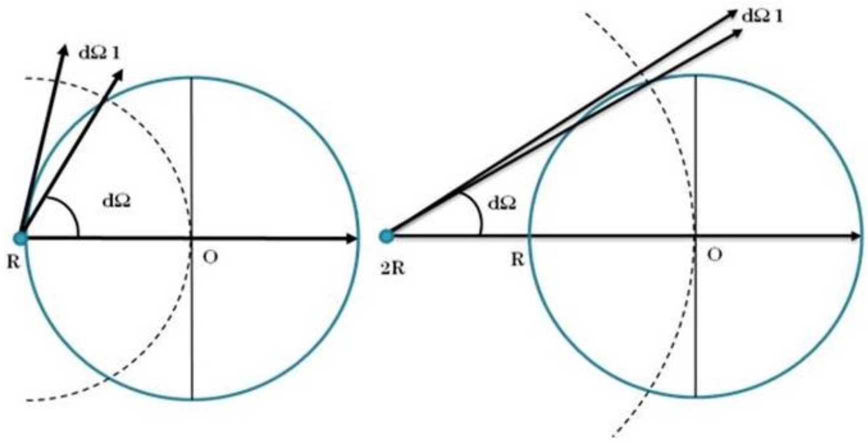

Figure 2: Spherical Shell and outside observer at different distance from the center.

This is the huge problem of Newton; he had assumed that Earth gravity as its mass concentrate at center. The assumption is not bad approximation for moon but bad to apple as like figure 2. Newton knew that in general case a system of particles does not exert gravity as though all the mass were at center of mass and he needed to determine how big a correction to make his equations accountable [7]. Newton's question is still hold and until today not proper derivation as well as correction done.

IV. Conclusion

This work is useful to such a problem. Work state that gravity of spherically symmetric mass distributive body is not as entire mass were concentrate at it center and in gravity calculation collective contribution of distance of all mass particle is less than r (distance from center). Second thing when observer goes away from above mentioned body then solid angle $d\Omega_1$ andit contained mass dS_1 decries, and gravity becomes more efficient with r. This state that, when uniform contraction of spherically symmetric mass distributive body towards its center, then its outside gravity changes decreasingly.

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