263(1): A New Theory of Orbital Dynamics

In UFT 262 it has been shown that the experimentally observed precession of orbits is given by the equation:

$$\alpha - r_0 = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(1)$$

where

$$r_0 = \frac{3MG}{c^2}. \quad -(2)$$

For a given M, r_0 is a universal constant. Here M is the mass at the focus of the ellipse, α is the half right latitude, ϵ the eccentricity and (r, θ) the plane polar coordinate system. Eq. (1) was derived from the turning point of the obsolete Einstein theory:

$$\frac{d^2 r}{dt^2} = 0 = -\frac{mMG}{r^2} - \frac{3MGL^2}{mc^2 r^4} + \frac{L^2}{mr^3} \quad -(3)$$

giving:

$$\Delta\theta = \frac{3MG}{\epsilon \alpha c^2} = \frac{3MG}{ac^2(1-\epsilon^2)} \quad -(4)$$

where a is the semi-major axis of the ellipse.

Unfortunately the Einstein theory is incorrect due to its use of an obsolete geometry without torsion.

There is however, a much simpler and more direct method of deriving eq. (1). This

a) method can be developed from the definition:

$$\underline{R} = R\underline{e}_r \quad -(5)$$

where

$$R = r + r_0 \quad -(6)$$

Therefore in fundamental kinematic theory, r is replaced wherever it occurs by R. The coordinate system becomes (R, θ). Therefore the linear velocity is:

$$\underline{v} = \frac{dR}{dt}\underline{e}_r + R\frac{d\underline{e}_r}{dt} = \frac{dR}{dt}\underline{e}_r + \dot{\theta} R \underline{e}_\theta \quad -(7)$$

and the linear acceleration is:

$$\underline{a} = (\ddot{R} - R\dot{\theta}^2)\underline{e}_r + (R\ddot{\theta} + 2\dot{R}\dot{\theta})\underline{e}_\theta \quad -(8)$$

In all planar orbits:

$$R\ddot{\theta} + 2\dot{R}\dot{\theta} = 0 \quad -(9)$$

so:

$$\underline{F}(R) = (\ddot{R} - R\dot{\theta}^2)\underline{e}_r \quad -(10)$$

$$= -\frac{L^2}{mR^2}\left(\frac{d^2}{d\theta^2}\left(\frac{1}{R}\right) + \frac{1}{R}\right)\underline{e}_r$$

and

$$\frac{d^2R}{dt^2} = F(R) + mR\dot{\theta}^2 \quad -(11)$$

Eqs. (5) to (11) are true for any force law.

3) The turning point of the orbit is:

$$\frac{d^2R}{dt^2} = 0. \quad -(12)$$

i.e

$$F(R) + mR\dot{\theta}^2 = 0 \quad -(13)$$

The angular momentum is defined by:

$$L = mR^2\dot{\theta} = \text{constant} \quad -(14)$$

where

$$\omega = \dot{\theta} = \frac{d\theta}{dt} = \frac{L}{mR^2} \quad -(15)$$

is the angular velocity and spin connection.

Now use the Hooke / Newton inverse square law modified for R:

$$\underset{\sim}{F} = -\frac{mMG}{R^2}\underline{e}_r \quad -(16)$$

Eq. (16) gives the modified elliptical orbit:

$$R = \frac{\alpha}{1+\epsilon\cos\theta} \quad -(17)$$

The turning point of this orbit is defined by:

$$-\frac{mMG}{R^2} + \frac{L^2}{mR^3} = 0 \quad -(18)$$

i.e

$$R = \frac{L^2}{m^2MG} \quad -(19)$$

4) From eq. (10):

$$R = \alpha = \frac{L^2}{m^2 M G} \quad -(20)$$

So at the turning point:

$$r + r_0 = \alpha \quad -(21)$$

so

$$r = \alpha - r_0 \quad -(22)$$

Eq. (22) implies eq. (1), so the precession is the experimentally observed:

$$\Delta\theta = \frac{3MG}{\epsilon \alpha c^2} \quad -(23)$$

Eq. (23) has been derived entirely without the use of the Einstein theory.

Discussion

The above equation are examples of ECE theory with spin connection magnitude ω. The experimental precession (23) is given by the spin connection:

$$\omega = \frac{L}{mR^2} = \frac{L}{m(r+r_0)^2} \quad -(24)$$

The Hooke / Newton / Kepler ellipse is

given by the spin connection:

$$\omega = \frac{L}{mr^2} \quad -(25)$$

The Hooke / Newton force law is modified to:

$$F = -\frac{mMG}{(r+r_0^2)^2} \sim -\frac{mMG}{r^2} + \frac{2mMGr_0}{r^3} \quad -(26)$$

which gives the precessing ellipse:

$$r = \frac{\alpha}{1+\epsilon\cos(x\theta)} \quad -(27)$$

where

$$x = 1 + \frac{r_0}{\alpha}. \quad -(28)$$

Using these equations the entire Einsteinian theory becomes irrelevant, and the entire subject of classical dynamics can be redeveloped with R replacing r.
