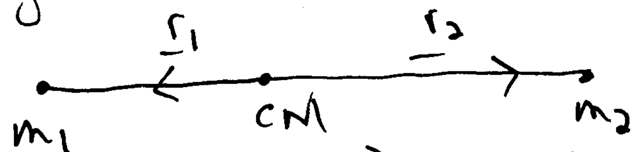
UFT09(4): Description of the Hulse Taylor Binary Pulsar as a Thomas Precession

The Hulse Taylor binary pulsar was considered in UFT375 and its notes. In this note we first consider the classical theory of an object m_1 orbiting an object m_2.



(Marion and Thornton chapter 7). First define:

$$\underline{r} = \underline{r}_1 - \underline{r}_2 \quad -(1)$$

and

$$r = |\underline{r}_1 - \underline{r}_2| \quad -(2)$$

so r is the distance between m_1 and m_2. These are the masses of the stars in the binary pulsar. The lagrangian is:

$$\mathcal{L} = \frac{1}{2}\mu|\dot{\underline{r}}|^2 + \frac{m_1 m_2 G}{r} \quad -(3)$$

where the reduced mass is

$$\mu = \frac{m_1 m_2}{m_1 + m_2} \quad -(4)$$

The hamiltonian is:

$$H = \frac{1}{2}\mu|\dot{\underline{r}}|^2 - \frac{m_1 m_2 G}{r} \quad -(5)$$

and is a constant of motion:

$$\frac{dH}{dt} = 0 \quad -(6)$$

The angular momentum is:

$$L = \mu r^2 \frac{d\phi}{dt} \quad -(7)$$

in plane polar coordinates and is another constant of motion:

$$\frac{dL}{dt} = 0 \quad -(8)$$

) The force is defined by:

$$F(r) = -\frac{\partial U}{\partial r} \quad - (9)$$

and the Binet equation is:

$$\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right) + \frac{1}{r} = -\frac{\mu}{L^2} r^2 F(r) \quad - (10)$$

$$= \frac{\mu m_1 m_2 G}{L^2} = \frac{m_1^2 m_2^2 G}{(m_1+m_2)L^2}$$

Defining:

$$k = m_1 m_2 G \quad - (11)$$

the Newtonian orbital velocity is:

$$v^2 = \frac{k}{\mu}\left(\frac{2}{r} - \frac{1}{a}\right) \quad - (12)$$

$$= (m_1+m_2) G \left(\frac{2}{r} - \frac{1}{a}\right)$$

The orbit is the conic section:

$$r = \frac{\alpha}{1+\epsilon\cos\phi} \quad - (13)$$

where

$$\alpha = \frac{L^2}{\mu k} \quad - (14)$$

and

$$\epsilon^2 = 1 + \frac{2HL^2}{\mu k^2} \quad - (15)$$

Here α is the half right latitude and ϵ is is the eccentricity. The semi major axis is:

$$a = \frac{\alpha}{1-\epsilon^2} = \frac{k}{2|H|} \quad - (16)$$

In the solar system, one mass M (the sun)

) is much larger than the mass m, so the Binet equation becomes:

$$\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)+\frac{1}{r}=\frac{m^2 M G}{L^2} \quad -(17)$$

In the binary pulsar:

$$m^2 M := m_1 m_2 \rightarrow \frac{m_1 m_2^2}{m_1+m_2} \quad -(18)$$

So

$$M \rightarrow \frac{m_2^2}{m_1+m_2} \quad -(19)$$

In Einsteinian general relativity the Binet equation of the solar system becomes:

$$\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)+\frac{1}{r}=\frac{m^2 M G}{L^2}+\frac{3MG}{c^2 r^2} \quad -(20)$$

and it is claimed that this produces the Einsteinian precession:

$$\Delta\phi_E=\frac{6\pi M G}{\alpha c^2} \quad -(21)$$

Using eq. (19), eq. (21) becomes:

$$\boxed{\Delta\phi_E=\frac{6\pi G}{\alpha c^2}\left(\frac{m_2^2}{m_1+m_2}\right)} \quad -(22)$$

As in UFT375:

$$\alpha = 5.3671\times 10^8 \text{ m}$$
$$G = 6.67408\times 10^{-11} \text{ m}^3 \text{kg}^{-1} \text{s}^{-2}$$
$$c = 2.9979\times 10^8 \text{ ms}^{-1}$$
$$m_1 \sim m_2 = 2.804\times 10^{30} \text{ kg}$$

$$\Delta \phi_E = 3.657 \times 10^{-5} \text{ radians per orbit} \quad -(23)$$

The orbit takes 7.75 hours to complete, and using

$$1 \text{ radian} = 57.296^\circ \quad -(24)$$

eq. (23) translates into:

$$\Delta \phi_E = 3.657 \times \frac{24 \times 365}{7.75} \times 10^{-5} \times 57.296 \quad -(24)$$

$$= 2.368^\circ \text{ per earth year.} \quad -(25)$$

The experimental result is

$$\Delta \phi (\text{exp}) = (4.226 \pm 0.002)^\circ \text{ per earth year}$$

Therefore the linear Einstein theory fails completely to describe the data.

The Thomas precession is:

$$\Delta \phi_T = \pi \left(\frac{v}{c} \right)^2 \quad -(26)$$

where v is the Thomas velocity. The experimental result (25) is reproduced by a Thomas velocity of

$$v = 1.366 \times 10^6 \text{ m s}^{-1} \quad -(27)$$

This means that the binary pulsar is described by a rotating line element of ECE2 general relativity:

$$ds^2 = c^2 d\tau^2 = c^2 dt^2 - dr^2 - r^2 d\phi'^2 \quad -(28)$$

where

$$\phi' = \phi + \omega t \quad -(29)$$

and

$$v = \omega r \quad -(30)$$

The standard model uses an elaborate non-

5) non linear extension of the Einstein field equation, but this method completely omits torsion and is mathematically incorrect. Any precession in the universe can be described by a Thomas velocity $\mathbf{v}$.

The concept of gravitational radiation is nowhere used in the above analysis. It is replaced by a rotating frame of reference (28). The shrinking of the binary pulsar is explained by a decrease in the distance between m_1 and m_2 and not by gravitational radiation. Another major problem of the standard model is that it uses a de Sitter precession which comes from rotating the Schwarzschild metric. The de Sitter precession is:

$$\Delta\phi_g =? \; 3\pi\left(\frac{v}{c}\right)^2 \quad -(31)$$

Using the Thomas velocity (27), the de Sitter precession would be

$$\Delta\phi_g =? \; 12.678^\circ \text{ per earth year} \quad -(32)$$

and this is not observed. The total standard model precession is:

$$\Delta\phi = \Delta\phi_E + \Delta\phi_g = 15.046^\circ \text{ per earth year} \quad (33)$$

and this is not observed. So the EGR theory of the binary pulsar is refuted.

The ECE2 explanation of precessions is that they are all caused by a rotating spacetime which generates spacetime torsion. The torsion produces the ECE2 unified field equations of gravitation.