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Slapping Someone Into Next Week: Exploiting the Earth's Orbit

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Abstract

This paper is a follow up to our previous paper where the act of slapping someone into next week using Lorentz Transformations was analysed. This paper investigates whether it would be possible to exploit the orbital dynamics of the Earth to achieve a similar effect. We found that for this to be possible the person would have to travel at $29.73\times10^3 ms^{-1}$ and leave the Earth's surface at an angle of 0.06° relative to its immediate direction of travel.

Introduction

Our previous paper determined that it was practically impossible to slap someone into next week by using the theory of special relativity and Lorentz Transformations (Pierce 2013). This paper investigates another way an effect may be created to create a situation which may be described as slapping someone into next week. By striking someone in such a way that they leave the Earth's regular orbital path at such a trajectory and speed that they return to the Earth in a week's time.

Theory

Our theory is best described by Figure 1:

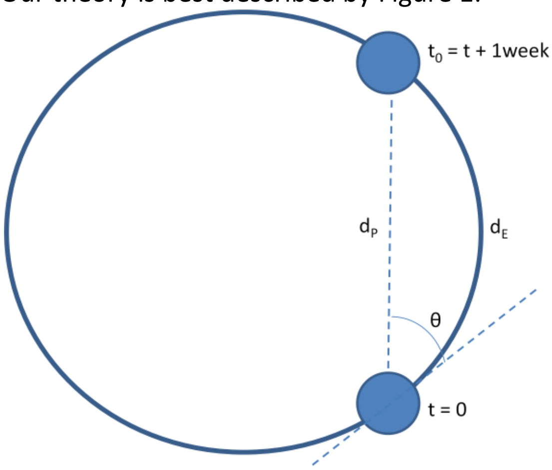

Figure 1: This diagram shows the orbit of the Earth and the trajectory d_P that the person must take in order to return to the Earth in a week's time. (Not to Scale)

There are two main concerns to address when considering this problem. Firstly, the speed at which the person must travel v_P in order to cover the distance d_P in the same time that the Earth covers the distance d_E. The angle θ must also be found as the trajectory is crucial to ensure the person is sent in the right direction.

Finding the distances travelled by both components of this system is a simple geometry problem. We can find the distance d_E by using Equation 1 (Tipler 2008):

$$d = v \times t \qquad [1]$$

By using the known speed of the Earth, $29.78\times10^3 ms^{-1}$ (Williams 2010), we can determine that d_E is 1.801×10^{10}m. This is found using t as one week converted to seconds.

The distance d_P is now found using basic geometry, d_P is a chord on the segment of the Earth's orbit. Its length in relation to d_E is found using the following equations (Tipler 2008).

$$d_E = \theta' R \qquad [2]$$

Where θ' is the angle the Earth moves through relative to the Sun and R is the radius of orbit known to be 149.6×10^9m (Brown 1992). We put our value of θ' into the equation for chord length:

$$d_P = 2R\sin\frac{\theta}{2} \qquad [3]$$

From this we can determine that d_P is 1.798×10^{10}m. By rearranging Equation 1 we find that the velocity the person would have to travel is $29.73 \times 10^3 ms^{-1}$.

The angle θ is found again by simple rules of geometry.

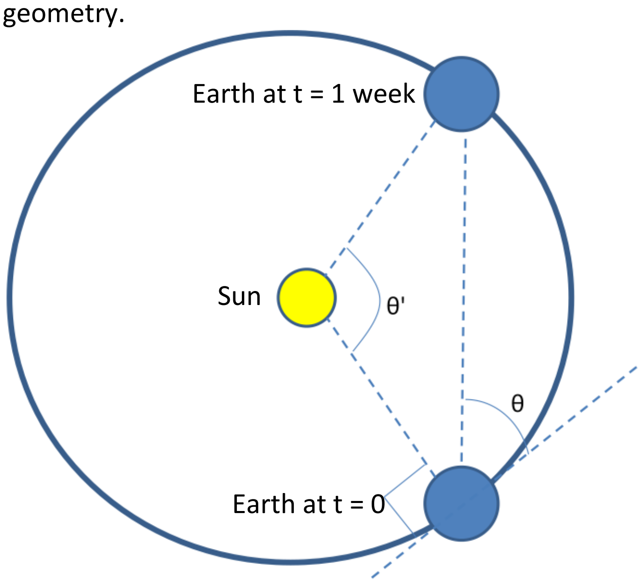

Figure 2: Angle diagram showing relative angles of Earth at both *t* and t_0 to the sun.

It is clear that the angle θ is found by the simple rule that all angles within a triangle add up to 180.

$$\theta = 90 - \left(180 - 90 - \frac{\theta'}{2}\right)$$

This gives us a value of 0.06° for θ. This is the angle at which someone must be struck relative to the Earth's tangential direction of travel in order to obtain the correct trajectory.

Discussion

A number of assumptions clearly have to be made in order to accept these findings. Firstly we have to assume that the person being struck can survive the week in space and may have some kind of life support system. Also we have to assume that the person's trajectory is not affected by the gravity of either the Earth or the Sun. Considering the vast distances involved, we decided it was not necessary to consider the air resistance of either leaving or re-entering the Earth's atmosphere, as it represents such a minute portion of the journey.

Conclusion

We believe the values calculated here to be valid providing the assumptions that we have made. This method does not offer a more reasonable method however of slapping someone into next week. The tolerances of the values are very slim, particularly with the angle at which someone is to be struck to achieve the correct trajectory. Because it is such a small value, any minor change will have a massive effect across such vast differences. The speeds of the person involved are at least within the realms of possibility unlike our previous method of exploiting relativistic effects.

Bibliography

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