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"The Twin Paradox"

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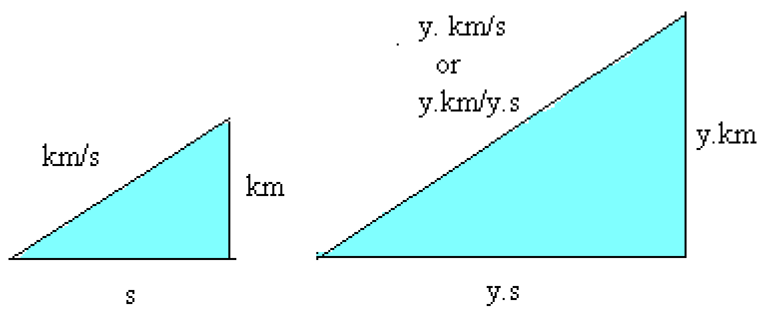
Understanding the "Twin paradox" is easy if the relativistic energy formula, $E_r = m_r.c_r^2$ in my paper: "Einstein's Energy Formula Must be Revised" is understood. In that paper, it is shown that light velocity, c is not a universal constant other than in the space and time of each inertial reference frame. If the space and time of an inertial reference frame are changed, then light velocity is also changed. Light velocity in a frame at rest is $c_o = 300{,}000 km_o/s_o$, but in a moving frame with an extreme velocity, it is $c_r = 300{,}000 km_r/s_r = 300{,}000 km_o.\gamma/s_o.\gamma$, (of which γ is the dilation coefficient and $\gamma > 1$). Light velocity, c_o in the frame at rest is only similar but not equal to light velocity, c_r in a moving frame.



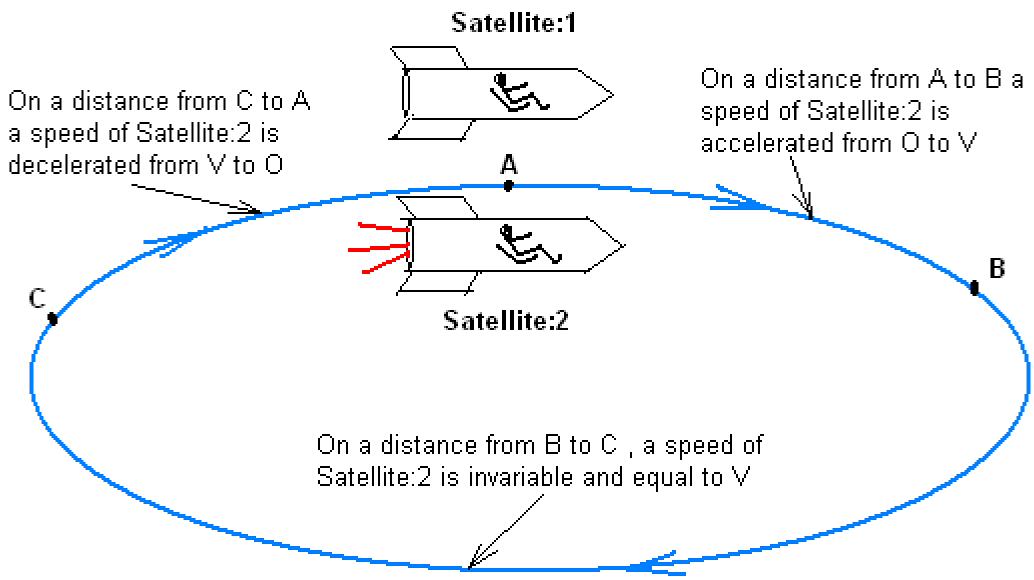
The units of light velocity (c_o or c_r) show that space, km_o and time, s_o in the frame at rest are different than km_r or $km_o.\gamma$ and: s_r or $s_o.\gamma$ in the moving frame. We can't do the math: $c = \frac{300{,}000.km_o}{s_o} = c' = \frac{300{,}000.km_o.\gamma}{s_o.\gamma}$, because $\frac{300{,}000.km_o.\gamma}{s_o.\gamma}$ shows that a unit of space: km_o and a unit of time: s_o of the frame at rest have been changed by the dilation coefficient: γ. If we do the math, then Einstein's relative theory is of no value. Since 1905, even Einstein has been confused by this simple math. In fact,

$$c = \frac{300{,}000.km_o}{s_o} \neq c' = \frac{300{,}000.km_o.\gamma}{s_o.\gamma} = 300{,}000.\gamma.\frac{km_o}{s_o}$$

Now, we can provide an example to show the effects of time dilation called by Einstein, "The Twin Paradox" as follows:

We assume that there are a set of twins living on two satellites. Satellite: 1 is stationary and satellite: 2, moves with extreme velocity, V so that its mass, space and time are changed by dilation coefficient: γ. (Figure A)

Figure A



In a figure A , Satellite 1 is considered a frame at rest with a mass m_o ; its space is km_o; its time is s_o and its energy is $E_o=m_o.c_o^2$. At point A, Satellite 2 is stationary with mass m_o ; space km_o; time s_o and its energy is $E_o=m_o.c_o^2$

Satellite: 2 moves and through the distance from A to B, its speed is increased from O to V; its mass is increased from m_o to $m_o.\gamma$; its time is dilated from s_o to $s_o.\gamma$; its space is increased from km_o to $km_o.\gamma$ and its energy is increased from $E_o=m_o.c_o^2$ to $E_r=m_r.c_r^2$ or $E_r=m_o.\gamma.(c_o.\gamma)^2$ = $m_o.\gamma.(300{,}000\ km_o.\gamma/s_o.\gamma)^2$. Satellite 2 is therefore not an inertial reference frame and at point B its speed is V.

The acceleration of Satellite 2 ends at point B and through the distance from B to C, its speed is uniform at V. Because the speed of Satellite 2 is uniform, it is considered an inertial reference frame. In the distance from B to C, Satellite 2 has a mass of m_r ;a space of km_r or $km_o.\gamma$; a time of s_r or $s_o.\gamma$ and an energy of $E_r=m_o.\gamma.(300{,}000\ km_o.\gamma/s_o.\gamma)^2$.

When Satellite 2 comes to point C, its speed begins to decelerated. In the distance from C to A, the speed of Satellite 2 decreases from V to O , .i.e.. Satellite 2 will stop at a point A. This means that its mass is decreased from $m_o.\gamma$ to m_o, its space is decreased from $km_o.\gamma$ to km_o , its time is decreased from $s_o.\gamma$ to s_o and its energy is decreased from $E_r=m_o.\gamma.(300{,}000km_o.\gamma/s_o.\gamma)^2$ to $E_o=m_o.(300{,}000\ km_o/s_o)^2$. Because the speed of Satellite2 decreased from V to O, in the distance from C to A, it is not an inertial reference frame.

We find that through the distances from A to B and from C to A, since Satellite 2 is not an inertial reference frame, its energy increased from $E_o=m_o.(300{,}000\ km_o/s_o)^2$ to $E_r=m_o\gamma.(300{,}000\ km_o.\gamma/s_o.\gamma)^2$ and decreased from $E_r=m_o.\gamma.(300{,}000\ km_o.\gamma/s_o.\gamma)^2$ to $E_o=m_o.(300{,}000\ km_o/s_o)^2$. The units of light velocity in then energy formula: $E=m.c^2$ show space: km_o ; $km_o.\gamma$ and time: s_o ; $s_o.\gamma$ of Satellite 2 when it moves through that distances. This means that in the distance from A to B or from C to A, the time in Satellite 2 is also dilated and it must be calculated by $s_r = \frac{s_o + s_o.\gamma}{2}$, with $\gamma > 1$.

The whole traveling time dilation of Satellite 2 when it moves is calculated by:

$$s_r = \frac{1}{3}.\left(\frac{s_o + s_o.\gamma}{2} + s_o.\gamma + \frac{s_o + s_o.\gamma}{2}\right) = \frac{1}{3}.(s_o + s_o.\gamma + s_o.\gamma) = s_o.\left(\frac{1+2.\gamma}{3}\right) = s_o.(1/3 + 2/3.\gamma)$$

The time of Satellite 1 which doesn't move is not dilated, so it is always s_o

Obviously, a time dilation of $s_r = s_o(1/3 + 2/3.\gamma)$ of Satellite 2 in motion shows that the time passing, s_r for Satellite 2 is slower than time passing, s_o at Satellite 1

$$s_r = s_o.(1/3 + 2/3.\gamma) \quad > \quad s_o \qquad \text{(of which } \gamma > 1)$$

The twins meet and the person in Satellite 2 will be younger than his brother in Satellite 1, which did not move.

Conclusion

Firstly, if we accept Einstein's relativistic energy formula: $E_r=m_o.\gamma.c^2$ or $E_r=m_r.c^2$, then it must be revised by $E_r=m_o.\gamma.(c_o.\gamma)^2$ or $E_r=m_r.c_r^2$.

The "Twin Paradox" is not a paradox as per the research of scientist *Paul Langevin (1872-1946)*. This is because the relativistic energy formula $E_r=m_r.c_r^2$ has shown a difference between the frame at rest and the moving frame. When the energy of one reference frame is different from the other, then the space, time and light velocity in one reference frame will be different from that in the other.

As in the above example, the person in a Satellite 2 which moves will be younger than his brother in Satellite 1, which doesn't move.

On the contrary, the person in Satellite 1 with energy: $E_o=m_o.c_o^2$, can't be younger than his brother in Satellite 2 which moves and has the energy, $E_r=m_r.c_r^2$, although that person considers that he is moving and Satellite 2 of is not moving. (This is because $E_r=m_r.c_r^2 > E_o=m_o.c_o^2$ and from $c_r=300{,}000km_o.\gamma/s_o.\gamma$ and $c_o=300{,}000km_o/s_o$ we find a time dilation of $s_r=s_o.\gamma > s_o$).

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