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FORMULATION OF A NEW EQUATION OF TIME ON RELATIVITY

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Abstract

A new equation of time in space has been developed as

$$\text{Time} = \frac{\text{Constant velocity of Light}}{\text{Gravitational Acceleration or Potential of space-bending of a celestial object}}$$

$$+\text{B(B is an integral constant)}$$

from Doppler's Effect of Light which is applicable to all celestial objects and Einstein's Universe as a whole.

Sidereal time is a timekeeping system that astronomers use to locate

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celestial objects. Briefly, sidereal time is a "time scale that is based on Earth's rate of rotation measured relative to the fixed stars". More exactly sidereal time is the angle along the celestial equator, from the observer's meridian to the great circle that passes through the March equinox and both celestial poles, and is usually expressed in hours, minutes and seconds. But my equation of time can measure sidereal time of any celestial object with the gravitational acceleration of the celestial object and velocity of Light only.

Formulation of a new Equation of Time

$$\text{Time} = \frac{\text{Constant velocity of Light}}{\text{Gravitational Acceleration or Potential of space-bending of a celestial object}} + \text{B(B is an integral constant)}$$

which is applicable to all celestial objects and Einstein's Universe as a whole.

Since Doppler Effect states increasing or decreasing of frequency of light on approaching or departing relative velocity so we get,

$$\frac{v + (V + v')}{\lambda} = n' \quad \text{or,} \quad \frac{v - (V - v')}{\lambda} = n''$$

where $(V + v')$ and $(V - v')$ are relative velocities of two approaching and departing celestial objects respectively, v and λ are original velocity and wave-length of light respectively, n' and n'' are increased and decreased frequencies respectively.

Now, since relative velocity is a variable quantity itself therefore, we take for $(V + v') = x$ and now we get the equation from the first equation as $\frac{\nu + x}{\lambda} = n'$ where v and λ are two constants.

Therefore, differentiating both sides of the above equation with respect to x we get,

$$\frac{dn'}{dx} = \frac{1}{\lambda} \quad \text{or,} \quad \frac{dx}{dn'} = \lambda \quad \text{or,} \quad \frac{dx}{dt} \times \frac{dt}{dn'} = \lambda.$$

Now, since $\frac{dx}{dt}$ is rate of change of relative velocity, therefore, it is considered to be acceleration and this acceleration is gravitational acceleration.

$$\text{Therefore, } g \times \frac{dt}{dn'} = \lambda$$

$$\text{or, } dt = \frac{\lambda}{g} \text{x} dn'$$

$$\text{or, } \int dt = \int \frac{\lambda}{g} \text{x} dn'$$

$$\text{or, } \int dt = \frac{\lambda}{g} \int dn'$$

$$\text{or, } t = \frac{\lambda}{g} n' + \text{B} \text{ (B is an integral constant)}$$

$$\text{or, } t = \frac{c}{g} + \text{B} \; [\because c = \nu = n'\lambda]$$

Since velocity of light is constant.

Thus, we get,

Time (Sidereal) = Constant velocity of light / Gravitational Acceleration or potential of space bending of a celestial object + B (an integral constant)

$$\text{with, } \frac{v - (V - v')}{\lambda} = n'' \text{ we get, } \frac{v - x}{\lambda} = n'',$$

putting variable x for $(V - \nu')$ and differentiating with respect to x again we get, $\frac{dn''}{dx} = -\frac{1}{\lambda}$, here – *ve* sign is due to decreasing rate of frequency and therefore ignoring – *ve* sign, we get by similar method, $t = \frac{c}{g} + \text{B}$.

Thus this equation of time is a mathematical deduction from Doppler's Effect. The value of '*g*' corresponds to a solar-system of celestial objects.

Conclusion

This equation of time can be applied to all celestial objects in order to calculate their respective sidereal time with their respective values of 'g'. The velocity of light in case of all celestial objects is considered to be constant.

With known value of '*g*' with the Earth, the value of constant, B = 10.04167 days approximately. This is a new way of calculating sidereal times of various celestial objects. The value of '*g*' depends on the solar-system.

References

(1) M. Muller, Equation of time-problem in astronomy, Acta Physica Polonica A (1995).

(2) David W. Hughes, B. D. Yallop and C. Y. Hohenkark, The equation of time, Monthly Notices of the Royal Astronomical Society, Vol. 238, June 15, 1989.