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On Validation of Constancy of Speed of Light

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Abstract: *In this paper, I mainly discussed the unsatisfactory justifications to the constancy of speed of light which is foundational postulate of special relativity. Hereby I tried to give insight to the theoretical approach to the validation of the same postulation with the help of an old Galilean transformation rather than Lorentz modified transformations; considering acceleration acted on the emitting photon of the light emitted from relatively moving body. Here I also tried to define the notion of acceleration and the uniform velocity in discrete observation manner which then leads to some of the modifications for maintaining the constancy of speed of light in any frame of reference.*

Keywords: *Acceleration, Lorentz transformation, Special Relativity, Speed of Light etc.*

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I. Introduction

As we know by the special theory of relativity, the first postulate which can be easily justified with some physical interpretations but the problem arises when we tend to justify the second postulate viz. the constancy of speed of light in any inertial frame of reference. Though we have the experimental verifications of its validation, there is no any reasoning made for it. Even there is no point to call it false as the whole of relativity is standing on it and more than that the conclusions this theory made came true time by time.

II. Theory and Formation

The foundation of the consideration of this postulate goes to Morley-Michelson experiment and then the structural new arrangement of the distance and time transformations given by Lorentz with his equation set,

$$x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}}, \qquad t' = \frac{t - \frac{vx}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} \text{etc.}$$

As we can see here the whole of Lorentz transformations is based on the distance covered, time and the constant velocity terms; there is no any consideration of the instant of emission point of light from the emitting body.

This point takes us to the common understanding of any kind of linear motion such that nothing can achieve any of the uniform or non-uniform velocity unless and until it have some initial acceleration imparted, So light has to have that initial acceleration. In this manner if we consider the initial acceleration acted on light, then the effect of motion of the light emitting body is to be considered.

Let us consider the two cases, in which we have an ideal body emitting a single photon at the time of observation,

Case 1: Let for the observer 1, the light emitting object is approaching towards him with some velocity v_1; As stated above, if we consider the acceleration on photon while ejecting from the body, the resultant acceleration on photon observed by the observer should be less than that of with respect with emitting body itself, such that the observer 2 at the emitting body while ejecting the photon will note the velocity of photon to be v' which is of course less than c and the resultant velocity our first observer observe for photon will come same as c in accordance with Galilean transformation,

$$v_1 + v' = c$$

Case 2: The same way stated above, just consider now the emitting object is moving away with velocity v_2 from the observer 1. In that case the acceleration effect will add up on the ejecting photon and it will increase the velocity of it with respect to the observer 2 to v'',which was at ejection point such that again the velocity of the ejected photon observed by observer 1 will come to be c in accordance with Galilean transformation,

$$v'' - v_2 = c$$

In this way we can maintain the constancy of speed of light true without any consideration of Lorentz transformation just with old Galilean transformation way.

III. Terminology

Consider the observer is observing a body moving continuously with constant velocity v, the simple verification to the uniformity of that motion demands its derivative with respect to time to be zero. But if we have a condition such that there is no way to explain the mathematical continuity in that observation then there won't come any derivative term and consecutively the uniformity term of the velocity.

For that case, consider for any particular moment observer keeps taking frozen snaps of the time and at particularly single time observes the single slide, then as he moves to observe the next slide with time lag of Δt, the uniformity of the motion wont remain the same with this discrete manner and at every such two consecutive cases there come accelerated motion.

In this notion any uniform velocity term can be considered as the accelerated motion and in such a way the problems discussed in case 1 and case 2 can be handled with this.

IV. Conclusion

With this theoretical analysis I conclude that there is a way to justify the constancy of speed of light in any inertial frame of reference. Also with the notion of discrete motion observation, the term acceleration explained can be considered differently to validate the foundational postulates of the special relativity.

References

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