Dynamic Absolute Space: explanation for the null result of Michelson-Morley experiment

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Abstract

Rotation and translation are the two (fundamentally different) kinds of motion in the universe. Rotational motion is the same in all inertial frames and hence can easily be understood as absolute motion. Translational motion, on the other hand, can be understood easily only as a relative motion and has never been clearly understood as an absolute motion. The results of Sagnac's and Michelson-Morley's experiments support this. Einstein denied the validity of absolute motion altogether. However, the author feels that if rotational motion is absolute, then absolute translational motion must also be valid somehow and be confirmed experimentally. One reasoning behind this hypothesis is that we apply absolute translational motion in the analysis of Sagnac's experiment and get the correct result, even though the fringe shift in the final formula is explained in terms of the angular velocity (rotation) of the apparatus rather than the translational velocity of the source and the detector. With the existing logic we are used to in discussions about absolute motion, however, one will always end up in the " relative to what?" question that always leads to confusion. Therefore, absolute translational motion must be redefined if it is to be valid logically. Absolute (translational) motion can be redefined as resulting from a change in state of motion (acceleration) of a body rather than as motion relative to some universal, static, absolute reference frame. According to the new theory, there is no universal absolute reference frame but there is a dynamic absolute reference frame. According to this theory, although the velocity of the earth relative to the sun is 30Km/s, its absolute velocity in space is almost zero because the acceleration of the earth is almost zero and that was why the Michelson-Morley device failed to detect any fringe shift. Two bodies may be in relative motion and yet may have the same absolute velocity or may be at rest relative to each other and yet may have different absolute velocities at some instant of time. The theory of 'Absolute Dynamic Space' reconciles the notion of absolute motion with Galileo's principle of invariance and Einstein's two postulates.

Introduction

Despite the established thoughts of Galileo's and Einstein's relativity, the notion of absolute motion is still considered by many physicists that are outside of the main stream thought. The validity of absolute motion is both intuitive and has experimental evidence, such as Sagnac's effect. On the other hand, Michelson-Morley's experiment's null result has been considered as the most important experiment that ruled out the whole notion of absolute motion.

The controversy over absolute motion and relativity (Galileo's or Einstein's) is still unsettled despite the significant development of relativity over the last one hundred years. All existing theories try to exclude one or the other view and there is no known theory yet that attempted to reconcile the two.

The ‘Dynamic Absolute Space’ theory proposed in this paper attempts to reconcile the notion of absolute motion with Galileo’s principle of invariance and Einstein’s two postulates.

Discussion

Rotation and translation are the two (fundamentally different) kinds of motion in the universe. Rotational motion is always absolute and this is confirmed by Sanac’s effect. Rotational motion is the same in all inertial frames and hence can easily be understood as absolute motion. Translational motion, on the other hand, is not always the same in all inertial frames and it can be understood easily only as a relative motion rather than as absolute motion. The idea of absolute (translational) motion has always been halted by the same logic: ‘relative to what?’. Behind this logic always existed the assumption of some universal, static reference frame with respect to which absolute motion is determined and such thought always ended up in confusion. This assumption was always behind the logic of both who deny and who accept the notion of absolute motion. Einstein denied the validity of absolute motion altogether in his theory of relativity. Despite the established thought in mainstream physics, however, the author feels that if absolute motion is logically valid and experimentally confirmed with respect to rotational motion, then absolute (translational) motion must also be logically valid *somehow* and be confirmed experimentally. One reasoning behind this hypothesis is that we assume absolute translational velocity in the analysis of Sagnac’s experiment and get the correct result, even though the fringe shift in the final formula is explained in terms of the angular velocity (rotation) of the apparatus rather than the translational velocity of the source and the detector. Although rotation and translation have fundamental difference, they must also have one property in common: absolute nature. However, we need to change the way we think about absolute (translational) motion in order to get a logically sound meaning of it.

Let us develop the new theory step by step. At first let us define absolute velocity as the time integral of acceleration. Imagine a body that has been in uniform rectilinear motion and then it started accelerating. According to the above definition, the absolute velocity of the body is its velocity in the reference frame in which it has been at rest initially, before it started accelerating. This reference frame will be the absolute reference frame for that body.

However, we need to modify our theory because, according to the above definition, the body would retain its absolute velocity even if it stopped accelerating but we know that no absolute motion was detected by the Michelson-Morley experiment. Thus absolute velocity must be dynamic. It should ‘discharge’ back to zero when there is no acceleration, with some time constant. If the ‘discharging’ is gradual then the ‘charging’ (build up) of absolute velocity must also be gradual (exponential?).

Therefore, according to the theory of Dynamic Absolute Space,

1. Absolute motion arises with change in state of motion (acceleration)
2. Absolute motion or absolute reference frame is dynamic.

According to this theory, although the velocity of the earth relative to the sun is 30Km/s, its absolute velocity in space is almost zero because its acceleration is almost zero and that was why the Michelson – Morley device failed to detect any fringe shift. Two bodies may be in relative motion and yet may have the same absolute velocity or may be at rest relative to each other and yet may have different absolute velocities at some instant of time.

Fig.1 graphically explains the relation between acceleration, relative velocity and absolute velocity according to this theory.

Fig.1a

Fig.1b

Fig.1c

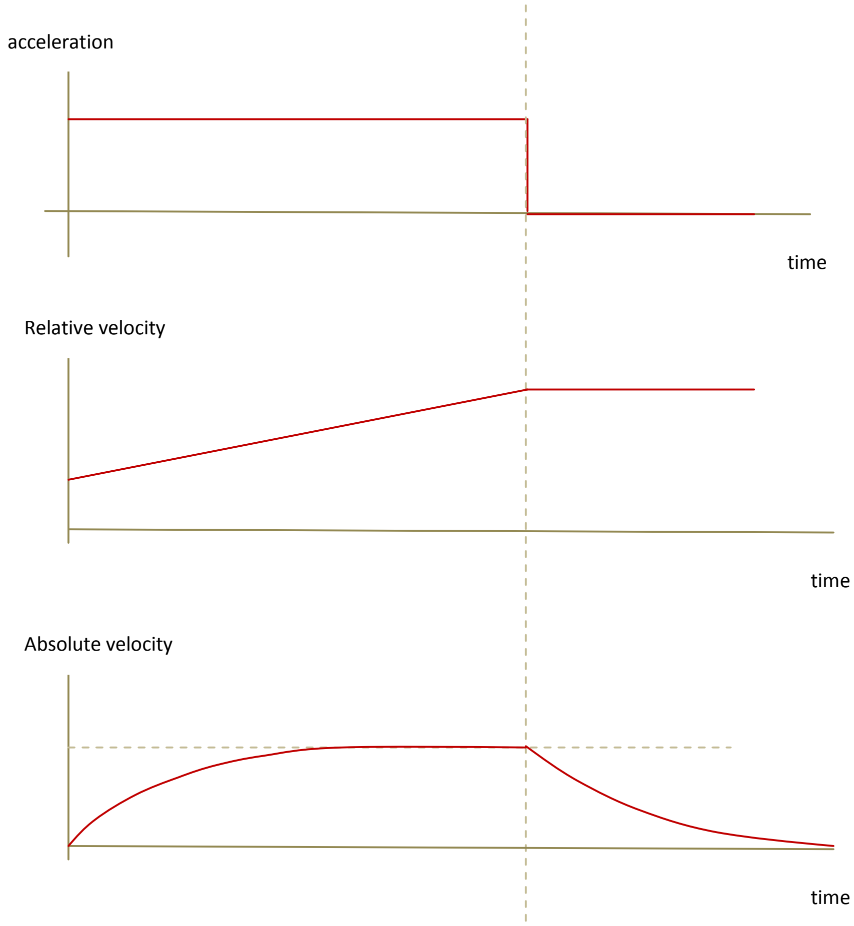


Fig.1d

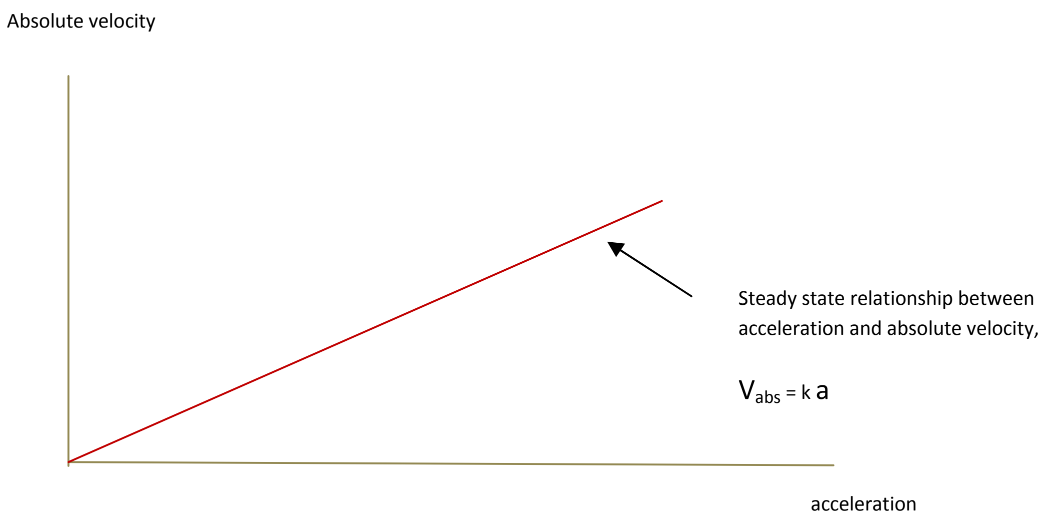


Fig.1 relationship between acceleration, relative velocity and absolute velocity for translational motion

Imagine a body that has been in uniform rectilinear motion for a long enough time. In such a state the body will have no motion relative to space; therefore it can be considered to be at absolute rest. The new theory agrees with special relativity in this respect.

Assume that the body starts accelerating. The absolute velocity of the body starts to build up ('charge') gradually. If the acceleration lasts for a long enough time, however, the absolute velocity settles in some final (steady state) value.

Suppose then that the body stops accelerating. Then the absolute velocity starts to 'discharge' back to zero. The analogy to this is the charging and discharging of a capacitor, according to the new theory. If that body was Michelson–Morley's apparatus, it would detect a fringe shift during the acceleration and even for some time after the acceleration stopped, until the absolute velocity discharges completely back to zero.

Absolute Dynamic Space, Galileo's principle of invariance and Einstein's two postulates

The 'absolute dynamic space' theory attempts to reconcile the notion of absolute motion with Galileo's principle of invariance and Einstein's two postulates. According to this theory, Galileo's principle of invariance and Einstein's two postulates are valid in the steady state (inertial) condition. Thus the speed of light is the same (C) for all observers that have been in uniform rectilinear motion for a long enough time (for observers moving directly towards or away from the source). However, the constancy of the speed of light for all observers need not invoke relativity of space (length) and time and an alternative theory to special relativity has already been proposed by the author: Relativity of Light/ EM fields [1].

Dynamic absolute reference frame

From the definition of absolute motion discussed so far, the absolute reference frame is dynamic and is the reference frame in which the velocity of the body is its absolute velocity. Imagine two inertial bodies which were in motion relative to each other initially and suppose that both start accelerating. Thus we would have two absolute reference frames, one for each body. This means that two dynamic absolute reference frames may be in motion relative to each other.
Just after start of acceleration, the absolute reference frame is the reference frame in which the body has been at rest for a long enough time and continuously changes afterwards during the acceleration of the body and for some time after the acceleration stops. In the steady state (inertial) condition, the absolute reference frame is the reference frame in which the body is at rest.

Absolute velocity and relative velocity

Absolute velocity arises only due to acceleration and is velocity relative to (dynamic) absolute space and has no dependence on relative velocity. Two bodies may be in relative motion and yet may have the same absolute velocity or may be at rest relative to each other and yet may have different absolute velocities at some instant of time.

Inertial/non-inertial source/observer

An inertial source/ observer or body is one that

1. is/has been in uniform rectilinear motion
2. for a long enough period of time

Thus a source/observer/body that is accelerating is non-inertial. A body that is in uniform rectilinear motion is also non-inertial if it has been in this state only for a short enough period of time. The speed of light is always equal to C for all inertial observers (moving directly towards/ away from the source). And it is equal to $C \pm V_{abs}$ for all non-inertial observers, where V_{abs} is the absolute velocity of the observer.

For an inertial source, the center of the wave fronts moves with the source, i.e the source is always at the center of the wave fronts. For a non-inertial source the center of the wave front does not move with the source. How then can the speed of light be independent of the speed of its source, for a source that is moving directly towards an observer. The theory of 'Relativity of Light' already proposed by the author explains this. [1]

In summary,

1. The velocity of light is always independent of the velocity of the source, both in inertial and non inertial conditions, for a source that is moving directly towards/away from the observer.
2. The speed of light is the same (C) for all inertial observers that are moving directly towards/ away from the source and is equal to $C \pm V_{abs}$ for all non –inertial observers.

The case for the lateral component of the relative velocity between the source and observer will be discussed in the section ahead.

Assume an inertial source and an inertial observer that are initially at rest relative to each other. The observer would measure the speed of light to be equal to C. Assume then that the observer starts accelerating directly towards the source. Then, the observer would measure the speed of light to be $C + V_{abs}$. Suppose then that the observer stops accelerating and remains in this state for a long enough time. In this state he will measure the speed of light to be equal to C again.

Relative motion of source and observer

In inertial conditions, the source can be considered to be at rest with the observer moving in the reference frame of the source or, equivalently, vice versa. The relative motion between the source and the observer results in compression or expansion of the light beam, according to the theory already proposed by the author [1].

Common source and observer acceleration

What if the source and observer share the same acceleration (i.e accelerate together)? Since the distance the light beam has to travel to the observer becomes progressively more and more, then the observer would detect a Doppler shift.

In the first case (Fig. 2a) the observer would detect a negative Doppler frequency shift and a positive Doppler frequency shift in the second case.

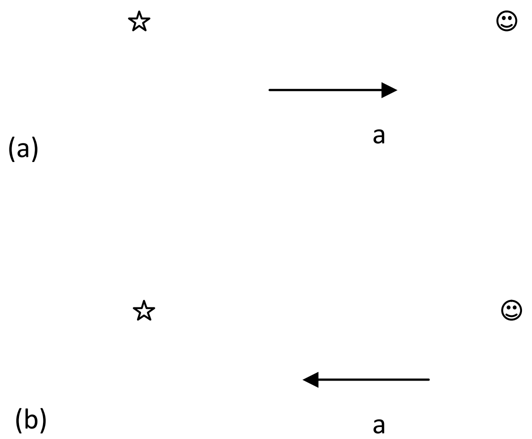


Fig.2

Michelson-Morley's experiment

Since the source is inertial, the center of the wave fronts always stays at the source. Hence no fringe shift will be detected.

Aberration of light

Both the star and the earth are inertial. Therefore the stars are always at the center of the wave fronts they emit, i.e the center of the wave fronts always moves with the stars. Thus the star can be considered to be stationary with the observer moving in its (the star's) reference frame or vice versa. The phenomenon of aberration of light can be explained in both cases.

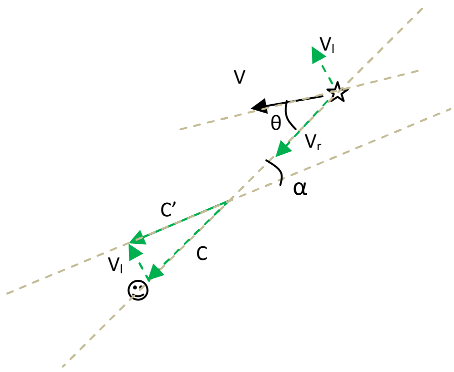


Fig.3

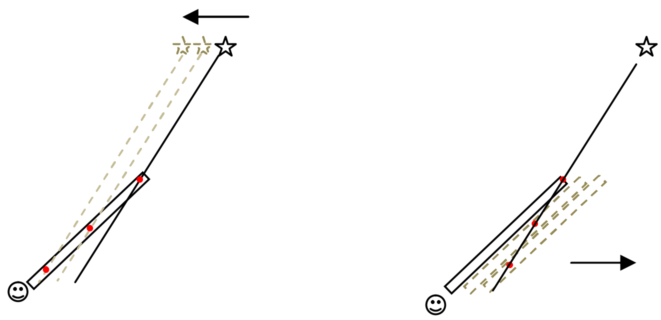
The above figure shows that the star is moving with velocity V in the reference frame of the observer, with V making angle of θ with the line connecting the source and the observer. The two components of the velocity V are shown in the figure with green arrows: radial component (V_r) and lateral component V_l). In inertial conditions V_r has no effect on the velocity of light as measured by the observer. However, the lateral component of V (V_l) will affect the velocity of light as measured by the observer, even in inertial (steady state) conditions. In steady state V_r has no effect on the velocity of light as measured by the observer.

Therefore, in steady state conditions, the velocity of light, C', as measured by an observer moving at angle relative to the observer would be:

$$C' = \sqrt{C^2 + V_l^2}$$

The angle α is the angle of aberration.

The same result can be obtained by considering the star to be at rest and the observer moving in the reference frame of the star.



(a) (b)

Fig.4

In fig4.a, the observer is considered to be stationary with the star moving in the observer's reference frame. In fig4.b, the star is considered to be stationary with the observer moving in the reference frame of the star.

Both explanations require that the star is always at the center of the wave fronts, i.e the center of the wave fronts moves with the star (b/c the star is inertial). Therefore, aberration of light is an evidence that the center of the wave fronts moves with the star.

The theory of 'Relativity of EM fields/light' already proposed by the author states that for an observer that is moving directly towards or away from the source the light beam will be compressed or expanded so that the speed of light relative to the observer will always be equal to C. However the lateral component of the relative velocity b/n the source and observer (V_l) will affect the velocity of light as measured by the observer.

'Dynamic Absolute Space' theory and emission theory

If the center of the wave fronts moves with the source, then one may ask what is the difference b/n the 'Dynamic Absolute Space' theory and emission theory.

The difference b/n the new theory and all other theories is the concept of dynamic frame; absolute velocity will get 'discharged' if acceleration stops.

According to emission theory the light beam acquires all the velocity of the source. According to the 'dynamic absolute space' theory, the light beam will acquire only the lateral component of the relative velocity of the source, in steady state (and not in non-steady state). The component of the velocity along the line connecting the source and the observer has no effect on the velocity of light as measured by the observer, in steady state / inertial condition.

Conclusion

There has been no known theory so far that attempted to reconcile the notion of absolute motion with relativity (Galileo's principle of invariance and Einstein's postulates). All known theories try to exclude one or the other view and none has been completely successful in invalidating the other view. The 'Absolute Dynamic Space' theory is perhaps the first theory that attempts to reconcile these apparently opposing views.

In the absence of acceleration, the universe will gradually 'forget' any translational/linear absolute velocity but always 'remembers' (absolute) angular velocities. Angular velocities are always absolute.

References

1. http://vixra.org/pdf/1302.0065v3.pdf