Special Relativity Predicts a Fringe Shift- a Disproof of Special Relativity and an Alternative Model of the Speed of Light

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Abstract

Special Relativity theory (SRT) correctly predicts the null results of Michelson-Morley and Kennedy-Thorndike experiments. However, this author discovered a new kind of experiment for which Lorentz Transformation equations predict a fringe shift. This is a self-contradiction in SRT, showing that all physics based on SRT, Lorentz transformation and Lorentz contraction should be abandoned. This paper proposes a very compelling alternative model of the speed of light, which we call Apparent Source Theory (AST). AST can be stated in a few words*: the speed of light is constant relative to the apparent source*. AST starts with a simple question: what is the effect of slightly changing the position of the light source in the Michelson-Morley interferometer ? From optics, a very small fringe shift will occur. AST asserts that the effect of absolute motion of the MM interferometer is to create an *apparent* change in the position of the light source relative to the detector. Therefore, only a small fringe shift will occur in the MM interferometer due to *apparent* change of source position (caused by absolute motion) for the same reason that only a small fringe shift will occur due to *real/physical* change of source position. This is the subtle trick of nature that eluded physicists for one hundred years. AST can easily explain many co-moving source and observer experiments, moving source experiments and moving observer experiments. AST also hints on the fundamental nature of light: light is not only a local phenomenon. Light is a dual phenomenon: local and non-local. The blunder in the conception of Michelson-Morley experiment was that they considered light as ordinary, material waves. The ether doesn't exist, but absolute motion does. This paper makes the distinction between the two. This paper reveals the fallacy in conventional and modern Michelson-Morley experiments.

Introduction

The main experiment considered as the evidence of SRT and against ether (absolute motion) is the Michelson-Morley (MM) experiment. However, the MM experiment has not completely disproved absolute motion as often claimed because there are also many experiments that support absolute motion and disprove relativity. These include the Silvertooth, the Marinov, the Roland De Witte, the CMBR experiments and the Sagnac effect. Even the original Michelson-Morley experiment showed a small fringe shift. The Miller experiments are known to have detected small, systematic fringe shifts, which the mainstream physics community, including Albert Einstein, couldn't ignore.

It is also assumed that Special Relativity theory has ruled out emission theory. It is true that emission theory has been disproved by moving source experiments. But emission theory is the most natural explanation of MM experiment. Most importantly, there is an outstanding experiment which supports emission theory and disproves relativity theory. This is the less known Bryan G Wallace analysis of Venus planet radar range data.

Therefore, the Michelson-Morley experiment and moving source experiments cannot be considered as exclusively supporting SRT and completely ruling out ether theory and emission theory, respectively. Therefore, SRT has no score over the two theories regarding these experiments. So far all the three theories of light: SRT, ether theory and emission theory have failed on at least one experiment. Therefore, if a theory of light is to claim correctness, it should *somehow* resolve its failures. SRT should at least resolve its failure on the Silvertooth and the Marinov experiments, emission theory should resolve its failure on moving source experiments and ether theory should resolve its failure on the Michelson-Morley experiment. In this paper, we prove that ether theory and emission theory can resolve their failures and defeat Special Relativity *if they are seamlessly united into a single theory*. This is the Apparent Source Theory proposed in this paper[1].

The question is: if SRT can never resolve its failure on the Silvertooth and the Marinov experiments, what is the implication of this on the other evidences of SRT ? There is a class of non-conventional experiments that are cited as exclusive evidences for SRT. These include the Ives-Stilwell experiment, muon time-dilation, relativistic mass increase of the electron and limiting light speed experiments. These experiments should be appreciated as facts of nature regardless of their perceived relation to SRT. They cannot be understood in a classical way and they need explanation. SRT has been successful at least in correctly *predicting* the results of these experiments.

The problem is that main stream physicists ignore the experimental facts against relativity and want to make up for that by searching for additional evidences for SRT, which is not in accordance with the scientific method. There is no use, for example, in searching for further violations of Lorentz invariance since absolute motion has already been detected by the Miller, the Marinov, the Silvertooth, the Roland De Witte and CMBR experiments. If absolute motion is detected by the Silvertooth and the Marinov experiments and no absolute motion is detected by the modern Michelson-Morley experiments using optical cavity resonators, this only shows a fallacy in the later experiment. This paper reveals the fallacy in conventional and modern Michelson-Morley experiments.

The constancy of the speed of light is the basis of Special Relativity and it is claimed that no experiment has detected any anisotropy of the speed of light. Light speed measuring experiments have been performed in different forms, such as the A. Michelson rotating mirror experiment and the Rosa and Dorsey experiment. Apparently these experiments have not shown any anisotropy of the speed of light with direction. However, I know of no experiment performed using time of flight method between two points.

Perhaps the only compelling logical evidence of SRT is Einstein's thought experiment: chasing a beam of light. Since the ether was disproved by the MM experiment, it was logical to assume that the speed of light is constant. However, this does not mean that the interpretation Einstein's thought experiment, which was SRT, was also logical and correct. Einstein's beautiful thought experiment was the beginning of the history of Special Relativity theory and has been crucial for the persistence of the theory. However, more acceptable interpretations could be made [1][2]. An alternative interpretation exists: it is the phase velocity, not the group velocity, that should be considered constant. Einstein's thought experiment was wrongly married to SRT and divorcing the two will leave SRT useless[2].

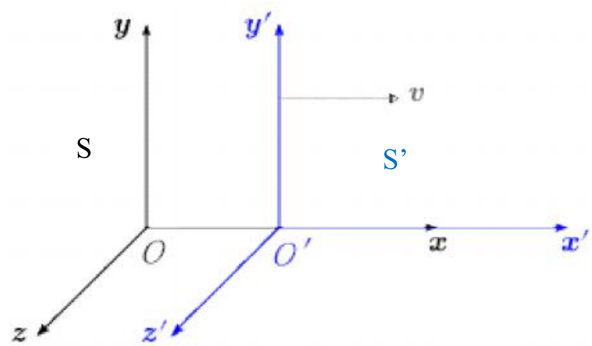
The logical inconsistency of SRT is endless. Special Relativity theory has introduced many more paradoxes than it solved. An example is the Twin Paradox. There is also the less known Trouton-Noble paradox. The physics community tolerated these paradoxes because the experimental and observational evidences for SRT are considered to be ‘overwhelming’, which is not true as we have discussed above.

There are two aims to this paper. The first is the announcement of yet a new logical evidence against the theory of Special Relativity. It is revealed that SRT predicts a fringe shift for some possible kind of interferometer experiment discovered by this author. In fact, the new evidence completely disproves Special Relativity. The second aim is to propose an alternative model of the speed of light. One of the main reasons for the persistence of SRT has been the lack of a competing, compelling alternative model of the speed of light. In fact the lack of an alternative explanation to the experimental facts of the speed of light is considered as an assurance that relativity is a correct theory of nature. The failure of ether theory and emission theory is normally cited as evidence of SRT.

Lorentz Transformation

We start with a brief review of Lorentz transformation [3] and then apply it to the Michelson-Morley experiment..

Consider two reference frames S and S’. S’ moves relative to S in the +x direction. An event observed in S’ has coordinates (x’, y’, z’, t’) . The same event observed in S has coordinates (x, y, z, t).



Then the Lorentz transformation specifies that these coordinates are related in the following way[3]:

$$t' = \gamma\,(t - \frac{vx}{c^2})$$

$$x' = \gamma\,(x - vt)$$

$$y' = y$$

$$z' = z$$

where

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Writing the Lorentz transformation and its inverse in terms of coordinate differences, where for instance one event (event 1) has coordinates (x_1, t_1) and (x'_1, t'_1), another event (event 2) has coordinates (x_2, t_2) and (x'_2, t'_2), and the differences are defined as

$$\Delta x' = x'_2 - x'_1 \ , \quad \Delta x = x_2 - x_1$$

$$\Delta t' = t'_2 - t'_1 \ , \quad \Delta t = t_2 - t_1$$

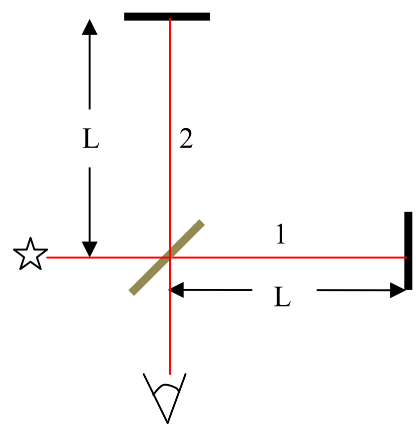
we get

$$\Delta x' = \gamma\,(\Delta x - v\,\Delta t) \ , \quad \Delta x = \gamma\,(\Delta x' + v\,\Delta t')$$

$$\Delta t' = \gamma\,(\Delta t - \frac{v\Delta x}{c^2}) \ , \quad \Delta t = \gamma\,(\Delta t' + \frac{v\Delta x'}{c^2})$$

Explanation of the Michelson-Morley experiment by the Lorentz Transformation

Consider the Michelson-Morley experiment in the reference frame S' in which it is at rest.



The time delay of beam 1 will be:

$$T_1' = \frac{2L}{c}$$

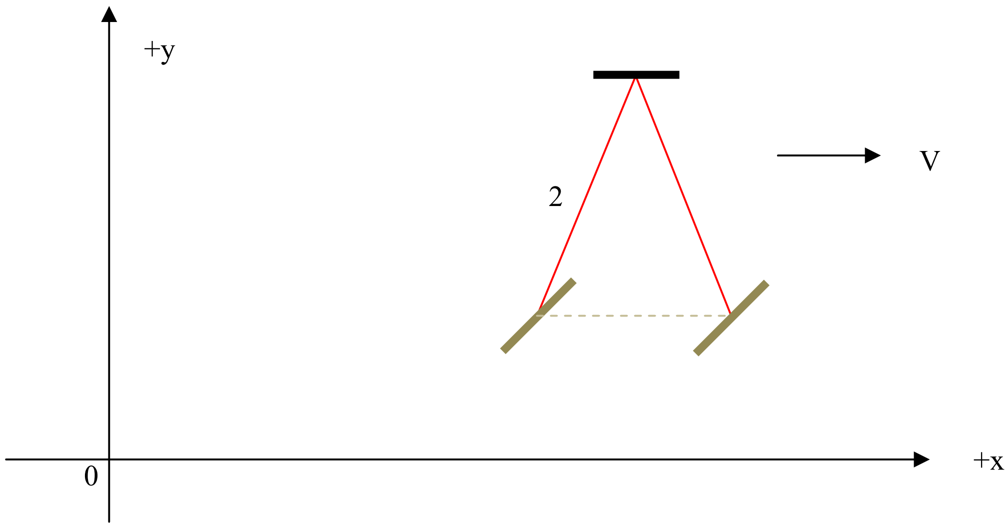
The time delay of beam 2 will be:

$$T_2' = \frac{2L}{c}$$

The difference in the delay times of beam1 and beam 2 will be zero in S'.

$$\Delta T' = \frac{2L}{c} - \frac{2L}{c} = 0$$

Now consider the Michelson-Morley interferometer in the reference frame S in which it is moving with velocity V in the +x direction. The following diagram shows the path of the transverse beam, beam 2.



Round trip time of beam 2

Now we determine the round trip time of beam 2 , in the reference frame S.

Forward travel time

Let us first determine the time it takes the light beam to go from the beam splitter to the mirror.

$$\Delta t = \gamma \left(\Delta t' + \frac{v\Delta x'}{c^2} \right)$$

$\Delta t'$ is the forward travel time (from beam splitter to mirror) delay of beam 2 in S' frame.

$$\Delta t' = \frac{L}{c}$$

and

$$\Delta x' = 0$$

Therefore

$$\Delta t = \gamma \left(\Delta t' + \frac{v\Delta x'}{c^2} \right) = \gamma \left(\frac{L}{c} + \frac{v * 0}{c^2} \right) = \gamma \, \frac{L}{c}$$

Therefore the time needed for beam 2 to go from the beam splitter to the mirror, as observed in reference frame S is :

$$\Delta t = \gamma \frac{L}{c}$$

Backward travel time

Next we determine the time interval between reflection from mirror and arrival at the beam splitter.

Δt' is the backward time of beam 2 in the S' frame.

$$\Delta t' = \frac{L}{c}$$

and

$$\Delta x' = 0$$

Therefore

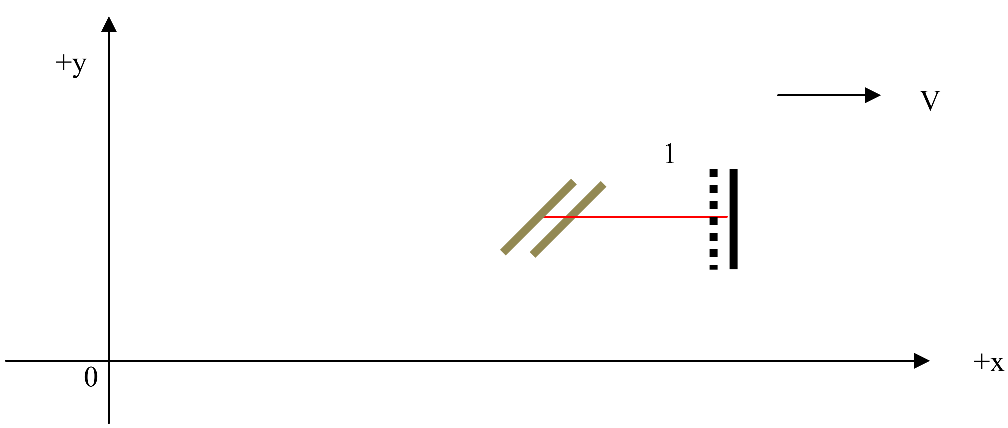
$$\Delta t = \gamma \left(\Delta t' + \frac{v\Delta x'}{c^2} \right) = \gamma \left(\frac{L}{c} + \frac{v * 0}{c^2} \right) = \gamma \frac{L}{c}$$

The total time delay of beam 2 will be the sum of the forward and backward travel times.

$$T_2 = \gamma \frac{L}{c} + \gamma \frac{L}{c} = \gamma \frac{2L}{c}$$

Round trip time of beam 1

Next we determine the round trip time of light beam 1, in the S frame.



Forward travel time

Let us first determine the forward travel time (from beam splitter to mirror).

Δt' is the forward travel time of beam 1 in the S' frame.

$$\Delta t' = \frac{L}{c}$$

and

$$\Delta x' = L$$

Therefore

$$\Delta t = \gamma \left(\Delta t' + \frac{v\Delta x'}{c^2} \right) = \gamma \left(\frac{L}{c} + \frac{vL}{c^2} \right) = \gamma \frac{L}{c} \left(1 + \frac{v}{c} \right)$$

Backward travel time

Next we determine the backward travel time of beam 1 (from mirror back to beam splitter)

Δt' is the backward travel time of beam 1 in the S' frame.

$$\Delta t' = \frac{L}{c}$$

and

$$\Delta x' = -L$$

The negative sign in the above equation is because the x-coordinate of the second *event* 2 (arrival at beam splitter) is less than the x-coordinate of the first *event* 1 (reflection at mirror).

Therefore,

$$\Delta t = \gamma \left(\Delta t' + \frac{v\Delta x'}{c^2} \right) = \gamma \left(\frac{L}{c} + \frac{-vL}{c^2} \right) = \gamma \frac{L}{c} \left(1 - \frac{v}{c} \right)$$

The round trip time of beam 1 , as observed in S will be the sum of the forward and the backward time delays.

$$T_1 = \gamma \frac{L}{c} \left(1 + \frac{v}{c} \right) + \gamma \frac{L}{c} \left(1 - \frac{v}{c} \right)$$

$$= \gamma \frac{L}{c} \left(1 + \frac{v}{c} + 1 - \frac{v}{c} \right) = \gamma \frac{2L}{c}$$

The difference between time delay T_1 and T_2 is zero.

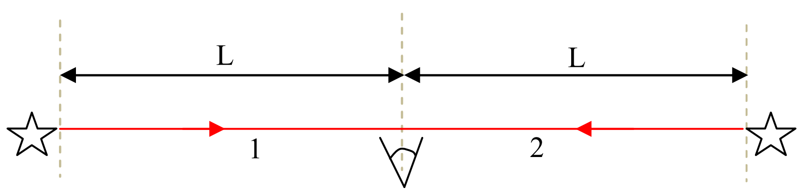
$$T_1 - T_2 = \gamma \frac{2L}{c} - \gamma \frac{2L}{c} = 0$$

This agrees with the zero difference in the two time delays as observed in the reference frame S' , hence the NULL fringe shift of the Michelson-Morley experiment is explained.

Failure of Lorentz transformation and Special Relativity

We have seen that the Lorentz transformation equations correctly *predict* the null result Michelson-Morley experiment. In this section the failure of Lorentz transformation, which has been hidden for one hundred years, will be exposed by a new possible experiment.

Consider the following experiment, with two *independent* light sources and an observer/detector at the middle. Note that the details (mirrors, beam splitters) required for interference of the two light beams are not shown.



First we analyze the experiment in the reference frame S'.

The travel time of light beam 1 will be:

$$T_1{}' = \frac{L}{c}$$

The travel time of light beam 2 will be:

$$T_2{}' = \frac{L}{c}$$

The difference between the travel time of beam 1 and the travel time of beam 2 is zero in S'.

$$T_1{}' - T_2{}' = \frac{L}{c} - \frac{L}{c} = 0$$

Now we consider the experiment in the reference frame S. According to Special Relativity theory, we expect the same time difference of zero, a null fringe shift, when the experiment is observed in the reference frame S. Let us see if this is the case.

<u>Beam 1</u>

$\Delta t'$ is the travel time of light beam 1 as observed in S'.

$$\Delta t' = \frac{L}{c}$$

and Δx' is the difference in the x coordinates of the two events, i.e. emission of light at the source and detection at detector/observer, in the S' frame.

$$\Delta x' = L$$

Therefore,

$$\Delta t = \gamma\left(\Delta t' + \frac{v\Delta x'}{c^2}\right) = \gamma\left(\frac{L}{c} + \frac{vL}{c^2}\right) = \gamma\,\frac{L}{c}\,(1 + \frac{v}{c})$$

Therefore, the travel time of beam 1 as observed in the reference frame S is

$$T_1 = \gamma\,\frac{L}{c}\,(1 + \frac{v}{c})$$

<u>Beam 2</u>

Now we consider the travel time of beam 2 , in the reference frame S.

Δt' is the travel time of light beam 2 in reference frame S'.

$$\Delta t' = \frac{L}{c}$$

and Δx' is the difference in the x coordinates of the two events, i.e. emission of light at source and detection at detector, in the S' frame.

$$\Delta x' = -L$$

Note the negative sign in the above equation again. It is because the x-coordinate of event 2 (detection of light at detector) is less than the x-coordinate of event 1 (emission of light at source).

Therefore

$$\Delta t = \gamma\left(\Delta t' + \frac{v\Delta x'}{c^2}\right) = \gamma\left(\frac{L}{c} + \frac{-vL}{c^2}\right) = \gamma\,\frac{L}{c}\,(1 - \frac{v}{c})$$

Therefore, the travel time of beam 2 , as observed in the reference frame S is

$$T_2 = \gamma\,\frac{L}{c}\,(1 - \frac{v}{c})$$

The difference in the travel times of the two light beams, as observed in S will be:

$$T_1 - T_2 = \gamma\,\frac{L}{c}\left(1 + \frac{v}{c}\right) - \gamma\,\frac{L}{c}\left(1 - \frac{v}{c}\right) = \gamma\,\frac{L}{c}\left(1 + \frac{v}{c} - 1 + \frac{v}{c}\right) = \gamma\,\frac{2Lv}{c^2}$$

which is not zero !

We can determine the fringe shift predicted by Lorentz transformation. As determined above, the difference in travel lengths of the two light beams is:

$$\Delta L = c\,(T_1 - T_2) = \gamma\,\frac{2Lv}{c}$$

By modifying the wavelength by the gamma factor, as in the analysis of Kennedy-Thorndike experiment, the fringe shift is given by:

$$\Delta N = \frac{\Delta L_A}{\lambda_A{}'} - \frac{\Delta L_B}{\lambda_B{}'} = \frac{\gamma_A}{\gamma_A \lambda}\,\frac{2Lv_A}{c} - \frac{\gamma_B}{\gamma_B \lambda}\,\frac{2Lv_B}{c} = \frac{2L}{\lambda c}\,(v_A - v_B)$$

which is NOT NULL. Special Relativity predicts a fringe shift !

The two *independent* light sources can be thought to be ideally coherent lasers.

Note that it is possible to analyze the above experiment by time of flight method also, instead of interference method. Three synchronized clocks are placed at the two sources and at the detector. Then the travel time difference is determined in S' . Then the travel time difference is determined in S.

Special Relativity predicts a travel time difference of zero in reference frame S' , but a travel time difference of

$$T_1 - T_2 = \gamma\,\frac{2Lv}{c^2}$$

in reference frame S.

An alternative model of the speed of light

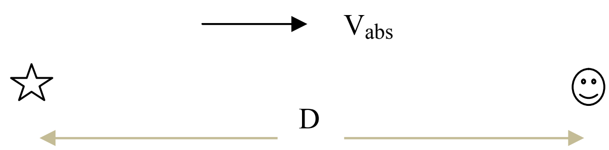
Despite the failure of the Michelson-Morley experiment to detect absolute motion, absolute motion has been detected by other kinds of experiments, such as the Sagnac effect, the Miller experiments, the Silvertooth, the Marinov, the Roland De Witte and the CMBR experiments. This shows some problem in the interpretation of absolute motion. Absolute motion was (wrongly) presumed to be motion relative to the ether, but the ether was disproved by the MM experiment.

A new interpretation of absolute motion and the speed of light is proposed in this paper. In this paper we will prove the existence of absolute motion; we won't discuss the 'relative to what? ' question here. A proposal has been made in [1].

In an effort to explain the Michelson-Morley and the Sagnac experiments, I came across the seed of idea that can reconcile these apparently contradicting experiments, which developed into Apparent Source Theory (AST) , after years of effort and confusions. There is no theory of the speed of light to this date that truly explains both these experiments with the same treatment.

Apparent Source Theory (AST)

Consider a light source and an observer absolutely co-moving as shown below.

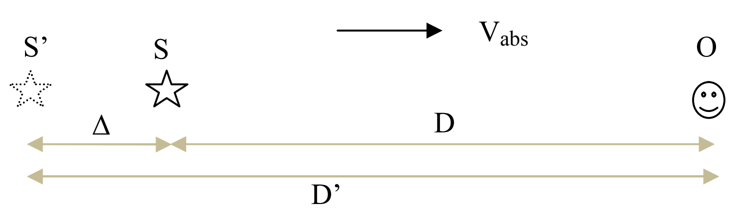


If the source and observer are at absolute rest ($V_{abs} = 0$), the time delay between emission of a light pulse and its detection at the observer will be:

$$T = \frac{D}{c}$$

However, if $V_{abs} \neq 0$, the time delay will be different, i.e. $T \neq \frac{D}{c}$. We may *postulate* that the effect of absolute motion is to create a change in the time delay T. At this point we make a careful interpretation. Why does time delay T vary with absolute velocity? Is it because the speed of light is variable relative to the observer, as for a sound wave? No, because this would imply a medium for light transmission which was disproved by the Michelson-Morley experiment. For co-moving source and observer, the speed of light is always equal to *c*. How then does T vary with absolute velocity if *c* is constant, as physical distance D is also constant ?

This puzzle is solved as follows: time delay T varies with absolute velocity because the source observer distance *apparently* changes with absolute velocity. For absolutely co-moving source and observer, light behaves *as if* the distance between source and observer is different from the actual, physical distance D. In other words, the position of the source apparently changes relative to the observer, for absolutely co-moving source and observer. Relative to the observer, the source appears to be farther than its physical distance D, in the case of an observer in front of the source with reference to the direction of motion.



The source appears to have shifted away from the observer by distance Δ. The observer O measuring the time delay T between emission and detection of the light pulse will be able to make correct explanation and prediction only by assuming that the light pulse started from S' and not from S, and by assuming that the speed of light is equal to c relative to the apparent source S'.

The amount by which the source apparently shifts position is determined as follows. The time elapsed for the light pulse to go from apparent source position S' to the observer is equal to the time elapsed for the source to move from position S' to S. i.e.

$$\frac{D'}{c} = \frac{\Delta}{V_{abs}}$$

But

$$D' = D + \Delta$$

From the above two equations

$$D' = D\frac{c}{c - V_{abs}} \quad \text{and} \quad \Delta = D\frac{V_{abs}}{c - V_{abs}}$$

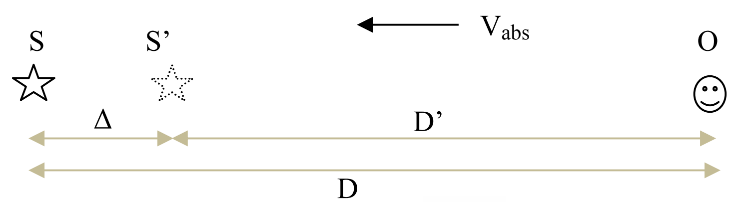
The time delay T will be:

$$T = \frac{D'}{c} = \frac{D}{c - V_{abs}}$$

In the above *interpretation*, each apparent source position S' applies only to a single point relative to the source. This means that the apparent source position is different for observers at different positions relative to the source. Each observer sees their own apparent source. This is because the apparent source distance D' depends on the physical source distance D and on absolute velocity V_{abs}.

Thus the effect of absolute motion for co-moving source and observer is just to create an apparent change in position (distance and direction) of the source relative to the observer. To analyze an experiment involving absolutely co-moving source and observer, therefore, we just replace the real source with an apparent source. Then we analyze the experiment by assuming the speed of light to be constant *relative to the apparent source*. ***The speed of light is always constant relative to the apparent source.***

Similar analysis applies for an observer behind the light source, i.e. an observer 'chasing' a light source, for co-moving source and observer. In this case, the source *appears* to have shifted towards the observer by an amount Δ.



$$\frac{D'}{c} = \frac{\Delta}{V_{abs}}$$

But

$$D' = D - \Delta$$

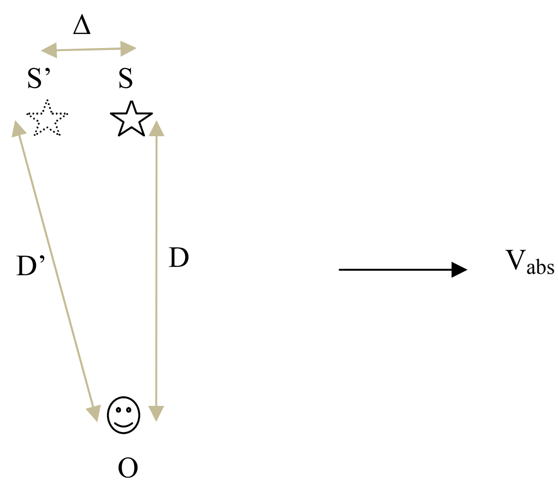
From the above two equations

$$D' = D\frac{c}{c+V_{abs}} \quad \text{and} \quad \Delta = D\frac{V_{abs}}{c+V_{abs}}$$

The time delay T will be:

$$T = \frac{D'}{c} = \frac{D}{c+V_{abs}}$$

Next imagine a light source S and an observer O absolutely co-moving as shown below, with the relative position of S and O orthogonal to the direction of their common absolute velocity.



During the time interval that the light goes from S' to O, the source goes from S' to S.

$$\frac{D'}{c} = \frac{\Delta}{V_{abs}}$$

But,

$$D^2 + \Delta^2 \approx D'^2$$

From the above two equations

$$D' = D\frac{c}{\sqrt{c^2 - {V_{abs}}^2}}$$

Therefore, the time delay *T* between emission and detection of the light pulse in this case will be:

$$T = \frac{D'}{c} = \frac{D}{\sqrt{c^2 - {V_{abs}}^2}}$$

From the above interpretations, we can work out the procedure to analyze any light speed experiment as follows:

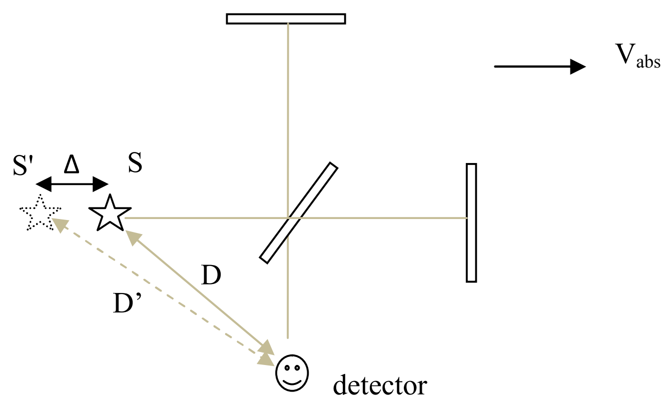
1. Replace the real source with an apparent source
2. Analyze the experiment by assuming that the speed of light is constant relative to the apparent source.

This means that we replace the real source with an apparent source to account for absolute motion. Once we put the apparent source at the apparent source position, we analyze the experiment by assuming the speed of light to be constant c relative to the apparent source. This is analogous with conventional emission theory in which the speed of light is constant relative to the source.

The distance D we use to determine apparent source position D' in the above analyses is always the *direct* source observer distance, even if no light comes directly from the source to the observer, but through mirrors as in the Michelson-Morley experiment.

Michelson-Morley experiment

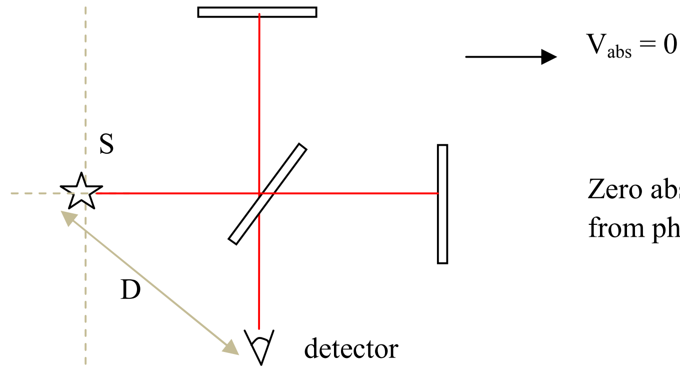
Now let us apply Apparent Source Theory (AST) to the Michelson-Morley experiment.



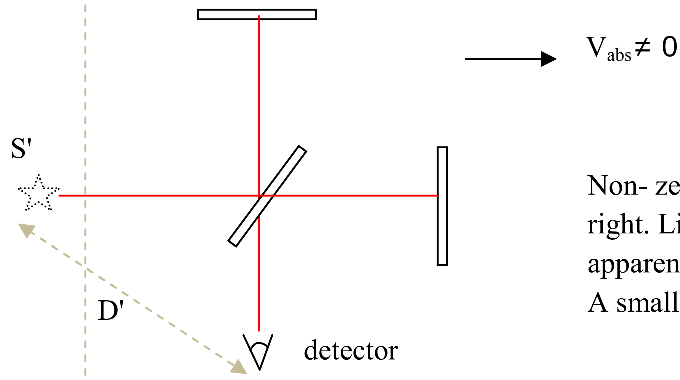
In the above diagram of Michelson-Morley experiment, the real source S has been replaced by an apparent source S'. Once we replace S with S', we assume the speed of light to be constant relative to S'. We may think of this as applying conventional emission theory to S'.

To understand the above analysis, one only needs to ask: will actually/ physically moving the source from position S to position S' create any fringe shift? The obvious answer is : from optics, NO significant fringe shift (or a small fringe shift) will be observed. However, it can be shown from optics that a small fringe shift will occur. This may be the small fringe shifts observed in the different experiments such as the Miller experiments. An apparent change in the position of the source (caused by absolute motion) does not result in a significant fringe shift for the same reason that an actual change in source position doesn't result in a significant fringe shift. We may intuitively think of this as : no (significant) fringe shift will occur because the change in source position has the same effect on both the longitudinal and transverse light beams.

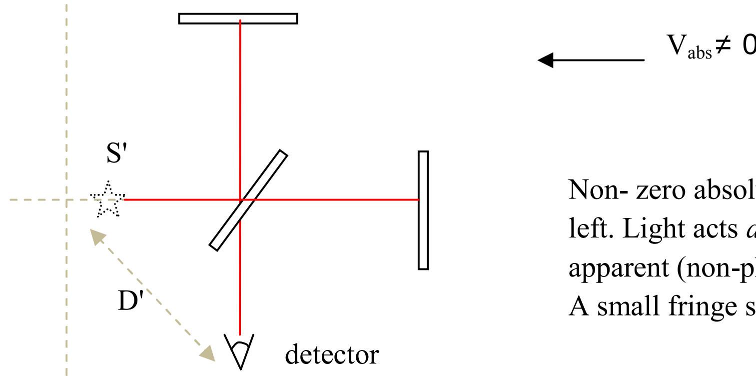
The above diagram is redrawn below to show cases of zero absolute velocity and non zero absolute velocities. No (significant) fringe shift will occur simply because the source position has changed. Note that *physically* light always starts from the real source S, but light acts *as if* it started from apparent source S'.



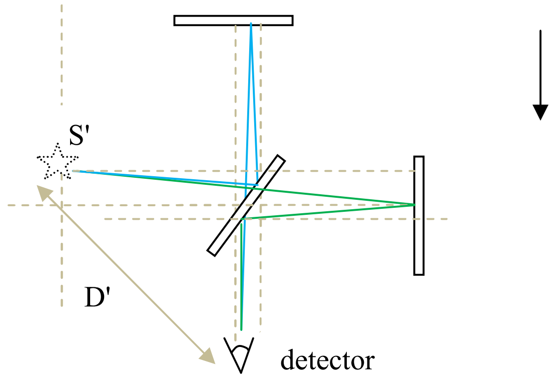
Zero absolute velocity. Light starts from physical source S.



Non- zero absolute velocity to the right. Light acts *as if* it started from apparent (non-physical) source S'. A small fringe shift will occur.



Non- zero absolute velocity to the left. Light acts *as if* it started from apparent (non-physical) source S'. A small fringe shift will occur.

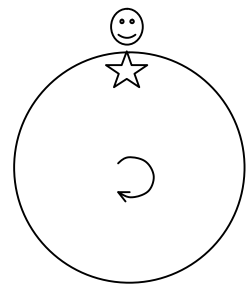


$V_{abs} \neq 0$

Non- zero absolute velocity downwards. Light acts *as if* it started from apparent (non-physical) source S'. A small fringe shift will occur.

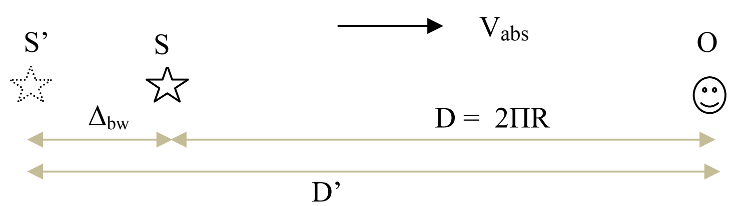
Sagnac effect

Let us consider a hypothetical Sagnac interferometer.



Assume that the light source emits light in the opposite directions tangentially. The two light beams travel in circular paths in opposite directions before being detected at the detector. A circular mirror is used to make light travel in circular path.

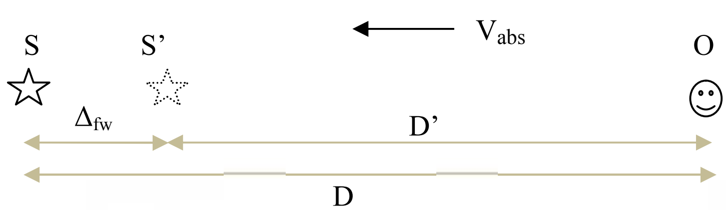
Consider the light emitted in the forward direction. This case can be considered to be an absolute translation problem of co-moving source and observer already discussed, with the observer in front of the source.



From our previous analysis:

$$D' = D\frac{c}{c - V_{abs}} = 2\Pi R\,\frac{c}{c - V_{abs}} \quad \text{and} \quad \Delta_{bw} = D\,\frac{V_{abs}}{c - V_{abs}}$$

The case for light emitted backwards can be represented as follows.



$$D' = D\frac{c}{c + V_{abs}} = 2\Pi R\,\frac{c}{c + V_{abs}} \quad \text{and} \quad \Delta_{fw} = D\,\frac{V_{abs}}{c + V_{abs}}$$

The observer sees two different apparent sources: when looking in the backward direction and when looking in the forward direction. The distance of the apparent source when looking in the backward direction is greater than the physical source observer distance D = 2ΠR. The distance of the apparent source when looking in the forward direction is less than the physical source observer distance D = 2ΠR.With the apparatus rotating, therefore, a fringe shift will be observed at the detector.

The path difference of the forward and back ward light beams will be:

$$\Delta = \Delta_{fw} + \Delta_{bw} = D \frac{V_{abs}}{c + V_{abs}} + D \frac{V_{abs}}{c - V_{abs}} = D \frac{2V_{abs}c}{c^2 - V_{abs}{}^2}$$

But , D = 2ΠR and $V_{abs} = \omega R$

From which

$$\Delta = 2\pi R \frac{2V_{abs}c}{c^2 - V_{abs}{}^2} = 4\pi R \frac{\omega Rc}{c^2 - \omega^2 R^2} = 4\pi R^2 \frac{\omega c}{c^2 - \omega^2 R^2} = 4A \frac{\omega c}{c^2 - \omega^2 R^2}$$

where A= ΠR^2 is the area of the circle.

Dividing both the numerator and denominator by c^2

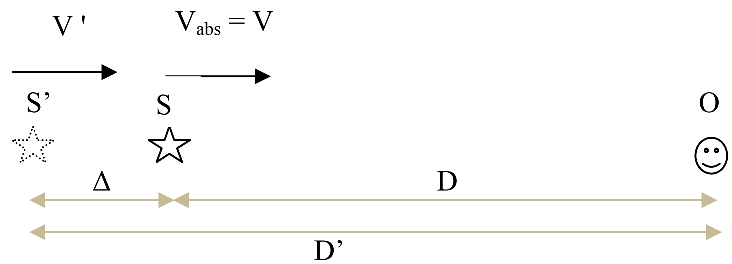
$$\Delta = \frac{4\omega Ac}{c^2 - \omega^2 R^2} = \frac{\frac{4\omega A}{c}}{1 - (\frac{\omega R}{c})^2}$$

In the above analysis of a hypothetical Sagnac experiment, we just interpreted it as two absolute translational motions, with the observer chasing the light source and the observer escaping from the light source. There is no reason why we can't consider the Sagnac effect as an absolute translation, at least for this hypothetical, simplest case. This is because the observer is moving along the light paths, just like an observer behind or in front of a light beam, for absolutely co-moving (translating) source and observer.

Moving source experiments

So far we have been considering the special case of absolutely co-moving source and observer. A general principle governing the speed of light is proposed as follows. The procedure of analysis of any light speed experiment is as follows:

1. Determine the distance between the observer and the apparent source *at the instant of emission.* This is determined from source observer physical distance at the instant of emission and *source absolute velocity.*
2. From the absolute velocities of the source and the observer, determine the velocity of the source *relative* to the observer, from which the velocity of the apparent source *relative* to the observer will be determined
3. Solve the problem by assuming that the speed of light is constant *relative to the apparent source*



Now we apply the above general analysis to the specific case of moving source and stationary observer shown above. Consider a light source moving towards an observer that is at absolute rest. We want to show that the speed of light is independent of the speed of the source.

Assume that the distance between source and observer *at the instant of light emission* is D. Assume also that the observer is at absolute rest.

The procedure of analysis is to determine the distance between the *apparent source* and the observer at the instant of emission and the velocity of the apparent source relative to the observer.

The apparent source distance D' at the instant of emission is :

$$D' = D\frac{c}{c - V_{abs}}$$

The velocity V' of the apparent source is determined by differentiating both sides of the above equation with respect to time:

$$D' = D\frac{c}{c - V_{abs}} \Rightarrow \frac{dD'}{dt} = \frac{dD}{dt}\frac{c}{c - V_{abs}} \Rightarrow V' = V\frac{c}{c - V_{abs}}$$

where V is the velocity of the real source and V' is the velocity of the apparent source relative to the observer.

According to AST, the speed of light is constant relative to the apparent source. So the speed of light relative to the observer will be $c + V'$. Therefore, the time elapsed between emission and detection of light will be:

$$T = \frac{D'}{c + V'} = \frac{D\frac{c}{c - V_{abs}}}{c + V\frac{c}{c - V_{abs}}} = \frac{Dc}{c\,(c - V_{abs} + V\,)} = \frac{D}{c} \qquad (\text{ because } V_{abs} = V)$$

Physically the light always starts from the real source S but light behaves as if it started from S' . Even though light appears to have been emitted from an apparent distance D' > D, the increase in distance is exactly compensated by the increase in the velocity of light. The velocity of light relative to the observer is c + V', where V' is the velocity of the apparent source relative to the observer. Therefore, the physically measured speed of light is independent of source velocity.

This shows that the physically measured speed of light is independent of source velocity, as confirmed by several experiments.

Discussion

The main aim of this paper is to present a new *model* of the speed of light that can consistently predict and explain the results of light speed experiments. But a question would surely arise: what is the physical meaning of Apparent Source Theory (AST) ? I would like to note that the physical meaning of AST has no importance in the analysis of light speed experiments, but is only useful for some intuitive understanding of the theory. AST can be understood intuitively as follows: the speed of light is $c + V_{abs}$ in the backward direction and $c - V_{abs}$ in the forward direction *relative to a source* moving with absolutely velocity V_{abs}. This is why the speed of light does not depend on the speed of the source. If a source moving towards a stationary observer emits light, the light will not arrive earlier because the speed of light relative to the observer will be the sum of the speed of light relative to the source in the forward direction (which is $c- V_{abs}$) and the speed of the source relative to the observer : $(c-V_{abs}) + V_{abs} = c$. AST implies bending of light rays relative to the source in lateral directions. Hence AST implies aberration of light even for absolutely co-moving source and observer.

AST turns out to be a kind of a fusion of ether (absolute motion) and emission theories. Most of the conventional experiments on the speed of light can be explained *either* by the emission theory *or* by the ether theory. This is a hint that the correct model of the speed of light is some form of fusion of the ether theory and the emission theories.

As a successful theory, AST also gives profound implications regarding the fundamental nature of light itself. The puzzle of light being a local or a non-local phenomenon is a centuries old puzzle and is still unsolved. The solution to the puzzle as implied by AST is proposed as follows:

Light is a dual phenomenon: local and non-local (action at a distance).

The other important problem is the implication of AST on Maxwell's equations. The electric and magnetic fields at every point in space seem to be controlled independently by the source. Consider absolutely co-moving source and observer. The light detected at the point of observation is more accurately understood as coming directly at the speed of light from the (*apparent*) source, and not from an adjacent point as in local phenomenon (e.g. sound wave). What is meant here is that light at point of observation comes from adjacent points of space, but we can't observe this physically, we just imagine it. If one tries to observe what is happening at an adjacent point, they will detect a wave coming to that point only. To every point of observation comes *its own* wave. Light is a dual phenomenon: local and non local. The current understanding of Maxwell's equations is based on a tacit assumption of the ether. Electromagnetic wave is still thought to be a local phenomenon, just as material waves, which is wrong. An EM wave propagates from the (apparent) source to the point of observation according to Maxwell's equations. We should not think this as material waves. We can't observe the propagation of the wave in the path between the apparent source and the observer: we just imagine it. *Each point in space surrounding the source observes its own, independent EM wave coming from the (apparent) source.* This is the distinction between electromagnetic waves and material waves. In material waves, all points along the path of a wave see the same wave, only differing in phase. *In the case of a light source (an EM wave source), an independent wave propagates to each point in space !*

Conclusion

In this paper we have completely disproved Lorentz transformation and the theory of Special Relativity. We have seen that Apparent Source Theory (AST) can consistently explain the Michelson-Morley experiment, Sagnac effect, moving source experiments.

Thanks to God and His Mother, Our Lady Saint Virgin Mary

References

1. Absolute/Relative Motion and the Speed of Light, Electromagnetism, Inertia and Universal Speed Limit *c* - an Alternative Interpretation and Theoretical Framework, by Henok Tadesse, Vixra
2. A Novel Solution to the Century Old Light Speed Paradox - Divorce of the Light Postulate from Special Relativity, by Henok Tadesse, Vixra
3. Special Relativity, Wikipedia