Theory of Absolute Space

By:


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Abstract

For many years and especially since publication of the Special Theory of Relativity, physicists use relative frames of reference to describe characteristics of movement. An inertial frame of reference was introduced to define a "Euclidean space carried by the observer" in which all physical laws hold true.

Conventional wisdom requires there to be a reference point to measure speed, since speed is always defined as relative movement to some other reference frame.

Since the discovery of electromagnetism and its properties, there is something "Not right" with this relative speed. In a "regular" space, velocities can be added and subtracted (as vectors) but the speed of electromagnetic waves violated this principle. It was always \( c \), regardless of the velocity of the emitting source.

I realize that this concept violates Lorentz transformation and the principle of relativity but it is the direct product of the invariant speed of light. Here, by invariant speed of light I think of propagation of electromagnetic waves in an empty space.

I will also show why Michelson-Morley type experiments cannot show the expected fringe shift. New type of the experiments (or modified M-M experiments) will have to be invented to prove (disprove) this theory.

This fact, that the speed of electromagnetic waves is constant and invariant of the emitting source will be used as a proof to show that there is an absolute space. The speed of an inertial frame of reference can be measured against this space even without having an observer comparing his position to anything else. One has to note that although the absolute space is the only stationary space it does not have an origin (as in coordinate system zero point). This space has only one characteristic and that is the fact that it is not moving and the speed of electromagnetic waves in that space is \( c \).
This paper will prove that there is absolute space as a special frame of reference that is not moving. It is the result of finite speed of electromagnetic waves. This absolute space is a unique space that is different from any other frame of reference (space).

This space is not aether and it is not movable. This is an absolute stationary space or absolute inertial frame of reference.

From philosophical point of view, it (at the first glance) would be absurd to talk about the movement relative to nothing. It is our everyday experience that limits us to understand the absolute space and its stationary characteristic relative to nothing.

Once one understands absolute space, this apparently absurd situation will be clear and there will be nothing absurd about it.

I realize that this is a theory against mainstream science. As it has happened many times in the past, when a new paradigm is raised then scientists have a new tool at their disposal for better understanding of our world.

I hope that my contribution, however controversial, will further our understanding of the universe.

One final note: Understanding of the world around us does not have to be complicated. Ever since the special theory of relativity was published, all explanation of physical reality became explanation of a mathematical solution of some differential equations. It should be the other way around, a physical (logical) model has to be built first and then described (quantified) by a mathematical model which has its own limitations and must be interpreted with caution. The beauty of this theory is in its simplicity. Nine dimensional space will never be able to describe our three dimensional world. Mathematical acrobatics is not physics.
II. RELATION TO PREVIOUS THEORIES

A. Galilean relativity

Great Galileo theorized about frames of reference in very simple terms. He stated that if a scientist performs a physical experiment under the deck of a ship with its windows closed on a smooth sea he would not be able to distinguish if the boat is moving with uniform linear speed or is not moving at all. All the experiments performed at a constant velocity in a straight line or at standing still would show the same results.

To generalize, all physical laws hold true in both stationary frames of reference and frames of reference moving at constant speed. Since there is not one point in space that we can say, with certainty, is not moving all motion is relative. It is just a matter of convenience to declare that I am stationary and you are moving or the other way around.

The key here is relative to what?

Everyday experience tells us that one needs to have a reference point relative to which one will measure the movement of everything else.

Historically, this reference point was the earth, considered to be immovable and every other motion was declared in relation to the earth. This logic gave us the name for planets - planetes is a Greek word for wanderer. The logic was that the earth was stationary and all stars travel around the earth in circular motion. Planets were not following this rule and were declared wanderers. Aristarchus of Samos (cca. 310 BCE-230 BCE) noticed this, and moved the absolute unmovable point to the middle of the sun. With this modification, all movements made sense. He had few followers but it was too hard to understand that something as big as earth can rotate around something perceived to be as small as the sun. Soon the theory was forgotten and had to wait for over 1700 years until Copernicus. The stationary frame of reference was placed in the middle of the sun. Later we realized that the sun is moving around the center of the galaxy...

The idea of absolute space was replaced with the idea of equal frames of reference.

To summarize: All physical laws hold true in any inertial frame of reference. There is not one special frame of reference. Every movement must be viewed as relative to something else. This is the present view in science.
B. Electromagnetism

At the beginning of the 19th century an English natural philosopher Michael Faraday was experimenting with electricity and discovered that a changing electric field creates a changing magnetic field and vice versa. Work of the Scottish physicist Maxwell and subsequently German scientist Hertz showed the existence of electromagnetic waves. It was later firmly established that light is a form of electromagnetic waves.

Through the work of many researchers and scientists the speed of propagation of electromagnetic waves in vacuum was established to be exactly 299 792 458 m/s. It was also noted that the speed of light (electromagnetic waves) is invariant of the source speed. In other words no matter how fast the source is moving the speed of light is always constant [c].

Those two statements will lead us to the establishment of the absolute space.

C. Special Relativity

Work of Einstein and Lorentz showed (falsely) that there is time dilatation if there is movement and that there is length contraction in the direction of that movement. Here I will not elaborate on special theory of relativity except to express the fact that the theory is based on incorrectly specified frames of reference.

I strongly suggest that after the reading of this paper, the reader look over original papers and books published about the theory of relativity. It will be crystal clear where the mistakes have been made.
III. EXPERIMENTATION

Since the speed of electromagnetic waves is extremely high it is very difficult to obtain reliable results that is clearly one order of magnitude bigger than the accuracy of measuring instruments.

Logical conclusions can be made if we use imaginary experiments. Here we can call on Aristarchus of Samos again: He did not have precise measuring instruments (just his eyes) and yet correctly concluded that the earth must rotate around the sun in order to explain "peculiar" movements of planets. Mathematics was not on a level that would allow him to know about sine and other trigonometrical functions and yet he attempted and calculated the size of Earth and the moon. Since he didn't have a protractor his results were way off but nonetheless his reasoning was right.

Einstein was very fond of the "Thought Experiment" since it can create a very good logical picture without spending too much money. Mathematical models could be developed based solely on thought experiments and those can give us tools necessary for confirmation of theory with reality.

I am not part of a research team with money and the equipment for experimentation and therefore I will limit myself to the theory only. If the theory looks promising and is without internal contradictions, I hope that some day someone will decide to do the experiment to prove (or disprove) it.

Ultimately it is up to the reader to decide if the theory is sound or not. In this decision I strongly suggest the reader not use assumptions that are "understood" in the development of the Special Theory of Relativity.

This theory also disputes Minkowski's space-time concept and brings physics back to Euclidean space with time as a separate characteristic.
A. Initial thought experiment

Imagine a space ship traveling in space with linear uniform speed (its engines not working). Its crew does not have any means to communicate with the outer world. There are no windows or any other devices available for the crew to see whether they are moving or not. For them there is no "relative to". They are in the frame of reference of the space ship and there is no other frame of reference they can relate to.

How possibly can they determine if they are moving or not? According to Galileo's (and Einstein's) relativity they are not able to determine if they are stationary or if they are moving in a straight line with uniform speed. When I am talking about the movement I assume they have to determine their movement along the axis of the ship. If they want to determine their true movement in relationship to absolute space they would have to repeat the experiment in the direction of two other axes perpendicular to the axis of the ship.

Since they have a lab on board the ship they can perform any experiment they want to. Let's say they decided to test the pendulum cycle time. The results confirm their theoretical prediction, all other physical experiments they perform show the results as expected and therefore they are concluding that either they are stationary or moving with uniform speed in space.

This, being a clever team of people (after all they are physicists), they come up with a setup that would give them an answer:

They devised the following experiment as shown in figure 1.
A time measuring unit (clock) is placed at point M and connected with point A through optical fibre cable of length $L_{AM}$ and with point B with the same length of cable $L_{BM}$, $L_{AM} = L_{BM}$. At point M there is the source of a light pulse. Points A and B are connected with optical fibre cable of length $L$.

Two signals are sent simultaneously (from one source), one towards point A and the other towards point B. Pulse signal that is sent towards point A (let’s call it signal A) travels from point M passing through point A, then B, and then back to point M. Total length that this signal travels is $L_A = L_{MA} + L + L_{MB}$.

Pulse signal that is sent towards point B (let’s call it signal B) travels from point M passing thru point B, then A, and then back to point M. Total length that this signal travels is $L_B = L_{MB} + L + L_{MA}$.

Both signals arrive back to point at the same time since they travel the same length $L_B = L_A$. Time for those signals is $t_A = t_B = (L_{MA} + L + L_{MB})/v_{oc}$, where $v_{oc}$=speed of light in optical cable.

So far no controversy, experiment turned out to be as expected.
B. Modified thought experiment

The procedure for this experiment is the same as in test one, except that optical fibre cable between points A and B is removed.

Logic for this test is as follows:

If the ship is moving forward then the light pulse that goes from point B to point A must take longer to reach point A since the target point A is moving away from the source and consequently, the light signal that is sent from point A must take less time since the point B is moving towards the signal. The difference between those two times must show the speed of the ship (relative to absolute space). After performing this experiment we can conclude, without any calculation, that the ship is moving due to the fact that the time M-A-B-M is less than M-B-A-M.

If the ship is moving backwards, the inequality is reversed. In any case, a clear conclusion can be made about the movement of the ship. Difference in pulse travel time implies that the ship is moving.

To determine the speed they can go many different ways; from measuring the time the signal travels from M-B-A-M and calculating the ship speed, knowing the time it should take the signal to
travel and subtracting the time signal actually travelled.

I will elaborate on the case with two signals sent at the same time (this way we avoid calculations to prove the point - the result can be obtained just by pure observation; just like Aristarchus observing planets). It should be noted that the time starts counting when the signals are sent from point M in both directions. This fact enables us to determine the maximum possible speed of electromagnetic waves (see explanation later in the text).

In this test a light pulse is sent from point M through optical fibre cable to point A, then the light travels in a free space between points A and B, after that the pulse goes through optical fibre back to the start point M.

1. Order of Events

(0) Signals are sent from point M

Pulse signals (pulse A with path M-A-B-M, pulse B with pattern M-B-A-M) are sent simultaneously from point M through two optical fibre cables. The clock is started at the same time. Time at this event is \( t_0 = 0 \).

(1) Signal A reaches point A, signal B reaches point B

Signal (let's call it B-signal) travels through optical fibre cable from point M through point B. As the time signal (pulse) reaches point B time is observed as time \( t_1 \).

Signal (A) that was sent from point M travels through optical fibre cable reaches point A at the same time as signal B reaches point B. This is because the length of optical fibre cable is the same as for the signal B.

Time for this event is

\[
t_1 = \frac{L_{AM}}{v_{OC}} = \frac{L_{BM}}{v_{OC}}
\] (1)

Here \( v_{OC} \) = speed of light in optical fibre cable

At the end of this event both signals are at their corresponding points (A signal at point A and B signal at point B)

(2a) Signal A reaches point B

Now, this is a different event than in the previous experiment. Signal A will reach point B after time \( t_{2A} \), where \( t_{2A} \) is the time taken for the light to travel from point A to point B. Length \( L_{2A} \) is the distance the ship moves (point B moves for distance \( L_{2A} = v \times t_{2A} \)). At
the same time light pulse will travel distance $L - L_{2A}$ with speed $c$. Here $v =$velocity of the ship (it could be said “relative to absolute space”)

Hence

\[ L - L_{2A} = c \times t_{2A} \]  
\[ L - (v \times t_{2A}) = c \times t_{2A} \]  

After re-arranging, this becomes

\[ t_{2A} = \frac{L}{(c + v)} \]  

(2b) Signal B reaches point A

This is the event where pulse B traveling from point B reaches point A (which moved away from point B while pulse was traveling through empty space (not optical fibre cable). Here again we can state that time $t_{3B}$ is the time point A moves for distance $L_{3B}$

\[ L_{2B} = v \times t_{2B} \]  

The light pulse travels distance $L + L_{2B}$ in this time ($t_{2B}$) at the speed $c$, so we can write

\[ t_{2B} = \frac{(L + L_{2B})}{c} \]  

If we express $L_{2B}$ from the equation for the movement of point A (After all, it is the same time)

\[ t_{2B} = \frac{(L + vt_{2B})}{c} \]  

After rearranging, this becomes

\[ t_{2B} = \frac{L}{(c - v)} \]  

(3a) Signal A reaches point M

Light pulse A travels from point B towards point M and reaches the target at point M. The time for this event is $t_{3A} = \frac{L_{MA}}{v_{OC}}$. At this point pulse A reaches the target M.

(3b) Signal B reaches point M

Light pulse B travels from point A towards point M and reaches the target at point M. The time for this event is $t_{3B} = \frac{L_{MB}}{v_{OC}}$. At this point pulse B reaches the target M.

Total time for pulse A is:

\[ T_A = t_1 + t_{2A} + t_{3A} \]
Total time for pulse B is:

\[ T_B = t_1 + t_{2B} + t_{3B} \]  \hspace{1cm} (10)

We know that \( t_{3A} \) and \( t_{3B} \) are the same time since the lengths of optical fibre cable are the same.

Time delay between pulse A and pulse B is

\[ T = T_B - T_A = t_1 + t_{2B} + t_{3B} - (t_1 + t_{2A} + t_{3A}) = t_{2B} - t_{2A} \]  \hspace{1cm} (11)

If we replace \( t_{2A} \) and \( t_{2B} \) with known values from equations (3a) and (3b), we will get a time delay of

\[ T = \left[ \frac{L}{c - v} \right] - \left[ \frac{L}{c + v} \right] \]  \hspace{1cm} (12)

After re-arranging, this becomes

\[ T = \frac{2Lv}{c^2 - v^2} \]  \hspace{1cm} (13)

At this point we can notice that for \( v > c \) the result would not make sense, since it would yield negative time (experiment would have to be finished before it starts). From here we can calculate ship’s speed (knowing \( T, L \) and \( c \)) as:

\[ v = \frac{-L \pm \sqrt{L^2 + T^2c^2}}{T} \]  \hspace{1cm} (14)

A careful reader will note that the equation has two solution. A solution with plus sign in front of the root will give us the velocity of the ship as we originally assumed it (from right to left)

A solution with a negative sign in front of the root will give us a proper answer if we take \( L \) as a negative vector (and this solution will give us negative sign for the ship velocity which means that the ship is moving backwards (from the left to the right) and our reasoning was for forward motion).

In any case the solution above gives us the same velocity of the ship in direction parallel with vector passing from point B to point A

The point is proven in any case. The crew was able to determine if they were moving without having any reference point outside their inertial frame of reference (and they were even able calculate their speed in relationship to the absolute space).
There follows a graphic representation of this logical reasoning:

Fig. 3
Distance AB = L = const.
Speed of light c
Velocity of ship v
The crew decides to make the following experiment. They send a pulse at the same intervals (let's say every second) to measure passage of time. The signal (A) goes from M through A than B than back to M. The signal B travels in opposite direction. After the initial time delay the signals come to the target at the same interval as they are sent so the crew conclude that there is no time dilatation (as expected). If two clocks are placed at point M they will both show pulses arriving every second (after initial time delay).

C. Thought experiment #3

Let's assume that the crew want to make an experiment similar to Michelson-Morley and they decided to rotate the ship around the axis that passes through midpoint between A and B (for easier calculation). They fire side rockets to rotate the ship into clockwise direction and observe incoming signals at point M.

At one point the ship is rotated for angle $\phi$. The Fig. 4 shows this situation.

Let's discuss what happens at this point.

Since the experiment is the same as before, the only difference is that the ship was rotates for the angle $\phi$ from its original position. In further discussion I will omit light path through optical fibre cable and just discuss events between points A and B.

As you can see on the fig. 4 where situation is shown when signal A leaves point A and signal B leaves point B.
Due to the speed of ship in the direction $v$, both signals miss their respective targets. Here we have to emphasise that if the ship speed is sufficiently small and the diameter of optical fibre cable big enough the signals will hit the entry point into optical fibre cable but not exactly at the point A or B (assumed to be in the middle of the optical fibre cable cross sectional area).

This experiment shows that Michelson Morley type experiments will never produce meaningful results since the mirrors would have to be adjusted every time rotation is
made in order for signal to hit exactly the same point on its return path. Small differences are big enough to eliminate meaningful phase shift.

Here I have to come back to the second experiment. As it was shown on Fig. 2. line between points A and B is parallel to the axis of the ship. In real situation this would only be true if the ship speed (perpendicular to $v$) is zero, otherwise in set up like this signals would miss each other. The experiment would have to be set up in such way that the signal from point A hits target in B which would not necessarily mean that line AB is parallel to the axis of the ship.

For those familiar with the Special Theory of Relativity:

Let’s assume that the clock is placed at the point M which will measure the time for both signals. Also we assume that the distance from point A to point B is the same as distance from point B to point A.

Let’s assume that the crew decided to measure the length of the bar AB. Knowing constant speed of light and the time for the pulse to travel from A to B, the length can be easily calculated as $L = c \cdot t$ (where $t$ is the time for light to travel from point A to point B or from point B to point A). Since the time for signal traveling from A to B is different than time for signal traveling from B to A, we would get two different length of the rigid rod AB. The rod is in the same reference frame as the clock so the conclusion of length contraction (expansion) at the same time does not make any logical sense. Even if an observer outside of the ship objects that the time dilatation would also play a role we cannot explain the time delay between signals with the SR theory. SR is based on the same logic as this thought experiment (except no fibre optic cables and no two different frames of reference) and therefore the same logic should apply (delay of signals). Easy measurement of AB distance would be to insert optical fibre as in experiment 1 and then calculate distance AB taking into account reduced speed of light in the glass. All 3 measurement should give us the same result if we take into account ship's movement in relation to absolute space.

Here I would like to mention the experiments that involve mirrors. If the experiment frame of reference moves in relation to the absolute space the speed will be "increased" in one direction and "decreased" for the same amount in the opposite direction and therefore eliminate the absolute space component.
IV. CONCLUSION

We have proven that if one devises an experiment as we did, one can determine if the ship is moving in relation to absolute space. This is an important conclusion which will affect our thinking about our place in universe. Its result, moving relative to nothing, is as controversial as the velocity of electromagnetic waves being independent of the emitting source (which is a scientific fact).

Use of optical fibre cable is important since it places the light in the same frame of reference as the observer (except during the interval where it is in its own frame of reference—from point A to point B). The experiment would lead to the wrong conclusion if optical fibre cables were not used.

I realize that this nullifies Einstein’s theory of relativity but the mistake that was made there cannot be ignored. The mistake was to assume that the inertial frame of light is the same as the inertial frame of reference of an observer who performs the experiment with light signals.

Because of the unique property of electromagnetic waves one can determine their movement in relationship to absolute space. Absolute space can be defined as the space of electromagnetic waves.

The speed of EM waves is always what it is (in vacuum 300 000 km/s). The EM waves simply have that propagation speed in its own space (frame of reference).

This theory does prove the maximum possible speed. At the experiment set up with velocity of the ship greater than c, time would be negative which does not make sense since this would mean that the experiment is finished even before it started. There might be cases that there is different frame of reference than absolute space for electromagnetic waves and there would be possibility to obtain higher speeds. Here my reasoning is as follows: if one accelerates a straight fibre optic cable to half speed of light (along the axis of the cable) and then sends light pulse from back end of the cable to the front end, that signal would travel with speed higher than c. This is because the speed of light in optical fibre cable is approx. 2/3 c and speed of fibre optic cable would be 1/2 c then the information transfer would occur at 1-1/6 c which is faster than the speed of light. Here, one can see difficulty of accelerating optical fibre cable to 1/2 c but similar situations can develop in particle accelerators where the surrounding of a particular light wave would travel at very high speed and therefore frame of reference for that particular light wave (pulse) could be something similar to that of optical fibre cable.


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