Special Relativity and Newtons Axioms

Dr.-Ing. Hartmut Schwab, Reutlingen, Germany

Abstract

It is demonstrated in three independent ways that the Special Relativity Theory (SRT) describes an effect derived from a misinterpreted thought experiment, i.e. an effect not existing and therefore is disproved. Time remains absolute and there is no necessity of a space-time continuum.

The best known effects modelled by the SRT until now are described by classical Newtonian physics.

1 Introduction

A well known quotation of Einstein reads: "Make things as simple as possible – but not too simple".

The goal of this paper is, following the quotation, to examine how far one can go with the classical physics, i.e. the first two of Newtons axioms, to describe the phenomenons demonstrated by experimental physics and derived from reflections which at present are described by the more complex model of the Special Relativity Theory (SRT).

For this purpose, it must be emphasized, that the assumption, light would propagate with constant velocity c in every unaccelerated coordinate system[1] (CS), and that this velocity cannot be reached by any object equipped with rest mass, does not require to be forced by a mathematical operation, i.e. the Lorentz Transformation. Nature itself provides for this (cf. Chapter 4).

The idea of a space time continuum with time depending on velocity [1] and different views of observers in CS with different velocities therefore is not necessary.

2 Confirmation and Extension of Galilei's Relativity Principle

Experimental physics have shown that objects with finite rest mass can not be acceleated up to light velocity, because their mass is more and more enlarged by approaching light velocity. This ensures the limitation of all objects with finite rest mass to velocities below light velocity. Additional limitation mechanisms are not necessary.A singular case are objects without rest mass, e.g. photons, which move with light velocity in every CS and are an exception in such a way that they either move and thir mass is finite or they do not move and lose their kinetic energy and their existence. Thus, the Galilei Transformation as a linear addition rule of the velocities of an unaccelerated KS and of objects moving steadily therein is still valid.

Hence, there is no necessity for a modification or a replacement of Galilei's relativity principle.

3 Relativity of Time

Looking at a theoretical event like the operation of a light clock [cf. eg. 8] in a CS with a velocity near light velocity from the view of an observer in the same CS (moving observer) and one in a distant CS (distant observer), the relativistic view is that the moving observer sees the light clock operate in just

[1] According to the common view proved on the earth (Michelson-Morley experiment [2]), hence in an approximately unaccelerated CS

the same way as before the acceleration, while the distant observer sees the clock slowing down with increasing velocity of the moving CS..

This view, however, is not correct with respect to the observation of the distant observer because the changing distance between observer and light clock from the start of a light pulse until its return was not taken into consideration. After all, the informations concerning these two events can be submitted to the distant observer only by light or radio, hence with light velocity, which means that the information concerning the second event arrives delayed with respect to that of the first event (if the CS of the moving and that of the distant observer depart from each other). From that the distant observer gets the impression that the operation of the light clock is slower than that of his comparing clock. Knowing the relative velocity between his CS and that of the moving observer, this delay can be taken into account, and the result is that the distant observer sees the operation of the light clock corresponding with that of his comparing clock and with the view of the moving observer.
Supposing – as customary until now – that the distant observer gets the informations about the events in the CS of the moving observer without delay by the transmission, there were no change in the result. The distant observer now sees how the light seemingly does a longer way, from which until now was deducted that it travels longer until it returns to the transmitter. However, it was overlooked that seemingly the velocity grows, too, by which the distant observer sees the light moving, because the relative velocity between the CS of the moving and the distant observer has to be (geometrically) added to the real light velocity, just as it was done with the distances. This seeming increase in light velocity exactly compensates the seeming increase in the distance.

Finally, it can be shown by means of the SRT itself that the views of the moving and distant observer on the light clock are identical: The SRT postulates that the distances in the direction of the movement of the light clock are shortened by the factor $\frac{1}{\gamma}$. The distance which the light clock travels while the light travels the distance l is such a distance (vt_1, cf. Appendix, Chapter 11.2, Figure 2). If this shortening is taken into account, the light clock operates the same way in the view of the moving and the distant observer.

Thus, the basis of the SRT is refuted. There is no difference between the views of the moving and the distant observer and hence the entitlement for a theory which explains such a difference is inapplicable.

The experimental results and thought experiments, however, which until now were explained by the SRT now must be brought into line with the classical physics. This shall be done for the most important ones in the following chapters.

4 Dependency of Mass on Velocity

The mass increase of an object with finite rest mass when approaching light velocity, which was predicted by the SRT and confirmed by numerous experiments, can be demonstrated by the classic Newtonian physics, too, if the insight is taken into account that mass and energy are equivalent, which is confirmed many times by highspeed particle physics.

An accelerated mass gains speed and kinetic energy. The latter is equivalent to an additional mass which at further acceleration must be accelerated, too, and requires additional enery for this purpose. The consequence is that the mass becomes speed dependent with a minimum, the rest mass, in its CS at zero relative velocity. Because of the velocity dependent mass Newton's acceleration rule (second Newtonian axiom) is only valid in its impulse form. If the infinitesimal increase of kinetic energy with respect to the infinitesimal increase of acceleration is interpreted as infinitesimal mass increase which must be additionally accelerated at the next acceleration step, the integration of the differential equation describing this event up to the light velocity yields the mass increase factor γ and the

Einsteinian equivalence of mass and energy solely from the classic Newtonian physics (cf. Appendix, Chapter 11.1).

Of course, the increase of mass is not real, but the increase is due to the equivalence principle and, in reality, is an energy increase. The most important result is that energy is inert.

5 Lenght Contraction

An object which moves away from a distant observer experiences a shortening by the factor $\frac{1}{\gamma}$ in the direction of its movement according to the SRT ([9]). While approaching light velocity it approaches zero length, its mass approaches infinity. This would mean a black hole, which was not observed even at the biggest particle accelerators, but was considered to be possible.The reason is again that the distant observer does not take into account the seeming light velocity (cf. Chapter 3).

This is demonstrated in Appendix 11.2 by comparisons of calculations of the Michelson Morley experiment, firstly following the ideas of the SRT and secondly according to the results of Chapter 3.

6 Myons

Myons are created in the atmosphere at a height of about 10 km by collisions of air molecules and high intensity cosmic radiation and their velocity at the moment of their creation is very close to light velocity. Their medium lifetime at rest is approx. 2.2 microseconds (measuring procedure cf. e.g. [3]).

According to this lifetime, which corresponds to a flight distance of approx. 660 m until disintegration, no myons should be found at the earth surface, but they are. To reach the earth surface without any decay of their velocity, a lifetime of approx. 33 microseconds would be necessary, and because the myons are decelerated by scattering at the air molecules on their way, even remarkably more.

It is now argued that as the myons at creation time are moving with nearly lig ht velocity, their liftime, according to the SRT, be by a factor γ bigger as their lifetime at rest, so according to a determination at relativistic myons in a particle accelerator such of 64 microseconds [4]. This bigger lifetime would enable the myons to reach the earth surface. Calculating back according to the SRT to the lifetime at rest also yields approx. 2 microseconds, which is judged to be a brilliant confirmation of the SRT.

Undoubtedly, myons possess a lifetime depending on their velocity, but this is an indirect dependency which has nothing to do with a velocity dependent time dilation.

The disintegration row e.g. of a negative myon is the same whether it disintegrates close to light velocity or at rest: one electron, one photon, one myon and one anti electron neutrino. These particles, however, have much less mass at rest compared with the mass at velocities close to light velocity. If the loss of mass at disintegration in both cases were identical, the rest mass of the myon could not cover the loss of mass at all, i.e. the myon would have to be totally transfered into γ radiation.

So, the loss of mass and accordingly the bond energy at „high“ velocities is remarkably higher than at rest, and as the disintegration probability descends when the bond energy raises, life time increases. Supposed that the mean lifetime of a myon is proportional to its mass (this is a hypothesis, but a probable one), on the one hand at rest, on the other hand at the velocity of its creation, the factor of the mass and the lifetime increase are identical, namely the Lorentz factor γ. Thus, the result for the velocity dependent lifetime of the myons is the same as according to the SRT. This hypothesis can be assessed as soon as there is success in expanding the standard particle model of the particle physics by the particle mass and to check if the mean lifetime of the myons is really proportional to their velocity dependent mass.

7 Atomic Clock in Aircraft

The experiment comparing an atomic clock on board a flying aircraft with an identical one at ground showing a small time delay of the clock on board the aircraft seems to prove time dilation depending on speed. This experiment from 1971 carried out by Hafele and Keating [7] contains such serious shortcomings, which at least partially were admitted later on by the authors, too, that it can not be taken serious. Additionally it has to be considered that the presumption, the clocks be in unaccelerated CS, is not valid for either of them, and that the elevation of the clock on board the aircraft from ground to flying height in the gravitational field of the earth supplies (potential) energy to the clock, such rising its mass, where the supplied potential energy at a flight speed of 250 m/s at an altitude of 10 km is approx. 1.5 times larger than the kinetic one and therefore plays the more relevant role.

There are reported time dilations of approx. 250 nanoseconds at flight times of 65 hours and more, which would yield a time dilation (time difference of the clock on ground, 30 km/s on its orbit around the sun, compared with that on board the aircraft, 30.25 km/s) by SRT of approx. 0.09 ns/s, hence a time dilation per hour flight time of 324 ns compared with the clock on ground. This is a time difference reached in the experiment not within one, but within 65 hours of flight time. As the orbit velocity of the sun around the center of the milky way is even much larger (270 km/s), the correct SRT calculation yields a much larger (tenfold) time dilation.

8 Twin Paradox

This means the following thought experiment: A twin starts a space flight straight away from the earth with a velocity near light velocity, after a flight duration of e.g. five years according to his clock turns over, and returns on the earth after ten years. He has become ten years older according to his clock, but he discovers with great astonishment that his brother on the earth now is remarkably older than he. According to the SRT, time runs slower in CS whose velocity is not small compared with light velocity as in CS at rest, and therefore he has aged slower than his brother.

With the help of an (x,t) diagram it can be easily assessed whether this statement is correct (Figure 1).

The t coordinate is dimensioned in a way by multiplying it with the light velocity that the result is the same way per unit of time as on the x coordinate when one moves in this direction with light velocity. An object which is locally at rest, hence moves on or parallelly to the t coordinate, one which moves locally, in the direction of t he t coordinate as well as in the direction of th x coordinate, and could it move with light velocity, on a $\pm 45°$ straight line.

Watching the twins, this situation is found: A stays on the earth, „moving“ on the t coordinate. B moves with a velocity close to the light velocity, beginning at t=0,in the direction of the positive x coordinate straight away from the earth, i.e. he moves on a straight line through coordinate zero which has an angle of less than 45° against the t coordinate. He sends a radio signal to A every second according to his clock. As he is rapidly moving away from A, the runtime of every radio signal following up increases and every signal arrives at A more than a second later compared with the signal before. It seems to A as if the time in B's spacecraft goes by slower than on the earth. One can tourn round this and let A send the radio signals. The for B time at A seeems to run slower. When they meet again, from the view of either of them the other is older.

According to the SRT, the time dilation factor is the Bondi factor k ($k = \sqrt{\frac{1+\frac{v}{c}}{1-\frac{v}{c}}}$, cf. [5]). When the

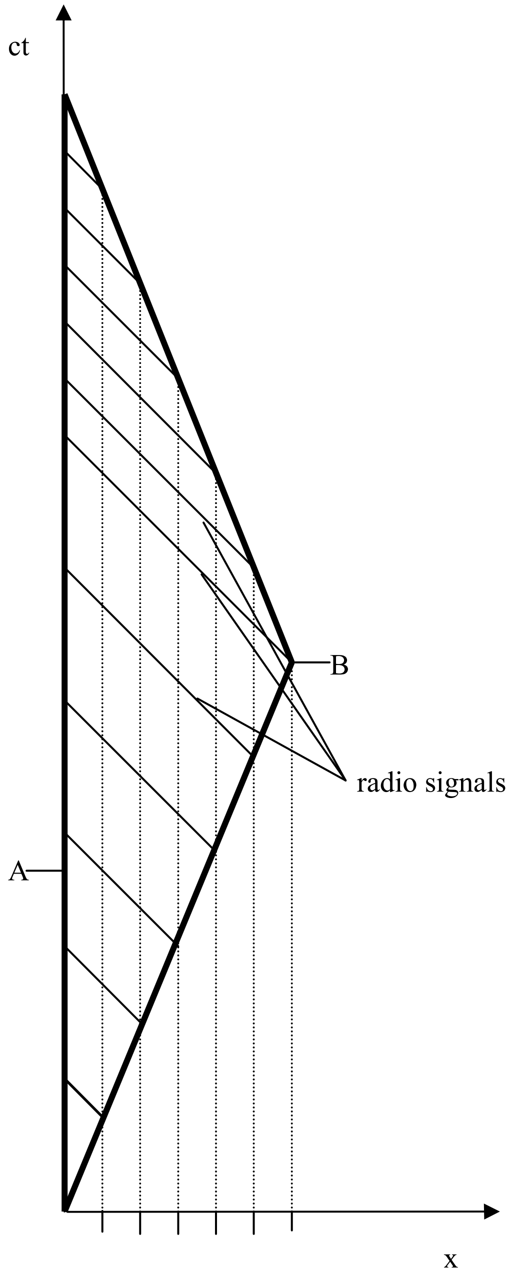

Figure 1: World Lines of Twins

spacecraft is on its way back, it moves on a straight line with an angle of less than –45° against the t coordinate. Now the radio signals arrive at A with a gap of less than one second. According to Paus [5] the reduction factor is $\frac{1}{k}$. Hence, if B has sent n radio signals on each half of the space flight, elapsed time for him on this journey is

$$t = 2nT$$

and for A

$$t' = n(k + \frac{1}{k})T \equiv 2nT\gamma \geq t$$

As can be seen easily, however, the increase of the runtime of the radio signals its not multiplicatively, but additively proportional to the grown distance of the spacecraft between two adjacent radio signals,

$\Delta t = \frac{v}{c} T$, and on the way back the same is valid for the shortening of the runtime:

$t' = n(T + \Delta t) + n(T - \Delta t) \equiv t$

Hence, the twin „paradoxon“ turns out to be a logical fault in the thought experiment. It is surprising that despite the high age of the experiment, this fault was not noticed earlier.

Occasionally it is claimed that the acceleration phases must be taken into account. Apart from the fact that the SRT is not valid in accelerated CS by definition, nothing is altered on the additive character of the change of the runtime of the radio signals and hence on the cancellation of the effect on the outward and backward flights.

9 Essential Conclusions

To describe the penomenons occuring at velocities close to light velocity, it is not necessary to presume time to be relative. The second Newtonian axiom, rather, is absolutely sufficient (cf. Appendix, Chapter 11.1) without the necessity of different views of the observer at rest and the moving one and hence time being relative. Additionally, the thought experiment (Chapter 3) which was used to justify the idea of a relative time was interpreted falsely, why this idea is obsolete together with the theory explaining it.

10 Outlook

The return to time being absolute has remarkable consequences on astronomy and cosmology. Therefore, every model idea must be assessed where the relativity of time or the space-time continuum plays a role, especially in the direction if, without the assumption of relative time or a space-time continuum, all observed phenomenons can be explained satisfyingly and be modelled reasonably by means of the classical physics, i.e. to apply the famous „Ockham's razor“. Especially, there is to think of the field theories like e.g. the General Relativity Theory and its best known consequences (e.g. „black holes“).

11 Appendix

11.1 Dependency of Mass on Velocity, Demonstrated by Newton's Second Law

From particle accelerator experiments it is known that particles with finite rest mass can not be accelerated up to the light velocity, but their mass increases by approching light velocity with a pole of mass at light velocity. This is corroborated by the SRT which postulates a relationship γ of the velocity dependent mass and the rest mass

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

Additionally it is known, as well from particle accelerator experiments, that mass and energy are equivalent because the one can be transferred into the other:

$$E \sim m = C \cdot m \qquad (2)$$

An accelerated object gains velocity and kinetic energy; the latter is, according to (2), equivalent to an additional mass which must be additionally accelerated when further accelerating the object and for this purpose needs additional energy. Therefore, mass becomes velocity dependent with a minimum, the rest mass in the actual CS, at low velocities v_0. With respect to the velocity dependent mass the Newtonian acceleration law now is only valid in its impulse form,

$$K = \frac{dp}{dt} \equiv \frac{d(mv)}{dt} \qquad (3)$$

The infinitesimal increase of kinetic energy with respect to an infinitesimal increase of velocity is, according to (3)

$$K = \frac{d(mv)}{ds}\frac{ds}{dt} \qquad (3a)$$

$$Kds \equiv dE_{kin} = vd(mv) \qquad (3b)$$

$$dE_{kin} = v^2 dm(v) + \frac{1}{2} m(v) d(v^2) \qquad (4)$$

This increase of energy is equivalent to an infinitesimal increase of mass which has to be accelerated additionally at the next (infinitesimal) acceleration step (cf. (2)):

$$dE_{kin} = Cdm(v) \qquad (5)$$

(4) and (5) yield

$$Cdm(v) = v^2 dm(v) + \frac{1}{2} m(v) d(v^2)$$

$$(C - v^2) dm(v) = \frac{1}{2} m(v) d(v^2)$$

$$\frac{dm(v)}{m(v)} = \frac{1}{2}\frac{d(v^2)}{C - v^2} \equiv -\frac{1}{2}\frac{d(1-\frac{v^2}{C})}{1-\frac{v^2}{C}} \qquad (6)$$

If (6) is integrated from v_0 to v, a short intermediate calculation yields

$$\frac{m(v)}{m(v_0)} = \frac{\sqrt{1-\frac{v_0^2}{C}}}{\sqrt{1-\frac{v^2}{C}}} \qquad (7)$$

Particles with finite rest mass can not be accelerated to light velocity as is known from particle accelerator experiments. Their mass grows over all borders when approaching light velocity, i.e. the mass has a pole at v=c. From this follows:

$1-\frac{v^2}{C} = 0$ for v=c, hence $C = c^2$

This yields

$$\frac{m(v)}{m(v_0)} = \frac{\sqrt{1-\frac{v_0^2}{c^2}}}{\sqrt{1-\frac{v^2}{c^2}}}; \; v_0 << c: \quad \frac{m(v)}{m(v_0 \approx 0)} = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (8)$$

and with (2)

$$E = mc^2 \qquad (9)$$

This is exactly the relationship for m which the SRT yields by the application of the Lorentz transformation, too, but without the necessity of an assumption of different views of the moving and the distant observer and hence to the realtivity of time, and for the equivalence of energy and mass from Einstein's photo emission experiment [6]. Here, both relationships were derived from the classical Newtonian mechanics.

11.2 Calculation of the Michelson-Morley Experiment According to the SRT Versus Chapter 3

It can easily and clearly be demonstrated from where the claim for the shortening of distances arises by calculating the Michelson-Morley experiment, firstly according to the SRT, secondly with respect to the seeming light velocity according to Chapter 3, seen by the distant observer:

The lenght of the light way s_1 is

$$s_1 = \sqrt{l^2 + v^2 t_1^2} \tag{10}$$

The runtime for the lenght s_1 is

$$t_1 = \frac{s_1}{c} \tag{11}$$

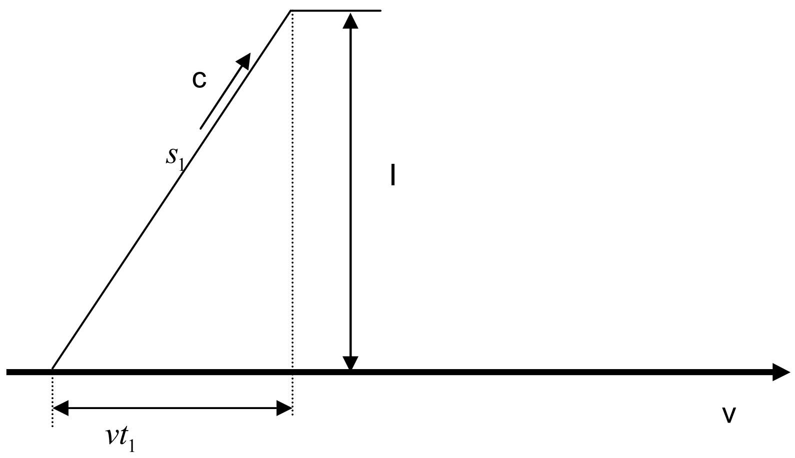

Figure2: Partial ray perpendicular to the direcection of movement of the Michelson-Morley experiment arrangement according to the SRT

This yields

$$t_1 = \frac{l}{c\sqrt{1-\frac{v^2}{c^2}}} \tag{12}$$

and for the ways forward and back

$$t_0 \equiv 2t_1 = \frac{2l}{c\sqrt{1-\frac{v^2}{c^2}}} \tag{13}$$

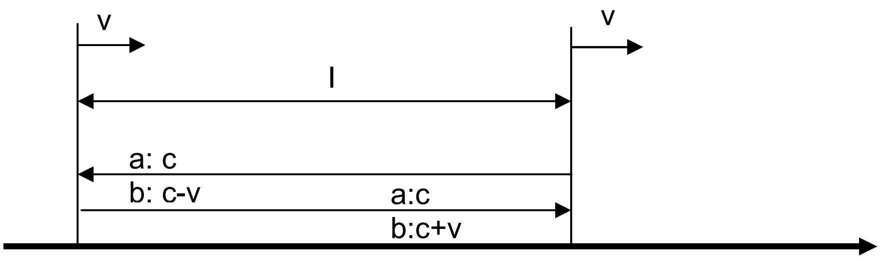

Figure3: Partial ray in the direcection of movement of the Michelson-Morley experiment arrangement
a: according to SRT
b: according to Chapter 3

The lenght of the light way s_1 on the way forward is (cf. Figure 3a)

$$s_1 = l + vt_1 \tag{14}$$

The runtime for the lenght s_1 is

$$t_1 = \frac{s_1}{c} \tag{15}$$

This yields

$$t_1 = \frac{\frac{l}{c}}{1 - \frac{v}{c}} \tag{16}$$

The lenght of the light way s_2 on the way back is

$$s_2 = l - vt_2 \tag{17}$$

The runtime for the lenght s_2 is

$$t_2 = \frac{s_2}{c} \tag{18}$$

This yields

$$t_2 = \frac{\frac{l}{c}}{1 + \frac{v}{c}} \tag{19}$$

and for the ways forward and back

$$t_0 \equiv t_1 + t_2 = \frac{2l}{c\left(1 - \frac{v^2}{c^2}\right)} \tag{20}$$

Comparing the runtimes for the longitudinal and perpendicular ways of the light, it is obvious that the runtime for the longitudinal way is larger by a factor of γ than that for the perpendicular way. From this the claim of the SRT results that the lenghtes in the direction of the movement of the Michelson-Morley experiment have to be shortened by the factor $\frac{1}{\gamma}$ in order that both runtimes become identical.
Of course, behind that is no modelling of a physical effect, but it is merely a trick to achieve the desired result that the Michelson-Morley experiment be not violated.

If this reflection is performed with respect to the knowledge from Chapter 3 it can be seen easily that the runtime perpendicular to the movement of the experiment arrangement is

$$t_0 = 2\frac{l}{c} \tag{21}$$

and in the direction of the movement the lenght of the way forward

$$s_1 = l + vt_1 \tag{22}$$

The runtime for the way forward s_1 is (cf. Figure 3b)

$$t_1 = \frac{s_1}{c+v} \tag{23}$$

(22) and (23) yield

$$t_1 = \frac{l}{c} \tag{24}$$

The lenght of the way back s_2 is

$$s_2 = l - vt_2 \tag{25}$$

The runtime for the way back s_2 is

$$t_2 = \frac{s_2}{c-v} \tag{26}$$

(25) and (26) yield

$$t_2 = \frac{l}{c} \tag{27}$$

and for the ways forward and back

$$t_0 \equiv t_1 + t_2 = 2\frac{l}{c} \tag{28}$$

So, the Michelson-Morley experiment is confirmed freely using the model description of Chapter 3.

12 References

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