Absolute Theory of Relativity (ATR)

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Abstract.

While Einstein considered a relative space and relative time but the ultimate speed of light, we did the opposite: we considered an absolute time and absolute space but no ultimate speed, and we called it the Absolute Theory of Relativity (ATR). ATR has no time dilation, no length contraction, no relativistic simultaneities, and no relativistic paradoxes.

After the 2011 CERN's muon neutrino experiments with speed greater than the light speed, we recall our hypothesis and theories of superluminality. We don't use Minkowski spacetime since we consider it as artificial, imaginary. We use the normal classical 3D-Euclidean space and 1D-time. Galilean transformations and symmetries are valid in our space.

Our 1982 approach ([2]) is different from Santilli's ([5]) views who has worked for years at a nonrelativistic absolute time theory, but at the covering Lie-isotopic level for interior dynamical problems, as in the iso-Galilean part of his volumes of 1991.

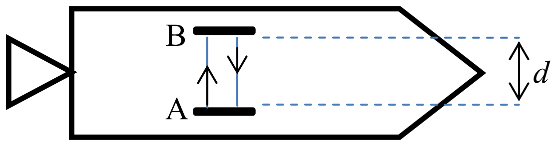
His theory is nowadays vulgarized as "parametric Galilei relativity," of course without any quotation of its origination, but in so doing they lose the crucial invariance over time (prediction of the same numbers under the same conditions at different time). Prior to his 1991 work, Dr. Santilli worked in the 1970s for years with Paul Roman and Jack Agassi on a relativistic absolute time theory, the nonrelativistic case being reachable via simple contraction, thus being considered a particular case. The literature on this is rather vast nowadays. The shortest presentation is that available in Section 3.5 of book [6].

1. Einstein's Thought Experiment with the Light Clocks.

There are two identical clocks, one is placed aboard of a rocket, which travels at a constant speed v relative to the earth, and the second one is on earth. In the rocket, a light pulse is emitted by a source from A to a mirror B that reflects it back to A where it is detected. The rocket's movement and the light pulse's movement are orthogonal. There is an observer in the rocket (the astronaut) and an observer on the earth. The trajectory of light pulse (and implicitly the distance traveled by the light pulse), the elapsed time it needs to travel this distance, and the speed of the light pulse at which is travels are perceived differently by the two observers {depending on the theories used – see below in this book}.

According to the astronaut:

Fig. 1



$$\Delta t' = \frac{2d}{c} \qquad (1)$$

where:

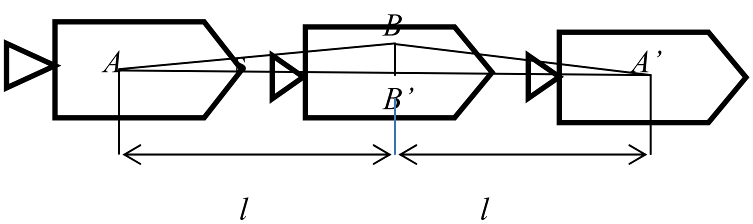
$\Delta t'$ = time interval, as measured by the astronaut, for the light to follow the path of distance $2d$;

d = distance;

c = speed of light.

According to the observer on earth:

Fig. 2



$$\begin{aligned} 2l &= v \cdot \Delta t \\ s &= |AB| = |BA'| \\ d &= |BB'| \\ l &= |AB'| = |B'A'| \end{aligned} \qquad (2)$$

where Δt = time interval as measured by the observer on earth.
And using the Pythagoras' Theorem in the right triangle *ΔABB'*, one has

$$2s = 2\sqrt{d^2 + l^2} = 2\sqrt{d^2 + \left(\frac{v \cdot \Delta t}{2}\right)^2} \qquad (3)$$

but $2s = c \cdot \Delta t$, whence

$$c \cdot \Delta t = 2\sqrt{d^2 + \left(\frac{v \cdot \Delta t}{2}\right)^2} \qquad (4)$$

Squaring and computing for Δt one gets:

$$\Delta t = \frac{2d}{c} \cdot \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} . \qquad (5)$$

Whence Einstein gets the following time dilation:

$$\Delta t = \frac{\Delta t'}{\sqrt{1 - \frac{v^2}{c^2}}} \qquad (6)$$

where $\Delta t > \Delta t'$.

2. Refuting Einstein's Speed of Light Postulate.

We do the opposite of what Einstein did. Instead of considering the speeds of the clock light the same for both observers, while the time intervals different, we consider the time intervals are the same for both observers, while the speeds c and respectively $v+c$ not equal. We refute Einstein's speed of light postulate according to our hypothesis that there is no speed limit in the universe and one can construct arbitrary speeds.

The classical formula

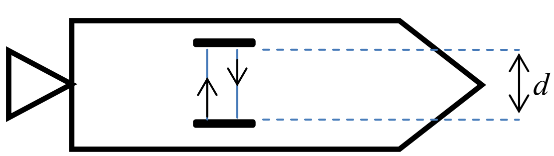
$$\textit{Distance} = \textit{Speed} \times \textit{Time} \qquad (7)$$

was distorted in the Special Theory of Relativity in the following way: *Time* was increased (dilated), while *Distance* was decreased (contracted).

In order to still keep the validity of this formula as Einstein did, the *Speed* had to be extremely decreased in order to compensate both the increment of *Time* and the decrement of *Distance*. The *Speed* was automatically decreased by the fact that it was not allowed to overpass the speed of light – this was the flaw of Relativity.

In our opinion $v+c$ should be strictly greater than c for the observer on earth, since to the speed of light it is added the speed of the rocket.

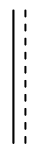
Fig. 3



We think the time intervals are the same for both observers in accordance with the common experience: an event, which occurs in an inertial reference frame (in this case: the observer in the rocket) and has a time interval Δt, lasts the same time interval Δt if it is regarded from another inertial reference frame (in this case: the observed on earth); we use the real (absolute) time interval, not the apparent time interval.

We agree with Einstein that the trajectories of the clock light are different for the observers, i.e.

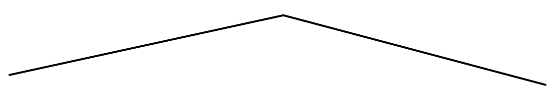
Fig. 4



for the observer in the rocket,

and

Fig. 5



for the observer on earth, and we also agree with the mathematics used in the Special Theory of Relativity to compute their length.

In our opinion there is neither a real time dilation nor a real length contraction, but an apparent time dilation and an apparent length contraction. Surely, we can consider in a metaphoric way that: time passes faster when we enjoy it, and slower when we endure it (for example in prison).

Or, under certain environmental conditions our biological or psychological processes could run faster or slower. We have moments when we can age more or less than normal. Therefore, our interior clock does not run constantly. Biologically, it is a chance that the more active you are (i.e. moving fast), the less you age (because the brain is more active) – so "time dilation," but with respect to the absolute time you have the same age as somebody less active but simultaneously born with you.

However, time dilation could produce nice science fiction stories, but it is not fact.

Einstein did not prove that the speed of light cannot be surpassed, he only postulated it. Therefore we have the right to question this. He did a thought not lab experiment. We mean we don't believe that $v+c=c$ for the observer on earth as Einstein asserted, but we think that $v+c>c$ for $0<v\leq c$. We prove below that there is no anomaly alike "time dilation", but the speeds are different: for the observer in the rocket the speed of the clock light is c, while for the observer on earth the speed of the clock light is $c+v$, which should be greater than c in order to avoid time dilation anomaly.

Let's note by x the speed of the clock light as seen by the observer on earth. We compute it mathematically:

$$2l = v\Delta t\,, \tag{8}$$

and:

$$2s = 2\sqrt{d^2 + l^2} = 2\sqrt{d^2 + \left(\frac{v\Delta t}{2}\right)^2} = x.\Delta t\,. \tag{9}$$

We need to solve for x the last equality:

$$(x\Delta t)^2 = \left[2\sqrt{d^2 + \frac{v^2(\Delta t)^2}{4}}\right]^2 \tag{10}$$

$$x^2(\Delta t)^2 = 4d^2 + v^2(\Delta t)^2\,. \tag{11}$$

Dividing both sides with $(\Delta t)^2$, we get:

$$x^2 = \left(\frac{2d}{\Delta t}\right)^2 + v^2\,. \tag{12}$$

We know for the observer in the rocket, that $\frac{2d}{c} = \Delta t$, and thus $\frac{2d}{\Delta t} = c$. Therefore:

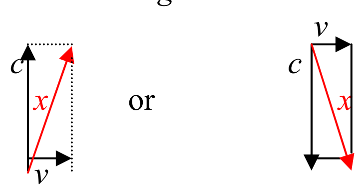
$$x^2 = c^2 + v^2\,. \tag{13}$$

Whence the speed of photon in the rocket, with respect to the observer on earth, is:

$$x = \sqrt{v^2 + c^2} > c, \tag{14}$$

which corresponds to the magnitude of the vectorial addition, i.e. $x = |\vec{v} + \vec{c}|$, since $\vec{c}$ and $\vec{v}$ are orthogonal:

Fig. 6



3. No Relativistic Paradoxes in ATR.

Since in Absolute Theory of Relativity there is no time dilation, in consequence there is no length contraction, and no relative simultaneity.

Therefore, many relativistic paradoxes are discarded:

a) Ehrenfest Paradox (1909) – since there is no length contraction.
b) Twin Paradox (1911) – since there is no time dilation and no gravitational time dilation.
c) Bell's Spaceship Paradox (1959) – since there is no length contraction.
d) W. Rindler's Paradox about a man falling into a grate (1961) – since there is no length contraction.

Etc.

4. Removing Lorentz Factor in ATR.

Lorentz Factor

$$\frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (15)$$

becomes equal to 1 in ATR, because in the equality

$$\Delta t = \frac{\Delta t'}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (16)$$

we replace

$$\Delta t = \Delta t'$$

Therefore Lorentz Factor has no effect in our ATR.

As a consequence in ATR we get:

- No **time dilation**, since $\Delta t = \frac{\Delta t'}{1}$ (17)
- No **Lorentz-FitzGerald Length Contraction**, since $l = l' \cdot 1$ (18)
- The **Relativistic Momentum** of an object of mass *m*, moving with speed *v*, becomes classical:

$$p = \frac{mv}{1}. \qquad (19)$$

- The **Total Energy** (upon Einstein) of an object of mass *m*, moving at speed *v*, becomes:

$$E = \frac{mc^2}{1} \qquad (20)$$

- The **Rest Energy** (upon Einstein) of an abject of mass *m* is

$$E_0 = mc^2 \qquad (21)$$

- Whence we obtain the **Kinetic Energy** of an object of mass *m*, moving at speed *v*, becoming:

$$E_k = mc^2\left(\frac{1}{1} - 1\right) = 0$$

(22)

which doesn't make sense.

Therefore, in our opinion, the famous physics formula $E_0 = mc^2$ is questionable. We understand that light is electromagnetic energy, but we don't understand why the energy of an object should depend on the light speed? We mean why on the speed?

5. Physics Laws might not be the same in all Inertial Systems.

If there exist superluminal velocities, there might be possible that not all physics laws are the same in all inertial systems.
As a counter-example let's consider as physics law the Addition of Velocities in a given inertial system S_i. Let's take the collinear and in the same direction velocities $v_1 = 0.8c$ and $v_2 = 0.9c$.
If we add them in STR we get:

$$v_1 + v_2 = \frac{0.8c + 0.9c}{1 + \frac{0.8c \cdot 0.9c}{c^2}} = \frac{1.70c}{1.72} \simeq 0.988372c \quad (23)$$

while in ART we simply get

$$v_1 + v_2 = 0.8\text{c} + 0.9\text{c} = 1.7\text{c}. \quad (24)$$

The results are certainly different.

6. Linear Trajectories for Both Observers.

We consider the case when the trajectories seen by both observers are linear.

6.1. Orthogonal Trajectory Vectors and Arbitrary Velocity K.

We can generalize this relationship, replacing "*c*" by any speed $K>0$ such that $\vec{v}$ and $\vec{K}$ are orthogonal. Then:

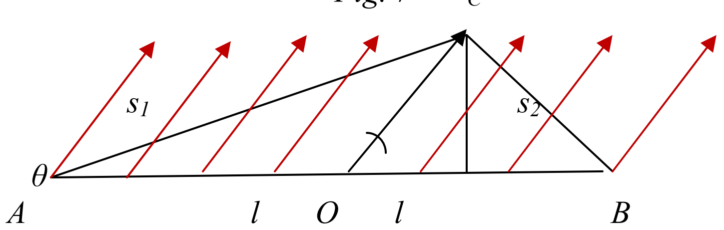
$$x = \sqrt{v^2 + K^2} = \left|\vec{v} + \vec{K}\right|. \quad (25)$$

6.2. Non-orthogonal Trajectory Vectors and *c* as Ultimate Velocity.

Let's change Einstein's theoretical experiment, and consider *d* making an angle θ, $0 \le \theta \le \pi$, with the motion direction (rocket's). Similarly, as before:

$$\frac{2d}{c} = \Delta t \text{ whence } \frac{2d}{\Delta t} = c \qquad (26)$$

Fig. 7



In the triangle *ΔAOC* we apply the Theorem of Cosine (which is a generalization of Pythagorean Theorem used in the Special Theory of Relativity):

$$s_1^2 = l^2 + d^2 - 2ld.\cos(\pi - \theta),$$

$$= \left(\frac{v\Delta t}{2}\right)^2 + d^2 - 2\frac{v\Delta t}{2} d(-\cos(\theta),$$

$$= v^2 \frac{(\Delta t)^2}{4} + d^2 + v\Delta t \cdot D \cdot \cos\theta \,. \qquad (27)$$

Similarly, in the triangle *ΔOBC* we apply the Theorem of Cosine, and we get:

$$s_2^2 = l^2 + d^2 - 2ld \cdot \cos\theta,$$

$$= v^2 \frac{(\Delta t)^2}{4} + d^2 - v \cdot d \cdot \Delta t \cdot c\,\mathrm{os}(\theta) \,. \qquad (28)$$

But $x \cdot \Delta t = s_1 + s_2$, then:

$$x\Delta t = \sqrt{v^2 \frac{(\Delta t)^2}{4} + d^2 + v.\Delta t.d.\cos\theta} + \sqrt{v^2 \frac{(\Delta t)^2}{4} + d^2 - v.\Delta t.d.\cos\theta} \qquad (29)$$

Divide by Δt:

$$x = \sqrt{\frac{v^2}{4} + \left(\frac{d}{\Delta t}\right)^2 + \frac{d}{\Delta t}.v.\cos\theta} + \sqrt{\frac{v^2}{4} + \left(\frac{d}{\Delta t}\right)^2 - \frac{d}{\Delta t}.v.\cos\theta} \qquad (30)$$

$$x = \sqrt{\frac{v^2}{4} + \frac{c^2}{4} + \frac{c}{2}.v.\cos\theta} + \sqrt{\frac{v^2}{4} + \frac{c^2}{4} - \frac{c}{2}.v.\cos\theta} \qquad (31)$$

$$x = \frac{1}{2}\sqrt{v^2 + c^2 + 2vc.c\,\mathrm{os}\,\theta} + \frac{1}{2}\sqrt{v^2 + c^2 - 2vc \cdot \cos\theta} \qquad (32)$$

Distance s_1 is traveled with the speed $\sqrt{v^2 + c^2 + 2vc \cdot \cos\theta}$, while the distance s_2 is traveled with the speed $\sqrt{v^2 + c^2 - 2vc \cdot \cos\theta}$, each of them in the same time interval $\frac{\Delta t}{2}$.

If $\theta = \frac{\pi}{2}$ when $\vec{v}$ and $\vec{c}$ are perpendicular, then $x = \sqrt{v^2 + c^2}$, therefore we get the same result as in our previous work [section 2.1].

If $\theta = 0$, then $x = \frac{1}{2}|v + c| + \frac{1}{2}|v - c|$ which means that $\vec{v}$ and $\vec{c}$ are collinear. For s_1 the speed is v+c since $\vec{v}$ and $\vec{c}$ are in the same direction, while for s_2 the speed is v-c since $\vec{v}$ and $\vec{c}$ are in opposite directions (like in Galilean Relativity).

If $\theta = \pi$, then $x = \frac{1}{2}|v-c| + \frac{1}{2}|v+c|$ since $\vec{v}$ and $\vec{c}$ are collinear, with opposite directions on s_1 and with the same direction on s_2 (again similarly as in Galilean Relativity).

6.3. Non-Orthogonal Trajectory Vectors and Arbitrary Ultimate Velocity.

We can extend this thought experiment by substituting "*c*" for any speed *K* (negative, positive, or zero, which can be smaller or greater than *c*). Then the speed as measured by the observer on earth is:

$$x = \frac{1}{2}\sqrt{v^2 + K^2 + 2vK \cdot \cos\theta} + \frac{1}{2}\sqrt{v^2 + K^2 - 2vK \cdot \cos\theta} \tag{33}$$

6.4. Non-Orthogonal Trajectory Vectors and Arbitrary Velocities.

We can again generalize the previous thought experiment by substituting "*c*" for any speed *w* (negative, zero, or positive smaller or greater than *c*). Then, the speed as measured by the observer on earth is:

$$x = \frac{1}{2}\sqrt{v^2 + w^2 + 2vw \cdot \cos\theta} + \frac{1}{2}\sqrt{v^2 + w^2 - 2vw \cdot \cos\theta} \tag{34}$$

Conclusion.

Our investigation was to reconsider Einstein's thought experiment from a different viewpoint, i.e. considering the frame of an Absolute Time and Absolute Space. We thus have obtained an "Absolute Theory of Relativity" (ATR) that has no time dilation, no length contraction, no relativistic simultaneities, and no relativistic paradoxes.

We went further and generalized this experiment taking any velocity (not only the speed of light) and the two velocity vectors to be added not only orthogonal, but also oblique, and we calculated the addition of these two velocities according to the ATR.

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