The informational model: twin paradox

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Abstract in the paper a number of existent solutions of the twin paradox are considered. It is shown, that any solutions aren't and cannot be principally the solutions, if they are in accordance with the special relativity theory.

Key words: special relativity, general relativity, twin paradox, twin paradox solution

1. Some introduction

"…*I see nothing wrong to use GR for some realistic scenarios but the real puzzle is to show the TP without it*…, etc." [from some discussion on the "Research Gate" net]

- nothing can solve the "twin paradox" in framework of the SR.

The paradox is known, in the "canonical" form, from 1905 year: let there are two twins in one inertial reference frame, and one of them instantly obtains some speed *V* and moves to some point in the space "a planet"; at the planet he instantly stops; then instantly obtains some speed (not obligatorily the same as on the way to the planet) directed to Earth; and, returning to the twin-homebody, again instantly stops. See Fig.1

Rather simple calculations show, that the twin-traveler will be younger then the twin-homebody; and that is always, independently on the inertial frame was moving with some speed or was at 3D spatial rest, any traveling along, in certain sense ["simply close-loop" if the homebody is at 3D spatial rest] "close-loop", trajectory twin will be younger.

However from the postulate about total and complete equivalence of all inertial reference frame follows that the ways are the same [symmetrically] in both reference frames, and so in the twin-traveler's frame just the twin-homebody must be younger.

I.e. the twin paradox is simply a complicated version of the more simple and so more evident "Dingle problem" of the SR: if there are two relatively moving frames, then every of both observers in both frames simultaneously must think that in the his vis-à-vis's frame the "time is dilated", the "space is contracted", etc.; including, for example, the vis-à-vis ages slower then he, what is evident logical absurd.

In the twin paradox simply the Dingle problem appears two times, on the ways to the planet and back to Earth.
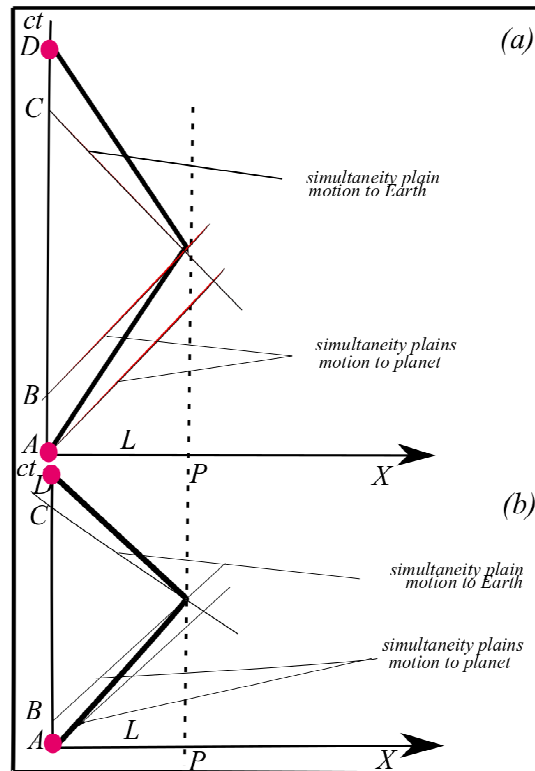
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Fig.1 Motions of the twin-homebody and the twin-traveler in the twin paradox in the Minkowski space; (a) - the traveler moves in the [3D] space to planet on the spatial distance *L* with Lorentz-factor be equal to ~ 3, (b)- the traveler moves in the [3D] space with Lorentz-factor be equal to ~ 5. The difference between the direction of the traveler trajectory in the space and the simultaneity plains decreases with increasing of the traveler's speed [the intervals "AB" and "CD" decrease]; at the speeds near the speed of light the intervals "AB" and "CD" become practically negligible and the time interval that is elapsed by the homebody approaches to the value $2L/c$, when the elapsed time for the traveler goes to the zero.

Besides the Dingle problem is not only simpler, for is solution it is rather difficult to invent some "solution" in framework of the SR, besides some childish "explanations"; though such explanations exist and are rather popular among the SR/GR true believers. The indeed correct solution is evident: the postulate about the total equivalence of the frames is wrong, and so many things in the SR are wrong also, first of all the postulated in this theory real transformations of the space and time have no relations to the objective reality.

In the reality Matter's spacetime is the absolute [5]4D Euclidian "empty container", where material objects and the system "Matter" as a whole exist and change; and [5]4D Euclidian spacetime in the physical theories.

The "twin version" of the Dingle problem is more complex, and just therefore there exist seems hundreds of "solutions" of the twin paradox that are published in official respectable journals and "near-scientific" publications, when in any publication in official sources, which relate to the SR, there are no any mentions about the Dingle problem.

Correspondingly the twin paradox has no solutions also, and all existent numerous "solutions" use always many tricks, which are mostly outside the SR, and in every case corresponding analysis finds the trick; that is another thing that in official publications it is impossible to find such correct analyses.

2. The unique solution

However in hundreds of the "solutions" there exist seems only one **solution that is totally in accordance with the SR**, it appeared seems in 1960-th and is very popular (see, for example, [1](in Russian), about how the SR theory is learned in Moscow Lomonosov University] soon 50 years in the true SR believers society.

In his "canonical" [initial] form this solution follows from the "canonical" version of the paradox above, however it uses at that additionally the postulated in the SR assertion that the axes of the inertial frame's coordinates are infinite and the frame's "the simultaneity plains" are infinite also. Besides, unlike to the 1905 year canonical version, where only the twins' ages were considered, this solution uses the Minkowski postulate that every reference frame is "active" and "mighty"; so every frame really transforms the spacetime and further this transformed ["contracted", "dilated", etc.] spacetime transforms ["contracts", "dilates"], all material objects inside itself.

This solution is given, for example, in https://en.wikipedia.org/wiki/Twin_paradox [2], sec. "Relativity of simultaneity", though in very short form comparing with the versions that are in publications before March 2013 [i.e., for example, in the link to UFN.ru above]; and till this time this section in this Wiki article was also long and detailed. However after the paper "Space and Time", where it was shown that this "solution" is evidently incorrect appeared in [3], this section was heavily edited/truncated; possibly that happened in some other electronic sources. But in the paper publications it remains be in the full versions.

The solution is as [see Fig.1]:

When the twin-traveler moves to "planet" [the point "P" on the Fig.], then, according to positions of his frame's "the simultaneity plains", the twin-homebody indeed ages slower then the traveler; thus the Dingle problem "becomes be solved": every of the twins simultaneously believes that the other ages slower on the Lorentz factor, and the "the simultaneity plains" show that clearly. But **these plains** not only show that the homebody ages slower then that is in the 1905 year version of the paradox, in accordance with the postulate above they **really force the homebody to age so.** Thus when the traveler arrives to planet, the homebody ages on the time interval AB in the Fig.1, so his age is equal to the age of the traveler in the homebody's frame];

Quite analogously, after the traveler turned out to move back to Earth and in whole way back till the final meeting, again the "the simultaneity plains" force the homebody to age so [slowly, the time interval CD in this Fig.1];

That happens since at the traveler's turnaround, his frame's simultaneity plains rotate also, when the traveler change the motion direction [on 180°].

And, besides, just at this their rotation the simultaneity plains force poor homebody to age practically instantly on rather essential time interval, on the Fig.1 that are the intervals BC.

Finally the sum of the intervals on the *ct*-axis, i.e. the interval AD, turn out to be equal just to the age of the homebody, which is larger then the traveler's age in the Lorentz factor, **i.e. in full accordance with the SR**.

That seems on first glance as rather convincingly, though, at that, rather fantastic. And, besides, it is not only fantastic, this "elegant solution", as that is pointed, for example in [4], [where an attempt to make the canonical version of this solution more adequate to the reality accounting for the real accelerations of the traveler and by using for that the GR]

is evidently based only on the SR postulate, which hasn't any direct experimental confirmations. As well as in the SR there is no any explanations – how the reference frames really transform the Matter's spacetime, and how this transformed spacetime really acts on material objects; as the frame's simultaneity plains really, in this solution, impact on a human's body, forcing the biochemical reactions in the body proceed with rates that are in accordance with their positions in the spacetime?

Moreover, these plains aren't ended [in this case] in the homebody, in the SR they are infinite. So, for example, if the traveler moves with the Lorentz factor >> 1, then the intervals AB and CD becomes be negligible comparing with the interval BC, so practically all aging of the homebody happens at the simultaneity plains rotation of the traveler turnaround, i.e. is practically $\Delta t(BC) = 2L/c$. Correspondingly some objects on Space, that are on a distances along the line "Earth-planet" say, of a billion light years, at the traveler's turnaround practically instantly become be "older" on 2 billions of years, etc.; thus this turnaround results in, say a billions of supernova explosions, etc.; what seems again more and more strange.

However even more strange consequences follows from this solution if we consider practically only the conditions that are in this solution, i.e. in the system "Earth-planet", with a minor and quite natural addition: it seems evident, that the traveler's frame's simultaneity plains act not only on the homebody, they act on everything on Earth. Thus, for example, if the distance L is equal 10 light years and the traveler moves with a speed that is near speed of light, then at the turnaround everything, not only the homebody, ages on nearly 20 years, everything on Earth ages on this time interval. It is evident, that in such temporal interval many things can happen on Earth, including, for example, some of people will dead, and many childes will be born. Thus, if the traveler, after he departed from planet, by some reason decides to return to planet again, and will do so with the same speed, the his frame's simultaneity plains will rotate also practically in the same position [practically in the "B" points], as they were before the first turnaround. Correspondingly everything on Earth, that already passed the time 20 years, will return in the past practically on this time interval (AB on Fig.1), those the dead will arise, children will be born back, etc.; all of that evidently violates at least the thermodynamics and biological laws.

3 Other solutions

As a summary relating to existent "solutions" of the twin paradox, note, that they mainly are of a few types [for example see the Wiki article in the link above, where most of types are presented]:

The type-1 solutions are some trivial tricks, which are, nonetheless rather popular in the SR true believers society; as, for example, the "solution" of the Dingle problem [in this case, of course, that is a main half of the twin problem], when they say:

"if two mans look on each other on a large distance, then every of them sees his vis-à-vis as a small man, when he himself is big one, i.e. both are simultaneously big and small, just as every of the observers in relatively moving frames ages simultaneously quicker and slower then other in the Dingle problem".

The trick is evident: the difference of the cases is fundamental. The fact that two the men are seen differently is quite explainable, and even a child knows, that if he see a distant man as be small, that is an illusion, because of the eyes see the angular, not the real, sizes; and in the reality this man is big. However in the case of the relatively moving observers any explanation is impossible, since this nonsense **is postulated in the SR, i.e. is established without proof,** except erroneous interpretations of the experimental data and so **cannot be proved as being true in framework of this theory**.

The type-2 solutions use some tricks outside the SR. Utmost popular is the assertion that because of the [at least four] accelerations the traveler's frame isn't "purely inertial".

However the SR doesn't contain any arguments – what happens with a frame at acceleration, and in what relation this frame, when it becomes be in the inertial motion, differs from "purely inertial" frames? Moreover, at the acceleration in every time moment there exist instant inertial frame, and the aging rate of the frame's observer doesn't depend on the acceleration, but it depends only on the instant frame's speed since the "time dilation" is the kinematical effect.

A lot of rather popular type-2 "solutions" use assertions that by some way relate to the GR, starting from banal bare claims that the twin paradox "has complete solution only in the general relativity", and those, which "use" the GR, suggesting that, in accordance with the GR equivalence principle, at the acceleration of the traveler's frame is some analogue of the "gravitational time dilation" appears, an example see Wiki, sec. "Viewpoint of the traveling twin". A few tricks here [that was "conceptually sketched by Einstein in 1918" and is presented in details, for example, [5] are evident.

The idea uses rather strange suggestion that at [in the canonical the paradox's version] instant and so practically infinite two accelerations of the traveler in the turnaround's point in the traveler's frame the gravitational field appears that "fills the universe" (?). Further

[Wiki] "…in a weak field approximation, clocks tick at a rate of $t' = t \, (1 + \Phi / c^2)$ where Φ is the difference in gravitational potential…. The rocket is firing towards the stay-at-home twin, thereby placing that twin at a higher gravitational potential… Due to the large distance between the twins, the stay-at-home twin's clocks will appear to be sped up enough to account for the difference in proper times experienced by the twins. It is no accident that this speed-up is enough to account **for the simultaneity shift** described above."

Even if somebody doesn't pay an attention on some strange "gravitational field" that "fills the universe" at the traveler's acceleration, it seems enough here to note that this "solution", that account for "the simultaneity shift above", i.e. the shift that is considered here in the "unique solution" case above, again "advances" not only the homebody's clock, it advances everything in the Universe; and, for example, if the traveler will make a number of the turnarounds on a large distance from the homebody, then with Universe will happen some a lot of unbelievable things. For example, since in this case "the aging everything beside the traveler effect" is accumulative, Universe will occur somewhere in a rather distant future, when, at that, by unknown reasons nothing happens with the traveler.

The type-3 and type-4 "solutions" have the common trait – they are practically only descriptive constructions and so in the reality don't prove anything. The difference is in that the type-3 "solutions" include some experimental points, when the type-4 use some theoretical "Gedanken" considerations of the twin paradox.

The type-3 "solutions" are in the referred above Wiki article [sections with Doppler effects]. Besides that in such considerations, in spite of they give eventually correct ages values of both twins at the end of the close-loop traveler's trip, in these examples the homebody's ageing is different at the traveler's ways to planet and back. But what is more important, again, these considerations are only descriptive, when any experiment, provided that the inertial reference frames are set in accordance with the SR, principally cannot to detect some deviations from this theory. Including, returning to the, again, principally acting in the twin paradox, Dingle problem: if both observers will measure experimentally the tick rates of the clocks in the vis-à-vis' frames, they obtain the same absurd result – in the every of both frames simultaneously "time is dilated" [see, for example, [6]]

The type-4 "solutions" [in the Wiki article sec. "Difference in elapsed time as a result of differences in twins' spacetime paths"]   are purely descriptive also and add also nothing new to the, again, known from 1905 year for the canonical version result: the traveler at the returning will be younger then the homebody. The unique difference is that in such "solutions" more real cases, i.e. when the traveler motion includes not infinite accelerations sections are considered. That is these "solutions" evidently aren't some solutions of the paradox.

There are a lot of type-5 "solutions", where mostly the canonical scheme is used, but it is considered from viewpoints of more then two observers/frames. Such approach cannot change something comparing with the canonical case [when all such "solutions" are again only descriptions of the known from 1905 year process, if are correct and don't use some tricks outside the SR] That is seems as rather evident, and so, for example, in the Wiki article above there are no references on such cases. However they are rather numerous and create a lot of in the provision of the background opinion that the twin paradox is solved.

The indeed correct solution of the "twin paradox" is possible only if somebody understands that the SR postulate that   all inertial reference frames are totally and completely equivalent is wrong, and that so Matter's spacetime is absolute. Besides it is necessary to understand that this spacetime is [5]4D Euclidian manifold, where two Rules/Possibilities "Time" act: the "true time", and the "coordinate time" [7], [8],

where every material object, including the frames and their observers, moves simultaneously with the speed of light in the true time (along corresponding axis) and with 4D speed of light in the Matter's 4D sub-spacetime, where the temporal axis is the coordinate time. At that the motion in the coordinate time is changing of internal states of the "T-objects", i.e. particles and bodies that have rest masses, including humans' bodies and the frames' meter rods and clocks.

    In this case the situation becomes be quite simple, see the Fig. 2
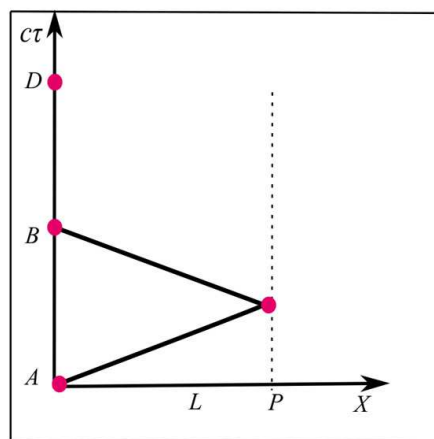

Fig.2 Motions of the twin-homebody (along the $c\tau$-axis) and the twin-traveler (the broken line A-P-B) in Matter's 4D the Lorentz factor be equal to ~2 in Matter's 4D sub-spacetime. At the returning the twins are in different the sub-spacetime's points, but in the same 3D spatial point and in the same true time point.

The Fig. 2 relates to the case, when the homebody is at the absolute 3D spatial rest and in the corresponding absolute reference frame. Since when a material T-object is at the spatial rest, it/he/she moves along the coordinate time ["$c\tau$", in contrast to Minkowski diagrams on the Fig. 1, where the "ct"-axis is some analogue of the true time axis] with maximal speed, i.e. with the speed of light, and so [more correctly – because of] the internal processes in this object proceed with maximal rate, including, for example, so the clocks at the absolute rest tick quicker then any clock that move in the 3D space.

If an T-object moves also in the space, its speed, as that the Pythagoras theorem prescribes, becomes be lesser then the speed of light on the Lorentz factor, and the rates of the internal the object's processes slows in this factor also. Thus when the traveler's returns to the same with the homebody spatial position, he have the number of elapsed changes of his internal states that corresponds to the point B on the coordinate time axis, which is lesser then the homebody's one, which at the meeting is in the coordinate time in the D point.

Nonetheless, though the twins are in different 4D sub-spacetime points, they "physically" meet, since all interactions [if we don't consider some quantum effects] happen in the 3D space and in the true time; when all objects in Matter are always in the same true time point.

Another corresponding example, when ["S-objects"] photons move only in the 3D space with the speed of light, they never are in the same 4D sub-spacetime points where the T-objects are. However everybody, if isn't blind, sees himself in a mirror. Or, say, when he sees in a telescope, he sees galaxies that are on distances of billions light years, so he sees photons that have billions of year ages in the true time and zero [more correctly billions years ago] ages in the coordinate time, and just therefore they are so the same as they were born.

All the above in this paper seems as rather evident, however the number of the "solutions" of the twin paradox is rather large already and time to time a next and next "solutions" appear in the official physical publications. That seems already as something irrational…

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