Special Relativity Theory Violates the Causality Principle

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It is unnecessary to perform experiments to prove the invalidity of Special Relativity Theory (SRT) since the logical errors are sufficient. The following simple example shows how SRT violates the causality principle.

1. Analysis

Let two rockets are in mutual rest at considerable distance in a free cosmic space. Their clocks are synchronised and start at the same moment that they both accelerate at the same rate towards one another for one hour. After acceleration, they move uniformly. Their clocks automatically register the duration of one hour of their acceleration and then reset to zero time. The rockets approach each other with high uniform speed v by which, according to SRT, in the reference frame of any rocket, time flows two times (twice) slower in the other. After a certain time, their reference frames coincide and they exchange signals showing the elapsed times on their respective clocks. What do they read? Which clock shows a greater or lesser time? There is no reason why one clock should show more elapsed time than the other. If we say there is a difference we must logically ask why. Even if we consider a middle observer as both rockets meet, their clocks must show the same time, since both rockets are moving at the same speed. In the case of relativistic effects, their clocks must slow equally in comparison with their own.

Fig. 1. The situation from the Viewpoint of the Middle Observer

However, in the following we will analyse the situation only from the viewpoints of the rockets starting at the same time with the same acceleration and the consequent mutual uniform approach until the moment of their meeting, when their clock again show equal time.

According to natural logic it is evident that if mutual symmetry is not violated, the clocks must be synchronised all the time. But according to SRT the symmetric mutual uniform motion violates clock synchronisation. From the viewpoint (reference frame) of either rocket, time slows in the other.

We have proven (it can also be verified experimentally), that both rockets must show the same time at their mutual meeting point. We must also accept this result while using the mathematical apparatus of SRT. In the phase of mutual uniform motion of two approaching rockets, according to either rocket, time slows in the other. The following Lorentz transformations describe our situation:

$$x + L_0 = \gamma\left(x' + v\left(t' - T_0\right)\right); \qquad t = \gamma\left(t' - T_0 + \frac{vx'}{c^2}\right),$$

$$x' = \gamma\left(x + L_0 - vt\right); \qquad t' - T_0 = \gamma\left(t - \frac{v\left(x + L_0\right)}{c^2}\right),$$

where $\gamma \equiv 1/\sqrt{1 - v^2/c^2}$

The x' axis coincides with the x axis. Both represent the axis of their mutual motion, which begins to measure time at the moment of cessation of acceleration and the beginning of uniform motion. When No. 1 finishes its acceleration and sets the time $t = 0$ on its clock, rocket No. 2 on the left side is at distance L_0 at $x = -L_0$. As rocket No. 2 approaches rocket No. 1 with speed v, both rockets will meet when time $t = L_0/v$ elapses on the clock of rocket No. 1.

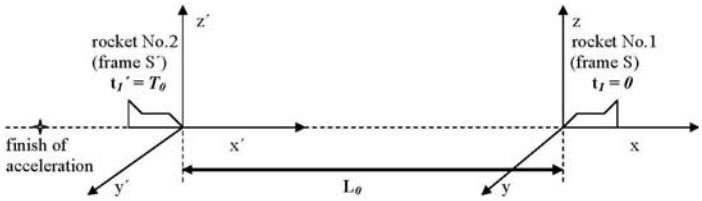

Fig. 2. The situation from the viewpoint of the rocket No. 1 in the moment acceleration ceases.

We will analyse the following events from the viewpoint of frame S (rocket No. 1):

The event No. 1 has the following coordinates: $t_1 = 0$, $x_1 = -L_0$, $t_1' = T_0$, $x_1' = 0$, which define the position and time of rocket No. 2 in both reference frames S and S' at the moment when rocket No. 1 finishes acceleration and becomes reference frame S toward which, rocket No. 2 moves with uniform speed v.

At moment $t_1 = 0$, when rocket No. 1 converts from acceleration to uniform motion, rocket No. 2 has already moved uniformly during the period T_0 in its own time. The time T_0 elapsed in rocket No. 2 (reference frame S') corresponds to the value γT_0 in reference frame S of rocket No. 1, because its time flows faster than in rocket No. 2. The lead-time T_0 for rocket No. 2 is necessary in order to achieve the same times on the clocks of both rockets at the moment of their meeting, as the time of rocket No. 2 slows down from the viewpoint of the rocket No. 1. This means, in the moment when the rocket No. 1 finishes its acceleration, rocket No. 2 has already moved with uniform motion during time γT_0 from the viewpoint of rocket No. 1. At the moment

of mutual meeting of both rockets (event: $x = x' = 0$, $t = t' = L_0/v$), after substitution of this event say to the first equation, we get the following result:

$$T_0 = \frac{\gamma - 1}{\gamma} \cdot \frac{L_0}{v} \ .$$

Suppose rocket No. 1 accelerated during its own time, T_a. This means, both rockets started before time T_a, i.e. in moment - T_a from the viewpoint of rocket No. 1. We could protest that if we measure this time by the clock in the immediate state of rocket No. 1 (after acceleration) we would get quite a different value. But independent of what the value T_a is (it can be whatever), we can always find L_0 by the given speed v, so that the following relation is valid: $\gamma T_0 > T_a$. This means that the simultaneous lift-off for both rockets came after rocket No. 2 reached uniform motion from the viewpoint of rocket No. 1. This means that from the viewpoint of rocket No. 1, the violation of causality appears in rocket No. 2, which finished accelerating before it began. The delay of the lift-off in comparison with the moment of achieving uniform motion by rocket No. 2 is: $\Delta T = \gamma T_0 - T_a$ from the viewpoint of rocket No. 1.

Event No. 2 has the following coordinates:

$$t'_2 = 0 \ , \ x'_2 = 0 \ , \qquad t_2 = -\gamma T_0 \ , \ x_1 = -L_0 - \gamma v T_0$$

This event, which defines the situation when rocket No.2 finishes accelerating and begins to move uniformly from the viewpoint of rocket No.1, happens at $-L_0 - \gamma v T_0$ with a lead time $-\gamma T_0$. We again have the same lead-time as event No. 1.

Using SRT, we have shown that both clocks are synchronised at the moment of the start of both rockets as well as at the moment of their mutual meeting, but the simultaneity of their transition from acceleration to uniform motion is violated. Both these moments are not simultaneous from the viewpoint of both rockets. Event No. 2, when rocket No. 2 begins its uniform motion, happens with lead time $-\gamma v T_0 = -(\gamma - 1) L_0 v$ from the viewpoint of rocket No. 1. We can always choose such a large L_0 that the lead-time will exceed any time of acceleration. So we get the absurd result that rocket No. 2 finishes its acceleration before it began. This result proves that SRT violates the causality principle and is an invalid and non-physical theory.

2. Conclusion

The mutual symmetry of systems cannot cause the effect of time dilation. Only if two bodies are in a different interaction with their surrounding space (vacuum) thanks to their motion, that time dilation can occur. Also the bodies in places with different gravitational potentials have a different interaction with their surrounding space. This is the reason why, according to General Relativity Theory (GRT), the processes slow (time dilation) in places with higher gravitational potential. The reason for time dilation must be the same. It cannot be different in SRT (as a consequence of mutual symmetry of systems) in comparison with GRT (consequence of mutual asymmetry of systems). The accelerating body moving in space with the same gravitational potential intensifies its interaction with its surroundings. The higher its speed (or the greater the gravitational potential), the greater its interaction with its surroundings and the slower the processes within it (time dilation). The body which accelerates and achieves escape speed from a gravitational field, weakens its interactions with its surroundings. With escape speed, it is in the same situation as if it were at rest in space with zero gravitational potential. Its internal processes flow with the highest possible speed.

The violation of causality in SRT is a direct consequence of the relativity of simultaneity. So the relativity of simultaneity does not exist. If two events are simultaneous in one system, they are simultaneous in all others, regardless of their motion or position in space. This follows from the principle of unity of the Universe according to which everything is connected with everything else. Non-local connections of opposites are the basic building blocks of the Universe as it is clearly explained in my monograph “God and the Universe”.