Reinterpretation of Lorentz Transformation and resolution of Special Relativity’s paradoxes.

(1) \[ x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}} \]

(2) \[ y' = y \]

(3) \[ z' = z \]

(4) \[ t' = \frac{t - \frac{vx}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} \]

If clocks in S are synchronized, clocks in S’ are desynchronized.

LORENTZ CONTRACTION

Once we understand that the clocks on moving frames are desynchronized, we can no longer continue to interpret Lorentz Transformation in the same way Relativity does. On the other hand, acknowledging this desynchronization allows us to understand the origin of Relativity’s Paradoxes. Consider a rod moving with velocity \(v\) relatively to S. Consider S with velocity \(v\) relatively also to S’. We consider S’ moving with the rod and if we admit \(v^2 < c^2\) for the right end of the rod from (3) we obtain

\[
T - \sqrt{1 - \frac{v^2}{c^2}} = \frac{T'}{\sqrt{1 - \frac{v^2}{c^2}}} \]

TIME BETWEEN DIFFERENT FRAMES - SOLVING THE TWIN PARADOX

Let’s consider one of the clocks of S, the one on x’ = 0 for simplicity. When our clock mark \(t' = 0\), the clock that it marks on S also marks the instant \(t\). We know S’ is moving related to the resting system of coordinates S with velocity \(v\). As time passes and one clock moves along \(x\), it will find the clocks of \(S'\) are not synchronized between each other. All the clocks of S’ marks the same instant at this moment. This means that by comparing our clock with the clocks on S’ it will find as it moves and moves goes by, we can conclude which is moving faster. That’s what we did by making \(v^2 = c^2/2\). For a given clock of our clock, the corresponding clock of \(S'\) marks the following instant:

\[ t' = \frac{t}{\sqrt{1 - \frac{v^2}{c^2}}} \]

This now is clear how the Twin Paradox is the result of a wrong interpretation of Lorentz Transformation. It’s a consequence of trying to measure time with desynchronized clocks. While (2) and (4) are symmetrical (as are (4) and (6)), their physical meaning is not the same. In order to establish an exact relation between the rhythms of two moving frames of reference, we have to know how their clocks are desynchronized. This knowing their velocities relative to rest. We can’t otherwise be certain which twin will age faster. How can we then establish such a relation? Let’s consider a third coordinate of frames, \(z\), with absolute velocity \(v\). We know from (7) that:

\[ d\tau^2 = dt^2 - \frac{dx^2}{c^2} \]

The INEQUALITY OF THE SPEED OF LIGHT - REINTERPRETING EINSTEIN’S DEFINITIONS

Let’s begin by assuming (Einstein, A. [1] p.154) the maximum possible speed \(c\) on the frame of reference we considered to be at rest is the speed of light \(c\). This means that if a ray of light were to leave the origin of S when \(t = 0\) it would reach \(x = c\) at \(t = 1\). All the clocks of \(S'\) would be marked that same instant by that moment. How can we then know that the speed of light is a speed of \(3\times10^8\) m/s? This is because the same light ray with that speed can be used to synchronize clocks. Einstein’s synchronism method doesn’t imply that the clock of \(S'\) situated on \(x = c\) would also be \(S\) when the light ray reaches it. This is true for any velocity \(v\). This could lead us to think the speed of light is the same for every frame of reference. But we can’t forget the clocks of every moving frame of reference are desynchronized. When the ray of light \(v = c\) the clock situated on \(x = c\) but the one on \(x = 0\) was marked a smaller value. It marked:

\[ L = \frac{L'}{1 - \frac{v^2}{c^2}} \]

This means that \(L' = 0\) is not the time the ray of light takes to reach \(c\). This time it takes for the light to reach that point can be calculated by only looking at the clock of \(S\) when \(l = 0\). As we said the clock of \(S'\) situated on \(x = c\) would also be \(S\) when the light ray reached it. This is true for any velocity \(v\). This could lead us to think the speed of light is the same for every frame of reference. But we can’t forget the clocks of every moving frame of reference are desynchronized. When the ray of light \(v = c\) the clock situated on \(x = c\) but the one on \(x = 0\) was marked a smaller value. It marked:

\[ L = \frac{L'}{1 - \frac{v^2}{c^2}} \]

(11) is the maximum speed measured on any frame of reference with velocity \(v\) related to rest. The maximum speed depends on the velocity of the frame. If we consider that the maximum speed is the speed of light, then the speed of light changes accordingly to the speed of the frame of reference and its direction. It’s value is only on the resting frame. When the ray of light is traveling in the same direction of the frame we’re measuring it in, its speed varies between \(L\) and \(c\). As assumed, in the resting frame the speed of light is \(c\). As the speed of the frame approaches \(c\), the speed of the ray of light measured on that frame, becomes \(c\). When the ray of light is traveling in the opposite direction of the frame of reference, its speed varies between \(c\) and \(-c\). Since the speed of the frame approaches \(c\), the speed of that same ray of light tends to infinity. Einstein’s synchronism method depends on the amount of a ray of light. Einstein’s definition (Einstein, A. [1] p. 125-130) implies that a clock situated at a distance \(L\) from the point of emission marks the value \(L'\) by the time light reaches it. Every clock of any frame of reference obeys this rule. But at the same time, Lorentz Transformation implies the clocks of \(v = 0\) and \(v = c\) are desynchronized between each other and, of course, will continue to be at rest. From the time \(v = 0\) onwards, Einstein’s synchronism method doesn’t imply synchronization. By defining speed as a function of the distance between the two frames for two desynchronized clocks, Einstein created a new definition of speed since that definition is not really time traveling to reach the clock. We can’t say this definition is wrong, but we must understand that by using it, we will necessarily consider the speed of light to be the same on every frame of reference. By using the usual definition of speed, we will arrive at different conclusions. Both definitions can be used, but in order to arrive at a physical interpretation, we must know which we’re using.

References