Examination of the local time window

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The Time Dilatation

This essay examines the local time window and its limitations. Following a brief definition of the term *local time window*, parallel time windows and their effects on our time window will be examined. Lastly, the question about how different time windows come to exist and which one is the true time window for us will be discussed.

Outline

1. Definition of the local time window
2. The twin paradox
3. Parallel different simultaneousness
4. The world of myons
5. Conclusions

Definition of the local time window

We live in a world with an even timeline, where time passes without our involvement and uninfluenced by human activity from past to present to future. Time passes at the same speed everywhere. It appears to be universal and unchangeable.

We have experienced this every day from past to present. When making a phone call from Germany to Australia, for example, it strikes us as odd that the two countries are in different time zones; it is night in Australia although it is day in Germany. Nevertheless, the different time zones belong to the same time window. Time passes at the same speed in both countries and anywhere else on Earth. A second is a second – no matter the location.

This simplified explanation defines the time window.

Until the beginning of the last century, not only time but also mass and space, were defined as absolute measures. Since Albert Einstein, however, defined the speed of light as single absolute measure in his theory of relativity, time has turned from being absolute, to being relative.

Hence, space, mass, and time turned into variable measures, which only depend on the speed of light. This essay evaluates time under the influence of the speed of light, which will improve the definition of the local time window.

A local time window is a dimension, in which objects move in the same direction at the same speed. The absolute measure is the speed of light at 300,000 km/sec. The speeds we encounter in everyday life are irrelevant compared to the speed of light. Therefore, the effects of a variable time speed are unimportant because they are not measureable. However, mathematically, the tiny time deviations are of interest to scientists, as they change dramatically in astronomy and quantum physics, where speeds close to the speed of light are measured and time as relative measure changes.

The twin paradox

A case example by Albert Einstein:

A set of twins lives on planet Earth. One of them goes on vacation on a far away star. The other one remains on Earth. Before the one twin starts his voyage to outer space, both twins are exactly 20 years old.

The one twin takes a space shuttle to the star that lies 10 light years away from Earth. The space shuttle accelerates to almost the speed of light and does not slow down until the star comes into sight. It slows to a stop, the twin takes a picture of the star, and the space shuttle returns to Earth. Back on Earth, the twin goes to find his brother. The twins are astounded to discover that they have aged at different speeds. While the brother who remained on Earth is celebrating his 45^{th} birthday, the traveling twin has aged only 2.5 years. He is now 22.5 and it is not his birthday. Time must have elapsed differently for the two brothers. This is also called *time dilatation.*

To understand what happened, one has to take a close look at the different time windows of both brothers.

The local time window of the brother who stayed on Earth

Right after the shuttle has taken off; the brother on Earth wonders when he will see his twin brother again. With the star being 10 light years away, it should take his brother at least 10 years to reach his destination, and 10 more years to return to Earth. Because the brother has to accelerate, and slow down, five more years are added to this time estimate. Consequently, the brothers would see each other again in 25 years.

Time went by normally, and after 25 years, the brother does indeed return to Earth. However, unlike the brother on Earth, he has not aged 25 years. Obviously, he must have aged slower than the brother on Earth.

From Earth’s local time window, the travelling brother has aged slower.

The local time window of the travelling brother

Right after the shuttle has taken off; the brother in the space shuttle wonders when he will see his twin brother again. With the star being 10 light years away, it should take him at least 10 years to reach his destination, and 10 more years to return to Earth. Because he has to accelerate, and slow down, five more years are added to this time estimate. Consequently, the brothers would see each other again in 25 years.

Time passes normally during the flight, and after only one year, the star comes into view. The brother is surprised and figures that he must have miscalculated the distance between the star and Earth. The star is only one light year away, not 10. The brother reaches the star, takes a picture, and returns to Earth. He recalculates when he will see is brother again and comes to the conclusion that he should be home 2.5 years after his departure.

2.5 years later, he does indeed return to Earth and goes to find his brother, who is celebrating his 45th birthday. The travelling twin is shocked to see that his brother has aged so much. Clearly, time must have passed faster on Earth than it did in the space shuttle.

From the shuttle's local time window, the brother on Earth has aged faster.

The reports of both brothers appear to contradict themselves because they are based on different time windows. The differences are to be evaluated with the right back ground knowledge. The two reports are equally correct.

Parallel different simultaneousness

Time passes unchanged in each time window. The brother on Earth ages at the same speed as before, so does the brother in the space shuttle. Both look at their watches and a second is a second. Time does not go by any faster or slower. Their local time windows are called *inertial frame*. This inertial frame - or reference system is equal to any other inertial frame in the universe. It is virtually impossible to determine which one of the twins moves at almost the speed of light, during the travelling phase of the second twin.

For the twin on Earth, the space shuttles moves away at almost the speed of light, and for the twin in the shuttle, Earth moves away at almost the speed of light. Hence, the twin on Earth ought to age at the same rate as the twin in the shuttle. However, this is only true during the flight phase, when both time windows – also called inertial systems are moving in one direction at one speed. The twin paradox is a special case, as the space shuttle does not move at a constant speed or straight.

At first, both brothers are in the same local time window on Earth. Time passes equally for both of them. With the start of the flight to outer space, the travelling twin is accelerated, and enters a different local time window. The more he accelerates, the more time deviates in comparison to the time window on Earth. It follows the flight phase at almost the speed of light and a slowing down phase, where the pattern of movement is reversed. The twin accelerates again, flies at almost the speed of light, and slows down. Only when he reaches Earth does he return to his brother's local time window. Here, the twins discover their different ages, even though they did indeed age equally.

The travelling brother has experienced something for him incomprehensible during the flight. He knew the star was 10 light years away, but he arrived at it much faster than anticipated. For him in his local time window, the worldly expansion of space did not apply anymore. While flying at almost the speed of light, space around him shortened by factor 10 (the age difference between the two brothers). It is possible to determine the speed of the brother's space shuttle. The following formula is universally applicable.

$\gamma = \frac{1}{\sqrt{1-\left(\frac{v}{c}\right)^2}}$ with γ being either the time dilatation, shortening of space, increase in mass, or deformation of the flying object. If the formula is solved for v, the speed needed to reach γ can be determined.

$v = \sqrt{1 - \frac{1}{\gamma^2}} \times c$ with $\gamma = 10$, the average speed of the space shuttle was 298496.22 km/sec, which is 99.49874% of the speed of light (with was assumed to be 300,000 km/sec).

γ depends on the speed of a mass, which can only approach the speed of light, but never reach it. *Figure 1* on page six illustrates equal time windows with different time processes that depend on the speed. The four red dots are four masses that move at different speeds. Their speeds are at the top of the figure as percentage of the speed of light. In front of every dot (inertial frame) is a window with a *hole-mask*. This mask lies at the 100% mark and represents the unchanging experienced time of each inertial frame. The time is displayed on the projection screen behind the mask (to the left). It is clear that the periods are experienced differently in every time window; however, the difference is only visible in comparison with the other time windows.

Increase in energy

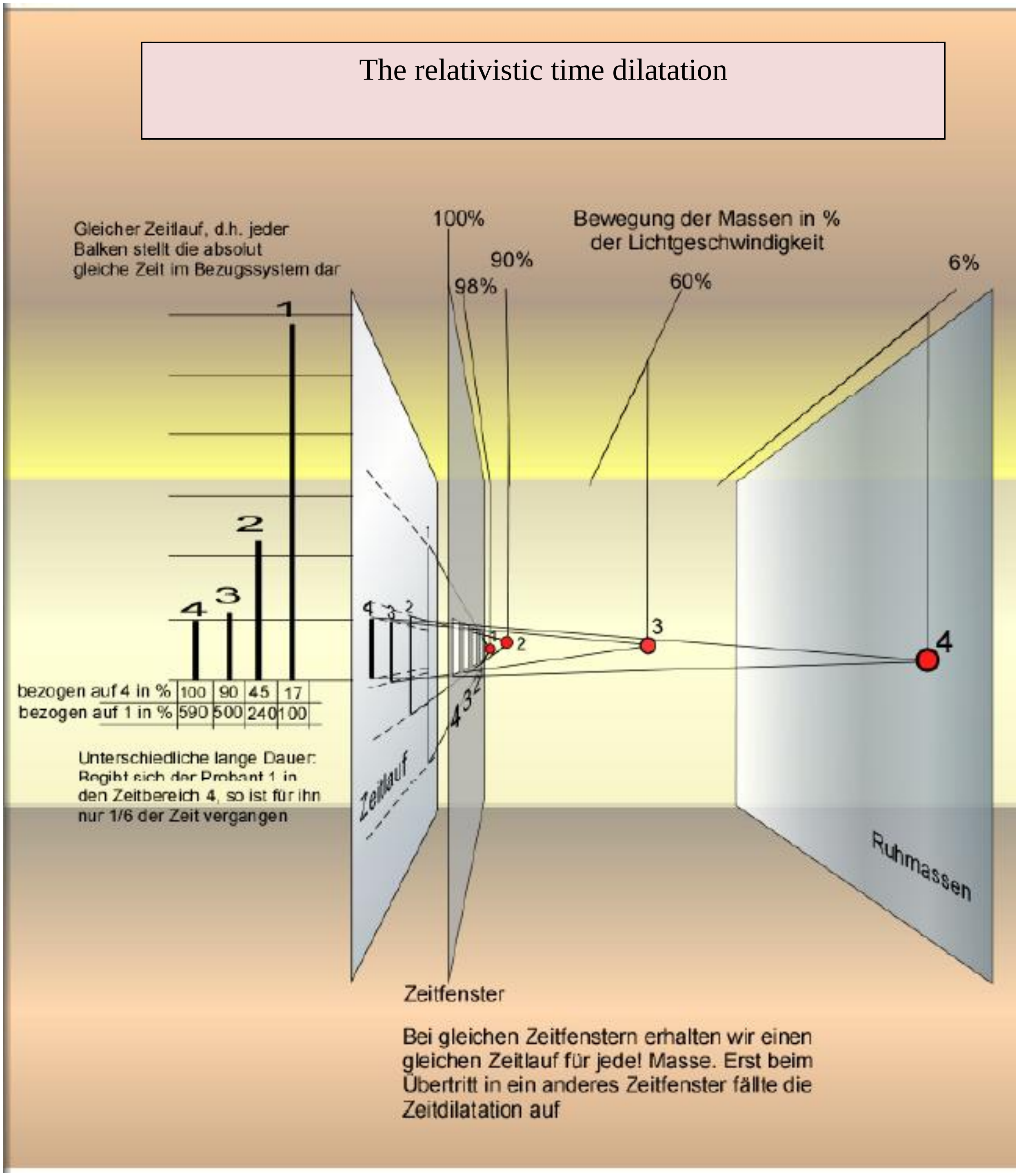
A very important fact to consider is the energy needed to move from one time window to the next. It is expressed in the famous formula

$E = m \times c^2$.

The traveling twin, for example, would be almost 10 times heavier after being accelerated to almost the speed of light (increase in energy = increase in mass).

An example taken from our experiences illustrates that crossing over into a different time window is only possible through slow acceleration or slowing down. Moving into a different time window too quickly can have deadly consequences. A car, for example, that travels at 200km/h is a time window. If this car was to move over to a different time window, such as a solid, unmoving concrete wall, the chances of survival for the passengers are slim.

Figure 1



Boundary area

Furthermore, the boundary area between different time windows is worth mentioning, as it is impossible to see details in a different time window at the same time. This dead zone is comparable to a kind of “out of focus relation” that exists in the science of quantum physics.

The boundary area is equal to looking at a wall of pictures out of a fast moving car. Single pictures are not clearly defined anymore, for they merge into a uniform, gray brown, undefined area on a wall. The twin paradox is not physically possible in real life. It is only an imaginary scenario. However, there are different time windows visible here form Planet Earth: in space and in quantum physics. The universe houses different time windows, which are only visible with an enormous delay (several one hundred million light years in the past) and from a distance. So is the aging process of far away galaxies with their high speeds (space expansion is nonexistent) slowed down. This means, we look at galaxies in areas (time windows) so reduced in their time that self-organization is impossible, because of the lack of time. (Not to mention that self-organization of matter is impossible according to the gravitation laws.)

In the world of atoms, a parallel time window is only visible through its results, for example, the myons that come down to Earth (to our time window) from the higher atmospheres.

The World of Myons

Myons are particles, 200 times the size of an electron. They are highly unstable and fall into three pieces after only 1.5 microseconds: one electron and two neutrons. These myons are the result of collisions between cosmic radiation and atoms in the high atmospheres. They fly toward the surface of Earth at the speed of light. Normally, a light quant needs 1.5 microseconds to move 500m. Consequently, the majority of myons will not reach the surface, for they fall apart after only 500m and the distance from atmosphere to surface is about 30km. A myon that reaches the surface would have to stay stable 60 times longer than normal, which is very unlikely. Surprisingly, a great number of myons reach the surface. Scientists have conducted a controlled experiment at CERN in 1976. Myons were created to observe their life spans at high speeds. In the experiment, the myons moved at 99.94% of the speed of light ($\gamma = 29$). The values measured during the experiment coincide with real life conditions according to the relativity theory. Every other myon reaches the surface of Earth intact, which is a result that proves the existence of another time window.

Conclusions

1. Time passes completely equal in the different time windows (inertial forums), as long as the movement of the systems is constant and in the same direction.
2. Crossing over from a time window to another requires an enormous amount of energy.
3. Bringing two time windows together results in the visibility of time differences.
4. If time passes faster or slower depends solely on the reference window.
5. Different time windows are parallel different simultaneousness' (This conclusion combines the absolute physical similarity of time per time window with the relative time of another window.
6. On Earth, the local time window determines the time used to compare every other time window. This means, for the twin paradox, for example, that the traveling twin aged

slower than the twin on Earth. (In reference to the twin on Earth – relative to the twin on Earth- the travelling twin aged most slowly).

7. Looking directly into another time window is impossible. Only the results are visible, once the time windows are together again.
8. Between two time windows lies a dead zone that cannot be breached.

Figure 2

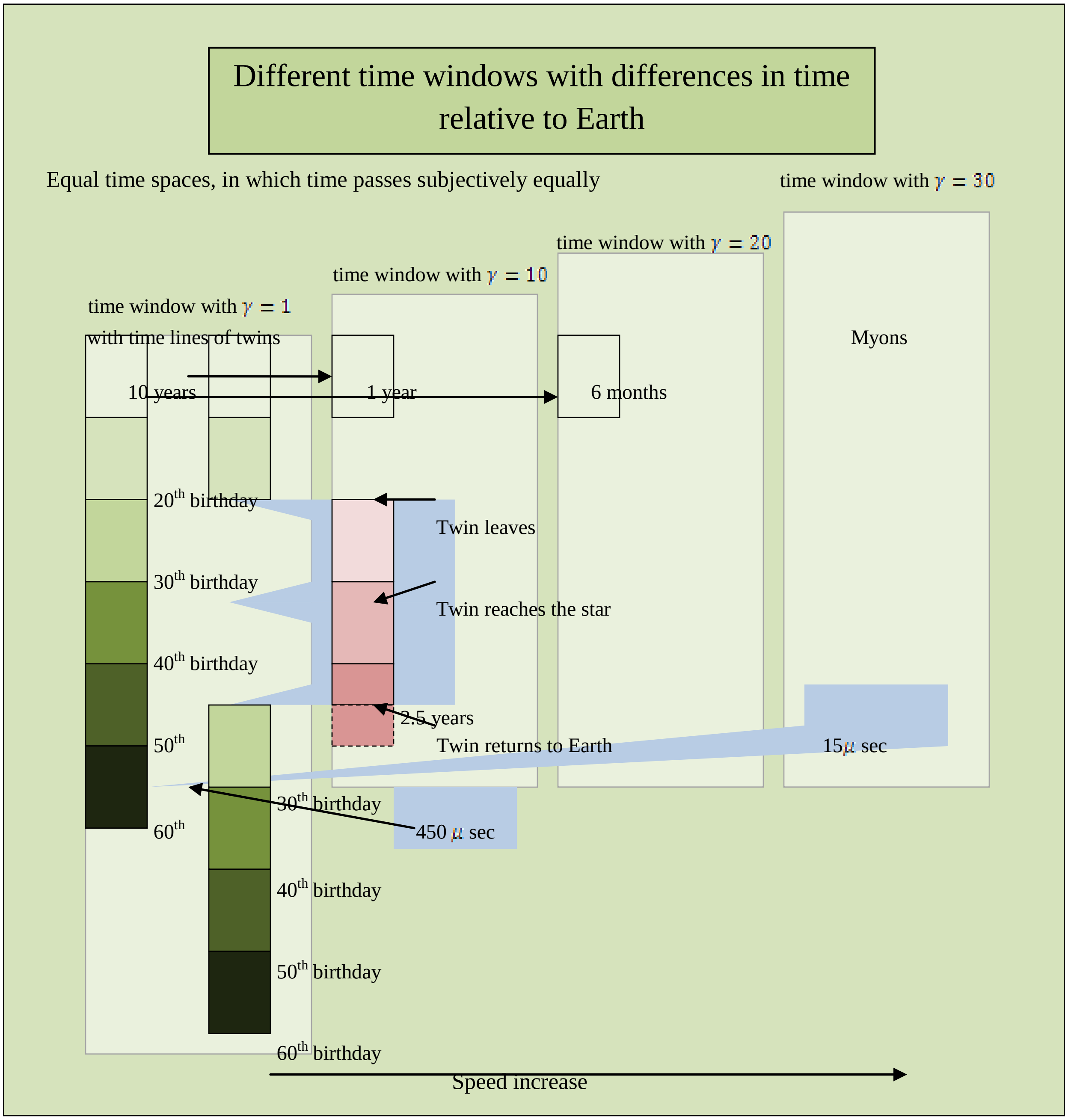
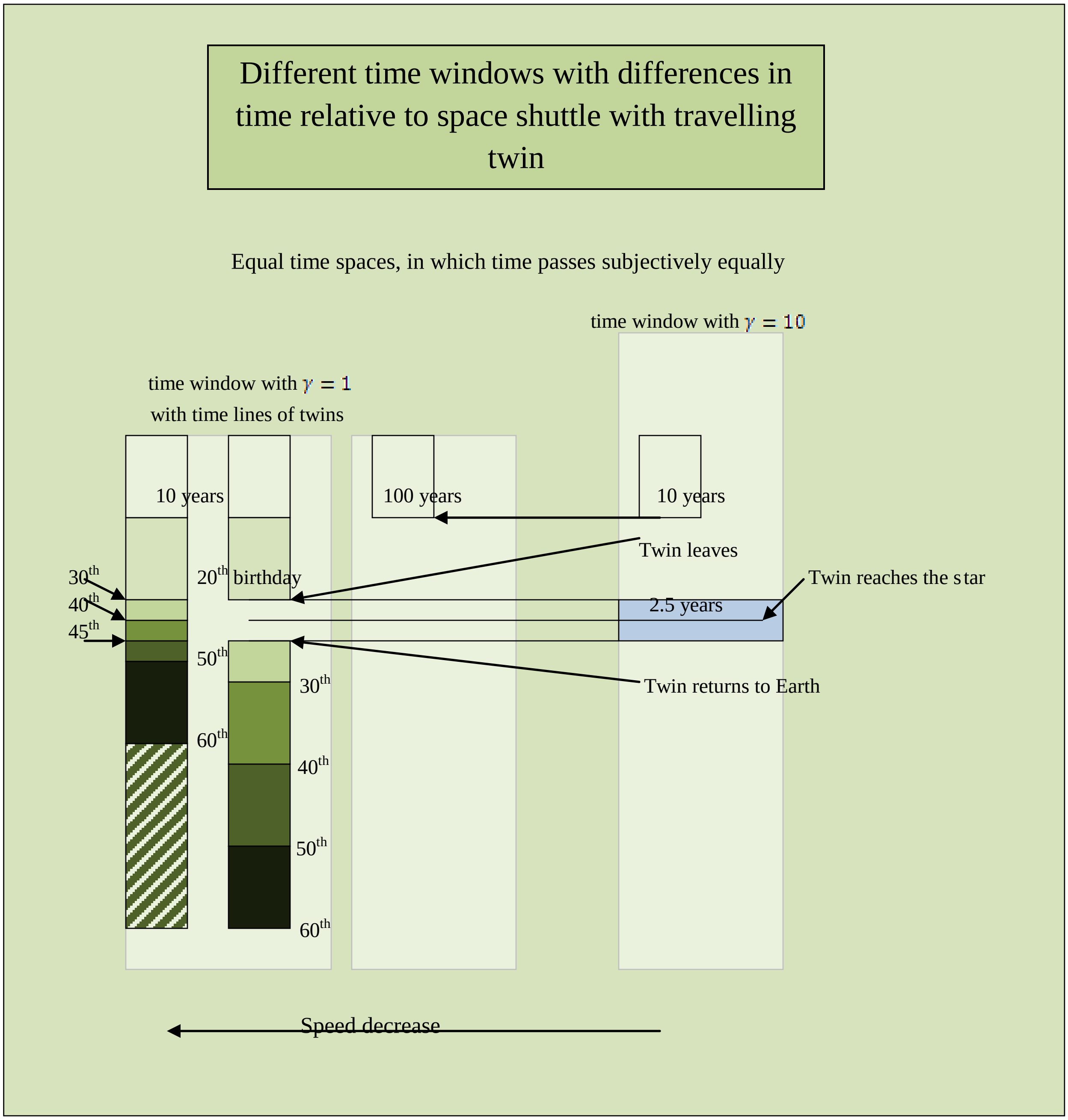


Figure 3


Different time windows with differences in time relative to space shuttle with travelling twin
Equal time spaces, in which time passes subjectively equally
time window with γ = 10
time window with γ = 1
with time lines of twins
10 years
100 years
10 years
Twin leaves
30th
40th
45th
20th birthday
Twin reaches the star
2.5 years
50th
Twin returns to Earth
30th
60th
40th
50th
60th
Speed decrease