# Relation between Time, Space And Motion

Amrit Srecko Sorli

sorli.bistra@gmail.com
Scientific Research Centre BISTRA, Ptuj
Slovenia

**Abstract**

On the base of elementary perception (sight) we see that stellar objects move in space and that time exists only as a measure of motion. With clocks one measures duration and numerical order of this motion. Time is what is measured with clocks: duration and numerical order of motion of elementary particles and massive bodies in space. In the Theory of Relativity, time as the "fourth coordinate" describes motion of massive objects and elementary particles in space. In this sense the fourth time coordinate is the "coordinate of motion". Time is a measure of motion in space carried out by clocks. Time is not a part of space. Space-time is not a physical reality into which material changes run. Space-time is a math model only, used describing the motion of objects in space where time is a coordinate of motion.

**Key words:** time, space, space-time, duration, numerical order

## Introduction

Time is what we measure with clocks: with clocks we measure duration and numerical order of motion of massive objects and elementary particles in space. There is no evidence that motion happens in time; we can only observe motion in space. To describe the position of two objects A and B in space, we need three coordinates X, Y and Z. To describe the motion from object A to object B, we need a fourth coordinate which is time "t". With clocks we describe motion. For example, let us take the simplest equation:

distance = speed x time.

Time in this case means duration of motion. If speed is given, we can calculate the distance that an object or particle has done in space.

In the Special Theory of Relativity, time as a "fourth" coordinate of space-time is a "coordinate of motion", and describes the motion of massive bodies and particles in space. Fourth coordinate **X4 = c x i x t** is called the "time coordinate", whereas **c** is light speed, **i** is an imaginary number and **t** is the number representing duration of material change. With "time coordinate" one describes motion of massive objects and particles in space. With clocks one measures the interval between material change X and material change X + n, where n represents the number of units of time. The smallest unit of time is

Planck time; in Planck time, photons pass a Planck distance. Time is a measure of motion in space.

Lynds defines time as: »Time enters mechanics as a measure of interval, relative to the clock completing the measurement" (1).

Space-time is a math model only; space-time does not exist as a physical reality. With the model of space-time we describe motion of objects and particles in space.

## Relativity of Speed of Motion and Speed of Material Change

According to this understanding of time in the Special Theory of Relativity, it is not time that is relative but the speed of material change; in a faster inertial system the speed of clocks and material change in general, is lower than in a slower inertial system. In physical space with stronger gravity the speed of clocks and material change in general is lower than in physical space with a weaker gravity field.

This understanding of time resolves the problem of twins. We do not live in time; we live in space only. A brother in a high-speed spaceship is getting older slower than his brother on Earth, but both are getting older in a space only and not in time. With clocks we measure biological changes in their bodies.

## Einstein-Podolski-Rosen experiment

The Einstein-Podolski-Rosen experiment confirms the idea that material change runs in space only and not in time. In the EPR experiment space is the immediate information medium between elementary particles which move in space only and not in time. There is no information signal traveling in time between particles. Time is a measure of motion of elementary particles in space and space is the "immediate information medium" between elementary particles (2).

## Causality problems for Fermi's two-atom system

Space as an "immediate information medium" resolves the causality problem of Fermy two atoms system: "Let *A* and *B* be two atoms or, more generally, a ''source'' and a ''detector'' separated by some distance *R*. At *t*=0*A* is in an excited state, *B* in its ground state, and no photons are present. A theorem is proved that in contrast to Einstein causality and finite signal velocity the excitation probability of *B* is nonzero immediately after *t*=0. Implications are discussed" (3).

Excitation probability of B is nonzero because space in which atoms exists is an “immediate medium of excitation”. There is no time needed for information or excitation to pass from A to B. Time is only a measure for motion of atoms A and B in space.

## General Theory of Relativity

In the General Theory of Relativity 3-dimensional objects exist in a 4-dimensional space. Gravity force is the result of a curvature of the 4-dimensional space. One can see the gravity force as a non-propagating force working directly into space and indirectly between material objects.

According to the Loop Quantum Gravity, space has a granular structure; it is made out of quanta of space. A curvature of 4-dimensional space is the result of its quantum structure. Gravity force as the result of the curvature of space is a non-propagating force; it works directly between quanta of space in a 4-dimensional space and indirectly between 3-dimensional material objects. 3-dimensional material objects are somehow captured inside a 4-dimensional space.

The brother living on Moon is getting older faster than his brother on Earth because gravity is stronger on Earth but both are getting older in same space.

Contradictory, hypothetical travel into past is possible according to the Theory of Relativity but out of question. No one can travel through space-time, as space-time is merely a mathematical model. One can travel in space only. We measure the duration of travel with clocks.

The rotation speed of planet Mercury is slower as it should be regarding its mass, because in space with stronger gravity the motion of massive objects is slower than in a space where gravity is weaker.

## Zeno Arrow Paradox

Zeno argued that the flight of an arrow is an example of motion. At any moment in time, the arrow either is where it is or it is where it is not. If it moves where it is, then it must be standing still, and if it moves where it is not, then it can't be there; thus, it cannot move.

According to understanding of time here, the answer for ZENO paradox is: The arrow does not move in time, it moves in space only. Time is a measure of arrow motion.

## Conclusions

In the Theory of Relativity and in physics in general with clocks we measure time as duration and numerical order of motion in space. A concept of space-time is here developed into a concept of space where time is a “measure of motion”.

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