

Physical Time is based on Motion Psychological Time is based on Neuronal Dynamics

Amrit S. Sorli
Scientific Research Centre BISTRA,
Ptuj, Slovenija
sorli.bistra@gmail.com

Albert Einstein about time: Space and time are modes by which we think, not conditions under which we live. Time--the time that we know through clocks and calendars--was invented.

<http://www.britannica.com/clockworks/article.html>

Ernst Mach about time: It is utterly beyond our power to measure the changes of things by time. Quite the contrary, time is an abstraction at which we arrive by means of the changes of things.

http://www-gap.dcs.st-and.ac.uk/~history/H...ics/Time_2.html

Abstract

Light speed c of is the fundamental speed in the universe from which is derived basic unit of time "Planck time" t_p . Experimental data confirms light moves in space only and not in time. Time t is obtained with clocks and is a measure of motion that runs in space. Mathematical formalism $x_4 = i * c * t$ confirms that in Special Theory of Relativity forth coordinate x_4 is spatial too. x_4 is composed out of c light speed, imaginary number i and time t that represents "thick" of a clock. Clocks are reference systems for measuring frequency, velocity, numerical order $t_0, t_1, t_2, \dots, t_n$ of material changes that run in space. This view explains some recent experiments which confirm that time t of physical event can be zero. It confirms also Gödel idea of universe without time where linear time "past-present-future" exist only as a inner psychological time based on neuronal dynamics of the brain.

Key words: time, run of clocks, numerical order, frequency, velocity, light speed, universe without time

Introduction

Light speed c is a fundamental speed in the universe on which is calculated basis unit of time "Planck time": $t_p = \frac{c}{l_p}$, where l_p is a Planck distance:

$l_p = \sqrt{\frac{\hbar G}{c^3}} \approx 1.616252(81) \times 10^{-35}$ meters. G is gravitational constant and \hbar is the reduced Planck constant.

Planck time t_p is the basic unity for measuring frequency, velocity and numerical order of physical events. Time t we obtain with clocks. Timer t as a clock run is not a part of space; time/clock run is a reference system to measure physical events i.e. material change. In Lorentz transformation time t and t' are running of clocks for two observers Q and Q'.

$$\begin{bmatrix} ct' \\ x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} \gamma & -\beta\gamma & 0 & 0 \\ -\beta\gamma & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} ct \\ x \\ y \\ z \end{bmatrix}.$$

where $\beta = \frac{v}{c} = \frac{\|\vec{v}\|}{c}$ and $\gamma = \frac{1}{\sqrt{1-\beta^2}}$.

According to formalism $d = v*t$ forth coordinates $c*t'$ and $c*t$ are spatial too.

Discussion

For certain physical phenomena time is zero, since no measurable time (no run of clocks) elapses for them to happen. For example in the article *Attosecond Ionization and Tunneling Delay Time Measurements in Helium* by Eckle et al, a conclusion is drawn that "an electron can tunnel through the potential barrier of a He atom in practically no time" (1).

Also in EPR experiment elapsed time for quantum entanglement is zero. EPR does not happen in space and time, EPR happens in space only. Here physical space in which particles exist is being considered direct information medium between entangled quanta (2).

The physical space as an "immediate information medium" resolves the causality problem of the Fermi two-atom 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 non-zero immediately after $t=0$. Implications are discussed"(3). The excitation probability of B is non-zero because the physical space in which atoms exist is an "immediate medium of excitation".

More and more modern researchers are challenged with the view that space-time is the fundamental arena of the universe. They point out that the mathematical model of space-time does not correspond to physical reality, and propose "state space" as the arena instead.

One recent paper on the subject is: *A New Geometric Framework for the Foundations of Quantum Theory and the Role Played by Gravity*. Since quantum theory is inherently blind to the existence of such state-space geometries, the analysis here suggests that attempts to formulate unified theories of physics within a conventional quantum-theoretic framework are misguided, and that a successful quantum theory of gravity should unify the causal non-Euclidean geometry of space time with the atemporal fractal geometry of state space (4).

In 1949, Gödel postulated a theorem that stated: "In any universe described by the theory of relativity, time cannot exist" (5). This article confirms that universe is a timeless phenomena, universe does not run in time, time is not part of the universe; clock/time is merely a measuring system for physical events. Duration of physical events has no existence on its own. Duration is result of measurement with clocks. Duration is an "effect of observation". Past and future does not exist in the universe. Space-time is merely a mathematical model and not fundamental arena of the universe.

Time is a run of clocks in timeless universe and excludes possibility of time travel. One can travel in cosmic space only and not in time.

Motion does not happen in time and also does not always require time. Massive bodies and elementary particles move in timeless universe. Timeless universe we experience as present moment. We live in illusion that present moments are following each other, we are not aware that physical events always run in the same present moment, means in the same timeless universe. We are not aware that we experience motion in timeless universe through inner linear time. Recent research has shown that inner linear time has its basis in neuronal activity of the brain:

“The brain is the ‘local’ creator of time, space and space-time as our special maps of reality we ‘observe’ and participate in”(6).

“Time is a fundamental dimension of life. It is crucial for decisions about quantity, speed of movement and rate of return, as well as for motor control in walking, speech, playing or appreciating music, and participating in sports. Traditionally, the way in which time is perceived, represented and estimated has been explained using a pacemaker–accumulator model that is not only straightforward, but also surprisingly powerful in explaining behavioural and biological data. However, recent advances have challenged this traditional view. It is now proposed that the brain represents time in a distributed manner and tells the time by detecting the coincidental activation of different neural populations (7).

Theory of Relativity shows that run of clocks is relative to the speed of inertial system and strength of gravitational field. Clocks run slower in faster inertial system and stronger gravity field. Research here shows that there is no physical time beyond run of clocks. Clocks run in timeless space, stellar objects and elementary particles move in timeless space. This approach is a standing point for reconciliation of General Relativity and quantum mechanics.

Conclusions

Common idea in physics that motion and speed are based on time is not correct. Time is run of clocks and is derived from speed. Idea of space-time being fundamental arena of the universe has no experimental data and has to be replaced with Gödel idea of timeless universe. Time is not part of physical space in which massive bodies and elementary particles move. Physical events happen in physical space only and not in time. Physical space itself is timeless. Time as a clocks run is merely a measuring device for physical events running in timeless universe. Duration of physical events is result of measurement with clocks.

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