Block Universe

According to the Formalism d = v x t Space-time is Timeless

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Abstract

According to the formalism $d = v * t$ fourth dimension of space-time $X_4 = i * c * t$ is spatial too. Time is not a fourth dimension of space-time. Material change i.e. motion run in a timeless space. Fundamental unit of numeric order $t_0, t_1, t_2 ....t_n$ of material change is Planck time t_p. We measure numeric order of material change with clocks. Material change t_{n-1} is "before" material change t_n equivalently as natural number $n-1$ is "before" natural number n. Numeric order of material change runs in a timeless $4D$ space and has no duration. Space-time is a timeless phenomenon.

Key words: space-time, timeless space, run of clocks, velocity, numeric order, duration, psychological time

Introduction

Let's take a photon moving between a point A and a point B of space situated at distance d. This distance d can be seen as a structure composed out of Planck distances l_p: $d = \sum l_{p1} + l_{p2} ... + l_{pn}$. The smallest distance photon can do on the way from A to B is l_p. Numeric order of photon motion from l_{p1} to l_{p2} is a Planck time t_p. Photon is moving exclusively in space and not in time. In space "before" and "after" exist only as a numeric order $t_0, t_1, t_2 ....t_n$ of a physical event: t_{n-1} is "before" t_n equivalently as natural number $n-1$ is "before" natural number n. We measure numeric order of material change with "ticking" of a clock where t_0 represents beginning of the measurement, t_n end of the measurement. Velocity v of a material change is derived from its numeric order t_n: $v = \frac{d}{t_n} ms^{-1}$. Frequency γ of material change is derived from its numeric order t_n: $\gamma = \frac{1}{t_n} s^{-1}$.

In Special Theory of Relativity fourth coordinate X_4 is spatial too. X_4 is the product of imaginary number i, light speed c and numeric order t_n of an event: $X_4 = i * c * t_n$. It is more correct to imagine cosmic space as a four-dimensional $4D$ space instead as a $3D + T$ space-time where the fourth dimension is time. There is no time in the universe in the sense of a quantity which has a primary physical existence, independent from matter. At a fundamental level universal space is timeless.

Fundamental unit of numeric order $t_0, t_1, t_2 ....t_n$ of material change that run in space is Planck time $t_p = 5{,}39124 * 10^{-44} s$ and is derived from the light speed: $t_p = \frac{c}{l_p}$

where l_p is a Planck distance. Planck time t_p exists in the universe as a fundamental physical unit that governs numeric order of material change.

In Lorentz' transformation time t and t' are the 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 $\gamma = \frac{1}{\sqrt{1-\beta^2}}$.

Clocks and material change in general run slower in the areas of timeless cosmic space where space is less dense and more curved, where the gravity is stronger. By going inside the planet Earth the speed of material clocks, i.e. material change, depends on the strength of gravity, expressed by the following formula:

$T = T_0(1 - dFi)$......................Misner, Thorne, Wheeler: Gravitation (1973)

$$dFi = \frac{8\pi}{3} * G * \frac{p}{c^2} * R * l$$

$T = T_0\left(1 - \frac{8\pi}{3} * G * \frac{p}{c^2} * R * l\right)$ where T_0 is the duration of an event measured by an observer on the surface of the earth, T is the duration of the same event measured by an observer situated under the surface of the earth at a distance l, R is the radius of the Earth, G is the gravitational constant, c is the light speed.

For example, at l is 4200 m under the surface (4200 meters is the deepest mine shaft) of the earth we obtain:

p is the density of the upper stratum of the earth: $2850\frac{kg}{m^3}$

G is the gravitational constant: $6{,}673 * 10^{-11} m^3 kg^{-1} s^{-2}$

R is the radius of the earth: $6{,}371 * 10^6 m$

c is the light speed: $2{,}99792458 * 10^8 ms^{-1}$

$$T = T_0\left(1 - \frac{8\pi}{3} * 6{,}673 * 10^{-11} * \frac{2{,}85 * 10^3}{(2{,}99792458 * 10^8)^2} * 6{,}371 * 10^6 * 4{,}2 * 10^3\right)$$

$$T = T_0(1 - 4{,}74 * 10^{-13})$$

$$\Delta T = T_0 - T$$

In one day clock situated 4200 m deep will tick for $\Delta T = 4{,}09 * 10^{-8} s$ more than the clock on the surface. In 30 days $1{,}23 * 10^{-6}$ seconds more than the clock on the surface. Density of space 4200 m deep is higher than on the surface, curvature is lover; gravity is less strong, clocks run faster than on the surface (1).

In this article the suggestive idea is introduced that the concept of time can be replaced with the numeric order of material change which is measured with a clock. Material change runs in $4D$ space. In all equations of physics the real meaning of symbol t is numeric order t_n of material change obtained with a clock. In Special Theory of Relativity and General Theory of Relativity it is not that time is relative, relative is velocity v of material change. Twin in a fast spaceship is getting older slower than his twin brother remaining on the earth. Both twins are getting older in the space only and not in time. One can travel in space only and not in time. Time travel is not possible. Material changes run of clocks included are running slower in space where gravity is stronger and faster where gravity is weaker. They always run in a timeless space.

About timeless physical events

For some important physical events clock/time is zero, since no measurable time elapses for them to happen. The numeric order of these events is equal to zero. 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" (2).

In analogous way, in Einstein-Podolski-Rosen (EPR) experiment the elapsed time for quantum entanglement is zero. In other words, quantum non-locality can be seen as a consequence of the fact that at a fundamental level space in which particles exist, acts as a direct information medium between entangled quanta.

According to a recently suggested interpretation, in an EPR-type experiment, physical space assumes the special “state” represented by the symmetrized quantum potential, and it is this special state of space that allows a non-local, instantaneous communication between the particles into consideration. In the case of a system of N particles the symmetrized quantum potential assumes the form

$$Q = \sum_{i=1}^{N} -\frac{\hbar^2}{2m_i} \begin{pmatrix} \frac{\nabla_i^2 R_1}{R_1} \\ -\frac{\nabla_i^2 R_2}{R_2} \end{pmatrix} \quad (1)$$

where R_1 is the amplitude function of the wave-function $\psi = R_1 e^{iS_1/\hbar}$ describing the forward-time process and R_2 is the amplitude function of the wave-function $\phi = R_2 e^{iS_2/\hbar}$ describing the time-reverse process. On the basis of Eq. 1, we can explain non local correlations in many-body systems – and thus EPR experiments - in the correct way (namely also filming back the process of these correlations). The symmetrized quantum potential (Eq. 1) can be considered the most appropriate candidate to provide a primary physical reality to space as a direct information medium (3). While the standard Schrödinger equation and the original bohmian theory imply that filming back a physical event it is not possible to see what effectively happens (namely the real interaction which characterizes the system under consideration), with the introduction of the symmetrized quantum potential we can interpret in the correct way both the forward-time process and the time-reverse process and thus the numeric order of a quantum process and the idea of space as a direct information medium can receive a primary physical significance. By means of the special state represented by the symmetrized quantum potential, we can say that in the subatomic world at a fundamental level physical space can be physically interpreted as an immediate information medium, as an entity that puts the particles into an immediate contact. In EPR experiment it is just the symmetrized quantum potential that makes physical space an “immediate information medium” which keeps two elementary particles in an immediate contact. We can call this peculiar interpretation of quantum non-locality as the “immediate symmetric interpretation”.

If in the subatomic world the symmetrized quantum potential makes physical space the real direct medium of information transfers between elementary particles, in a complete physical theory the possibility is opened that a fundamental arena in which space functions as a direct information medium is the primary element from which every field and object of physics derives and which is able to reproduce the fundamental interactions and physical fields in a unified way. If non-locality is considered as the essential characteristic of the physical world and the idea of the symmetrized quantum potential seems the most general and consistent way to introduce non-locality, in a fundamental physical theory the symmetrized quantum potential should assume a crucial role and all the objects of physics might emerge from it as special states. In particular, the possibility is opened that there is an important link between this fundamental arena and the Planck scale, in particular with the granular structure of space predicted by loop quantum gravity. According to loop quantum gravity, space is made out of quanta of space (4). On the basis of the immediate symmetric interpretation, the perspective is opened that direct quantum information transfers run over quanta of space which have the size of Planck length. According to this interpretation, at the Planck scale space acts as an immediate information medium. At this scale information transfers are immediate: elapsed time for them to happen is therefore zero.

The idea of space as a direct information medium introduces interesting perspectives also as regards the interpretation of the gravitational interaction in the general relativity theory context. One can say that at a fundamental level curvature of space can be considered as a direct medium that generates gravitational motion of material objects into direction of higher curvature of space. There is no direct attraction force between material objects. Material object causes curvature of space and curvature of space causes gravitational motion. Gravitational interaction $mass \leftrightarrow space \leftrightarrow mass$ is immediate: presence of mass increases curvature of space that causes gravitational motion. Mass acts on other mass indirectly via curvature of space: $mass \leftrightarrow curvature \leftrightarrow mass$. Curvature of space is defined by Einstein curvature tensor:

$$G\mu\nu = \frac{8\pi G}{c^4} \cdot T\mu\nu \quad (2).$$

In this view gravity is interpreted as an immediate physical phenomenon. On the basis of the interpretation of space as a direct information medium, for example, the gravitational interaction between the earth and the sun is immediate in the sense that the curvature of space caused by the presence of the sun (given by Eq. 2) acts instantaneously on the earth determining its motion in its own trajectory. The sun acts instantly on the earth via the curvature of space (determined by the sun) which functions a direct, immediate information medium between the earth and the sun.

In original papers of 1916 Einstein do not mention gravitational waves. This idea arises few months later. Einstein introduces gravitational waves as space-time perturbations (5). With the introduction of gravitational waves that propagate with light speed gravity is interpreted a non-immediate phenomenon as propagation of gravitational waves requires some “tick” of clocks.

Timeless description of physical events

Several 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 a "state space" or a "timeless space" as the fundamental arena where with clocks we measure numerical order of material change.

For example, in *A New Geometric Framework for the Foundations of Quantum Theory and the Role Played by Gravity*, Palmer underlines that, since quantum theory is inherently blind to the existence of state-space geometries, 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 a-temporal fractal geometry of state space (6). In this paper, Palmer introduces a new geometric law of physics about the nature of physical reality based on an Invariant Set Postulate. The Invariant Set Postulate conjectures that states of physical reality are defined by a fractal geometry *I* , embedded in state space and invariant under the action of some subordinate causal dynamics D_I . The postulate is motivated by two concepts that would not have been known to the founding fathers of quantum theory: the generic existence of invariant fractal subsets of state space for certain nonlinear dynamical systems, and the notion that the irreversible laws of thermodynamics are fundamental rather than phenomenological in describing the physics of extreme gravitational systems. The Invariant Set Postulate posits the existence of a fractionally-dimensioned subset *I* of the state space of the physical world (namely the universe as a whole). *I* is an invariant set for some presumed-causal (namely relativistic) deterministic dynamical system D_I ; points on *I*, called also "world states", remain on *I* under the action of D_I . World states of physical reality are those, and only those, lying precisely on *I*. It is important to underline that in Palmer's theory, the subset *I* of the state space is more primitive than the deterministic dynamical system D_I . Given *I*, $D_I(t)$ maps some point $p \in I$, a parameter distance *t* along a trajectory of *I*. Crucially, D_I is undefined at points $\notin I$: if states of physical reality necessarily lie on *I*, then points $p \notin I$ in state space are to be considered literally "unreal". For practically-relevant theories (such as quantum theory) the intricate structure of *I* is unknown and these points of unreality cannot be ignored. As regards the key question of how to represent quantum-theoretic states in a mathematically-consistent way for such points of unreality, the Invariant Set Postulate provides support to the search for a timeless description of physics: by treating the geometry of the invariant set as primitive introduces a fundamentally timeless perspective into the formulation of basic physics.

Moreover, H.T. Elze has recently developed an approach based on the observation that "time passes" when there is an observable change, which is localized with the observer (7). In this picture, necessary ingredients are incidents, i.e. observable unit changes, which are recorded, and from which invariant quantities characterizing the change of the evolving system can be derived. This approach invokes compactified extradimensions in which a particle moves in addition to its relativistic motion in Minkowski space. More precisely, in Elze's model the physical time is constructed on the basis of the assumption that an observer in (3+1)-dimensional Minkowski space can perform measurements on full (5+1)-dimensional trajectories, only within a quasi-local window to the two extradimensions $x^{4,5}$ (which are assumed to be toroidally compactified). In particular, the observer records the incidents ("units of change") when the full trajectory hits an idealized detector which covers a small convex area element on the torus described by the coordinates $x^{4,5}$). The detector can be defined invariantly and amounts to attributing to an observer the capability to count discrete events. Thus, the detector counts present an observable measure of a discrete physical time. In fact, in Elze's model physical time is an emergent discrete quantity related to the increasing number of incidents measured by the reparametrization invariant incident number:

$$I = \int_{s_i}^{s_f} ds' \lambda(s') D(x^4(s'), x^5(s')) \quad (3)$$

where *λ* stands for an arbitrary "lapse" function of the evolution parameter *s*, $x^{4,5}$ describe the trajectory of the particle in the extradimensions, the integral is taken over the interval which corresponds to a given invariant path $x_i^\mu \to x_f^\mu$, and the function *D* represents the detector features. The physical time *t* has been therefore obtained by counting suitably defined incidents, i.e., coincidences of points of the trajectory of the system with appropriate detectors (8, 9). This physical time induces stochastic features in the behavior of the external relativistic particle motion and is characterized by a discreteness in the sense that it is given by a nonnegative integer multiple of some unit time, *t* ≡ *nT*.

Palmer's theory and Elze's approach can be considered as significant mathematical proof that at a fundamental level space is timeless, that the duration of physical events has not a primary existence. The view according to which clocks represents measuring systems of the numeric order $t_0, t_1, t_2 ....t_n$ of material changes can be considered the most direct and natural development of Palmer's approach and Elze's model: it is a description of motion in physics without using concept of time. Material change does not run in time. Time/clock is a measuring device for numeric order t_n of motion that runs in a timeless space where velocity v of motion is derived from its numeric order t_n: $v = \frac{d}{t_n} ms^{-1}$ and numeric order is characterized by a discreteness at a fundamental level.

Numeric order of change $t_0, t_1, t_2 ....t_n$ runs in space only and not in time

Girelli, Liberati and Sindoni have recently developed a toy model in which they have showed how the Lorentzian signature and a dynamical space-time can emerge from a non-dynamical Euclidean space, with no diffeomorphisms invariance built in. In this sense this toy-model provides an example where time (from the geometric perspective) is not fundamental, but simply an emerging feature (10). In more detail, this model suggests that at the basis of the arena of the universe there is some type of "condensation", so that the condensate is described by a manifold R^4 equipped with the Euclidean metric $\delta^{\mu\nu}$. Both the condensate and the fundamental theory are timeless. The condensate is characterized by a set of scalar fields $\Psi_i(x_\mu)$, i=1,2,3. Their emerging Lagrangian L is invariant under the Euclidean Poincarè group ISO(4) and has thus the general shape

L = F(X1;X2;X3) = f(X1) + f(X2) + f(X3); $X_i = \delta^{\mu\nu} \partial_\mu \Psi_i \partial_\nu \Psi_i$ (4).

The equations of motion for the fields $\Psi_i(x_\mu)$ are simply given by

$$\partial_\mu\left(\frac{\partial F}{\partial X_i}\partial^\mu \Psi_i\right)=0=\sum_j\left(\frac{\partial^2 F}{\partial X_i \partial X_j}\left(\partial^\mu X_j\right)+\frac{\partial F}{\partial X_i}\partial_\mu \partial^\mu \Psi_i\right) \quad (5)$$

The fields $\Psi_i(x_\mu)$ can be expressed as $\Psi_i=\psi_i+\varphi_i$ where φ_i are the perturbations around the solutions ψ_i of the above equation. The lagrangian for ψ_i is given by

$$F(\overline{X}_1,\overline{X}_2,\overline{X}_3)+\sum_j\frac{\partial F}{\partial X_j}(\overline{X})\delta X_j+\frac{1}{2}\sum_{jk}\frac{\partial^2 F}{\partial X_j \partial X_k}(\overline{X})\delta X_j \delta X_k+\frac{1}{6}\sum_{jkl}\frac{\partial^3 F}{\partial X_j \partial X_k \partial X_l}(\overline{X})\delta X_j \delta X_k \delta X_l$$

(6)

where $\overline{X}_i=\delta^{\mu\nu}\partial_\mu\psi_i\partial_\nu\psi_i$ and $\delta X_i=2\delta_\mu\psi_i\partial^\mu\psi_i\partial_\mu\varphi_i\partial^\mu\varphi_i$.

Different choices of the solutions ψ_i lead to different metrics

$$g_k^{\mu\nu}=\frac{df}{dX_k}(\overline{X}_k)\delta^{\mu\nu}+\frac{1}{2}\frac{d^2 f}{(dX_k)^2}(X_k)\partial^\mu\psi_k\partial^\nu\psi_k \quad (7).$$

If one considers the specific class of equations of motion for which $\psi_i=\alpha^\mu x_\mu+\beta$, the SO(4) symmetry leads to $\overline{\psi}=\alpha x_0+\beta$ which shows that the choice of the coordinate is completely arbitrary. Hence the Lorentzian signature can be obtained for the condition $\frac{df}{dX}(\overline{X})+\frac{\alpha^2}{2}\frac{d^2 f}{(dX)^2}(\overline{X})<0$, $\frac{df}{dX}(\overline{X})>0$ and in this case the lagrangian becomes $L_{eff}=\sum_i\eta^{\mu\nu}\partial_\mu\varphi_i\partial_\nu\varphi_i$ where $\eta^{\mu\nu}$ is the Minkowski metric. Moreover, Girelli, Liberati and Sindoni have showed that by means of the change of variables

$$\begin{pmatrix}\varphi_1\\ \varphi_2\\ \varphi_3\end{pmatrix}=\Phi\begin{pmatrix}\phi_1\\ \phi_2\\ \phi_3\end{pmatrix} \quad (8)$$

with $\Phi^2=\sum_i\phi_i^{\,2}=l^2$ where *l* is related to Planck scale, a dynamical space-time emerges from L_{eff}, which is characterized by the Einstein-Fokker equations

$R=2\pi G_N T$ (9),

$C_{\alpha\beta\gamma\delta}=0$ (10)

where

$R=\frac{6}{l^2}T$ (11),

$T(\phi_i)=g^{\mu\nu}T_{\mu\nu}(\phi_i)=-\Phi^2\sum_i\eta^{\mu\nu}\partial_\mu\phi_i\partial_\nu\phi_i$ (12),

$g_{\mu\nu}=\Phi^2(x)\eta_{\mu\nu}$ (13)

(which shows that the gravitational degree of freedom is encoded in the scalar field Φ) and where G_N is proportional to l^{-2}.

The toy model developed by Girelli, Liberati and Sindoni shows in a clear way that at a fundamental level space is a timeless condensate and that different solution of the equations of motion of the fields characterizing this condensate determine different metrics of the space-time background. This means that on the basis of this model time as humans perceive it cannot be considered a fundamental physical reality, the duration of material change has no existence of its own: with clocks we measure only the numeric order of material change i.e. motion and the numeric order of change runs in space only and not in time.

But what are these clocks which characterize a timeless space? What are the main features of the clocks in a timeless space? How does a clock work in a timeless space? In this regard, in the recent article “The nature of time: from a timeless hamiltonian framework to clock time metrology”, Prati has showed that in a timeless framework a physical system S, if complex enough, can be separated in a subsystem S2 whose dynamics is described, and another cyclic subsystem S1 which behaves as a clock (11). The dynamics of S2 is mapped in the states of the cyclic subsystem S1 which provides a discrete approximation of the parameter time. This provides a unitary framework capable to account for the fundamental timelessness of Nature, and the experimental evidence of time.

More precisely, according to Prati’s model we have a parameter time σ which has the property of providing a privileged parameterization suitable for describing dynamics (but is not an observable quantity), and an observable quantity T which realizes an experimentally measurable discrete approximation of σ. Defining the clock time T, measured for example by atomic clocks, corresponds to label simultaneous occurences in the phase space of two or more subsystems where one is identified as the clock. It is a matter of the experimentalist to choose suitable cyclic subsystems (macroscopic clocks) in order to provide a good approximation of the parameter time σ. For a given $\bar{\sigma}$, a state ψ of the system S consists of the tensor product of the state $\psi_1(\bar{\sigma}) \in H_1$ and the state $\psi_2(\bar{\sigma}) \in H_2$ where H1 and H2 are the Hilbert spaces of the subsystems S1 and S2 respectively. Given the interval (σA, σB), it is now defined the set $\Omega(\sigma_A, \sigma_B) \subset H_2$: $\Omega(\sigma_A, \sigma_B) = \{\psi_2(\sigma) \in H_2 / \sigma \in (\sigma_A, \sigma_B)\}$ (11). The origin σ_0 of the parameter time is associated with the arbitrary initial states $\bar{\psi}_1 = \psi_1(\sigma_0)$ and $\bar{\psi}_2 = \psi_2(\sigma_0)$. Macroscopic time duration T(S1) of the interval (σA, σB) measured by the cyclic subsystem S1 is given by the number of states $\psi_2(\sigma) \in \Omega$ so that $\psi_1(\sigma) = \bar{\psi}_1$.

Prati’s interpretation of the clock role in the description of the evolution of another subsystem has some important consequences. The first deals with the unavoidable semiclassicality of the measurement of a quantum system. Since clock time is by definition fundamentally discrete and it depends on the specific fabrication of the clock, a (macroscopic) measurement of time below one cycle (period) of the time standard is meaningless. At the present time the most advanced available clock technology is given by single ion atomic clocks based on Al+/Hg+ with a fractional uncertainty of about 1 – 2 × 1017 [12]. Adopting such view it implies for example that Planck time scale is an extrapolation, an extension of the concept of clock time beyond its field of definition. Following the terminology of Kofler and Brukner [13], macrorealism (property of a system of being in one or more macroscopically distinct states) and classical (or semiclassical) laws emerge out of quantum physics under the restriction of coarse-grained measurements. The description of time evolution of a system is necessarily semiclassic because the observer is tracking time with a macroscopic system whose fluctuations dominate on the short time scale. Indeed, T is expected to fail as a good approximation of σ in the fast decoherence process which occurs during a measurement. The second point deals with the clock ambiguity problem, where clock is treated as a subsystem like in Prati’s approach [14]. Gauge invariance transforms one parameterization into another, so they are all equivalent. This implies that a complex system can be separated in many ways in a part which constitutes the clock, and the rest and therefore that each subsystem which acts as clock provides only the numeric order of the dynamics of the other subsystem. Moreover, such property reveals the assumption that parameter time and clock time are considered to coincide and approach assumes consequently that parameter time, interpreted in the sense of the numeric order of material change, is an observable quantity.

Clock as a measuring system of numeric order in timeless space resolves Zeno Problems on motion

Zeno problems of motion confronted in terms of space and time are agitating human reason for centuries. Here we see that motion exists in timeless space only and not in time. With clocks we measure numeric order of motion. Achilles surpasses Tortoise in space only and not in time. Velocity v of both runners is derived from the numeric order of their motion. You imagine Achilles at the point A , Tortoise at the point T . Between A and T there is a distance d . When they start running into the same direction we activate a stopwatch. When Achilles is surpassing Tortoise we stop stopwatch. On the stopwatch we see $t_n = 10 \sec$. Achilles has passed 10 meters, his speed is $v_a = 1ms^{-1}$. Tortoise has passed 1 meter, its $t_n = 10 \sec$, velocity is $v_t = 0{,}1ms^{-1}$. At the starting points the distance d between Achilles and Tortoise was 9 meters. Achilles runs distance $d_1 = 10\,m$ .Tortoise runs distance $d_2 = 9\,m$ .They both move in space only and not in time. Clock is a measuring device for numeric order $t_0, t_1, t_2 .... t_n$ of their motion. Their velocities $v_a = \frac{d_1}{t_n}$ and $v_t = \frac{d_2}{t_n}$ are derived from numeric order of their motion.

Here the idea is considered that universe is timeless. Zeno and Parmenides too have been considering that universe is timeless: “Quantum mechanics brings another flavour in Zeno paradoxes. Quantum Zeno and anti-Zeno effects are really paradoxical but now experimental facts. Then we discuss supertasks and bifurcated supertasks. The concept of localization leads us to Newton and Wigner and to interesting phenomenon of quantum revivals. At last we note that the paradoxical idea of timeless universe, defended by Zeno and Parmenides at ancient times, is still alive in quantum gravity “ (15).

Numeric order experienced through psychological time creates a sensation of duration

Recent neurological research shows that by measuring a physical event with a clock we experience numeric order $t_0, t_1, t_2 .... t_n$ of event through psychological time “past-present-future”. However numeric order of physical event runs in timeless space and has no duration.

“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 (16).

Conclusions

Here is shown physics describes physical world with more accuracy replacing concept of time with numeric order of material change. Nothing can happen in time as time is a psychological frame through which we experience numeric order of material change running into timeless $4D$ space.

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