Description of Electromagnetic Phenomena in 3D Euclid Space

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Abstract - In the 20th century, physics has understood space and time as being coupled into a “space-time” manifold, a fundamental arena in which everything takes place. Space-time was considered to have three spatial dimensions and one temporal dimension. Out of the experimental facts one can conclude that time t is only a numerical order of material change, i.e., the motion that we obtain with clocks. For the description of the electromagnetic phenomena it is here proposed an Euclid 3D space whilst time t is merely a numerical order of a photon motion in a 3D space. This view opens new perspectives on the understanding of the quantum entanglement, where the 3D space becomes an immediate medium for quantum communication.

Key words: space-time, space, time, numerical order, photon, quantum entanglement

Time t is a numerical order of material changes that run in a 3D space

The Planck’s time is a fundamental unit of the numerical order of physical events. Let us consider light. A photon moves in space. Let us observe a photon moving from point A to point B in space. By assuming that space has a granular structure at the Planck scale (this view is supported by significant theoretical results regarding, for example, reticular space-time dynamics and loop quantum gravity), the smallest distance that a photon can move on the distance \( d_{AB} \) from A to B is the Planck’s length \( l_p = \sqrt{\frac{\hbar G}{c^3}} \): 

\[
d_{AB} = l_p + l_p + \ldots + l_p.
\]

Each motion on the line segment \( l_{px} \) corresponds exactly to one Planck time \( t_{px} = \sqrt{\frac{\hbar G}{c^3}} \). The time \( t \) of photon motion across distance \( d_{AB} \) is the sum of all \( t_{px} \):

\[
t = t_1 + t_2 + \ldots + t_n = \sum_{x=1}^{n} t_{px}.
\]

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The Planck’s time $t_p$ is here considered to be the fundamental unit for measuring the numerical order of photon motion. The velocity of a photon $c$ is calculated by dividing the Planck’s length $l_p$ with Planck’s time $t_p$. For longer distances $d_{AB}$, $c$ is obtained by dividing $d_{AB}$ with the numerical order of the photon motion $t$.

$$c = \frac{l_p}{t_p} = \frac{d_{AB}}{t}$$

**Description of electromagnetic phenomena in inertial systems o and o’ in 3D Euclid space**

A photon has constant velocity in all inertial systems. Its motion in inertial systems o and o’ can be described within Euclid space, with Galileo transformations for three spatial dimensions and Selleri transformation for numerical order $t$ of material change:

$$X' = X - v \times t$$
$$Y' = Y$$
$$Z' = Z$$

This transformation is valid for the observers O and O’ in inertial systems o and o’. Moving inertial system o’ observed from rest system o moves regarding o with constant velocity $v < c$ parallel to the $X$ axis. For time $t$ as a numerical order of material change we use Selleri formalism.

$$t' = \sqrt{1 - \frac{v^2}{c^2}} \times t$$

In this formalism time and space are two separated quantities. Clock as a measuring device of numerical order of material change in an experiment runs slower (in generally all material change run slower) in a faster inertial system o’ than rest inertial system o. Experiments with clocks in a fast airplane confirm that these relative velocities are valid for both observers O and O’.

With time $t$ as numerical order of change the “Twin paradox” is definitely resolved; the twin brother in a fast spaceship ages slower than his brother on Earth. Both are growing older in a space only where time $t$ is a numerical order of their aging. Also the question of time travels is definitely resolved: time travel into past or into future.
is not possible. One can travel in a space only and time $t$ is a numerical order of his/her motion.

Quantum space is an immediate medium of quantum information transfer

According to the concept of space-time, all physical phenomena happen in space and time. This concept cannot explain those physical phenomena where information transfer is immediate. For these phenomena time $t$ (i.e. the elapsed clock run for them to happen) is zero. If these phenomena would happen in time intended as some physical reality, time could never be zero. This article presents a new concept of time in quantum space where time $t$ is only a numerical order of material change: quantum phenomena where information transfer is immediate have no time. Examples of such phenomena are: the non-local correlations between quantum particles in EPR-type experiments and other immediate physical phenomena like tunneling or quantum entanglements regarding the continuous variable systems or the quantum excitations from one atom to another in Fermi’s two-atom system.$^{9,10,11,12}$ These phenomena are carried directly by the quanta of space QS which constitute quantum space. Quanta of space QS have a volume of Planck:

$$t_p^3 = \sqrt{\frac{(hG)^3}{c^9}},$$

where $\hbar$ is the reduced Planck constant, $G$ is the gravitational constant and $c$ is the velocity of light. Inside Planck volume, time as numerical order of material change does not exist. Time enters existence at the scale of Planck. Planck time is the fundamental unit of photon motion on the Planck length.

Conclusions

Electromagnetic phenomena can be described in Euclid space and with Galilean transformation for three spatial coordinates. For transformation of time as a numerical order of material change we use Selleri formalism. In this view time is taken away status of a physical quantity in which material change run. Time gain a status of a numerical mathematical order of material change. This view on time corresponds better to the physical world and has more explanatory power in describing immediate physical phenomena.

References:


