Quantum Entanglement and Multispace Conception

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Abstract

In contemporary physics space is the boundless, three-dimensional extent in which objects and events occur, i,e, a large container and the force field is a part of space where force acts. In contradiction to this very basic principle of contemporary physics we here propose a new concept that space and physical force field are mutually dependent entities of the same phenomena. If the force field does not exist, then the corresponding space does not exist either. And vice verse, if space does not exist, there is no force field present. Therefore each force field is associated with a separate space, which we call *eigenspace*. Objects which carry several force fields form several eigenspaces, for example, an electron has gravitation eigenspace, electric eigenspace and magnetic eigenspace. Particles in one eigenspace can be entangled, while in another eigenspace they must be separated in large distances, for example, photons entangled in the electromagnetic eigenspace can be separated in the gravitation eigenspace. All eigenspaces except gravitation eigenspace are separated for direct observation. In this sense they are Einstein "hidden variables".

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03.65.Ud Quantum nonlocality

03.50.-z Classical field theories

12.10.-g Unified field theories and models.

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Introduction

Quantum entanglement was first discussed by Albert Einstein in 1935, in a joint paper with Boris Podolsky and Nathan Rosen [1]. In this study they formulated the Einstein, Podolsky, Rosen (EPR) paradox, a thought experiment that attempted to show that the quantum mechanical theory was incomplete. Later Einstein called quantum entanglement as a spooky action at a distance.

Until now quantum entanglement is the greatest mystery in physics. The real existence of quantum entanglement is confirmed in multiple experiments, but its mechanism of action is still incomprehensible by use of contemporary physics notions about space as an infinite container in which everything is located and everything happens. In this article we show that the implementation of a new concept that the space and physical force field are two types of manifestation of the same phenomenon explain the quantum entanglement nature.

Basics of multispace conception

In contemporary physics a force field is a vector field that describes a non-contact force acting on a particle at various positions in space. Therefore a force field is only a part of space.

Space equation

Below it is shown how to derive the space equation from well-known basic expressions of the classical non-relativistic field theory.

The energy of any force field is defined as:

$$W = \alpha\varphi \qquad \textbf{(1)}$$

where: α – source of force field, φ – potential.

The source is an extensive physical quantity – the cause of conservative forces. Here we assume that the source is point like. For example, for gravitation the source of energy is mass, for electricity the source is a charge, for magnetism the source is the Gilbert magnetic charge or Dirac monopoly and for a nuclear (strong) field the source is a baryon charge.

Potential is the potential energy of one unit of source.

The source of a force field is constant, but the intensity of the field is dependent on Euclidean distance between the source point and the observable point of the corresponding space (force field).

Field intensity is: $I = d\varphi/dr = dW/\alpha dr = grad\varphi$ **(2)**

where: r – distance from source to any point of space.

For homogeneous fields: $I = W/\alpha r$ **(3)**

Capacity of field is: $C = \alpha^2/W$ **(4)**

Propagation (Permittivity, Permeability) of field is: $\Pi = dC/dr = \alpha^2/rW$ **(5)**

For the description of propagation of a field in contemporary physics different quantities are used: Permittivity for electric field, Permeability for magnetic field and the inverse value of the Gravitation constant for gravitation field. Here we show how these quantities can be unified by the conception of propagation.

From propagation (Eq. 5) and intensity (Eq. 3) we get: $\alpha/\Pi = rW/\alpha = r^2(W/\alpha r) = r^2 I$

The result is the space equation: $\alpha/\Pi = r^2 I$ **(6)**

The space equation is a basic equation for any physical force field. For the description of any physical force field all what is necessary to know is the source of a field, its propagation and intensity. The description of basic physical fields is shown below.

Gravitation field.

The source of gravity is mass: $\alpha = m$, intensity is: $I = g = -d^2r/dt^2$, propagation is: $\Pi = 1/G$

Therefore the space equation for gravity is: $mG = -r^2(d^2r/dt^2)$ or: $g = -mG/r^2$ **(7)**

It is the Newton gravitation law.

Electric field

The source of an electric field is a charge: $\alpha = q$, intensity is: $I = E$, propagation is: $\Pi = 4\pi\varepsilon_0$

Therefore the space equation for the electric field is: $q/4\pi\varepsilon_0 = r^2 E$ or: $E = q/(4\pi\varepsilon_0 r^2)$ **(8)**

It is the Coulomb law.

Magnetic field

The source of a magnetic field is the Gilbert magnetic charge or Dirac monopoly: $\alpha = M$, intensity is: $I = H$, propagation is: $\Pi = 4\pi\mu_0$

Therefore the space equation for a magnetic field is:

$M/4\pi\mu_0 = r^2 H$ or: $H = M/(4\pi\mu_0 r^2)$ **(9)**

Properties of entangled state

There are certain rules which govern the mutual interaction of force fields, their spaces having different sources. The space (and force field) of the same type of source is an additive. If forces interact, the sources and their eigenspaces are entangled. For example, the total gravitation force acting on some bodies in a gravitation eigenspace containing multiple objects with mass would be the sum of their gravitation forces. Since the space and its corresponding force field is the manifestation of the same phenomenon, consequently we would observe one space, which would be the sum of all spaces caused by all bodies with mass. As a result, the gravitation eigenspace of our observed Universe corresponds to the total mass of the Universe. All masses in the Universe are entangled. This explains the speed of gravity. The eigenspaces and force fields of a different kind of sources may overlap each other, but they are not additive. For example, electrical forces and gravity forces overlap, but do not affect each other. As a result, the electrical eigenspace and the object can act as the source of several force fields and spaces. For example, an electron has mass, though it has its own gravitation eigenspace, it has charge, though it has its own electrical eigenspace and it has a magnetic moment, which acts as the source of the magnetic force field and the magnetic eigenspace. In the gravitation eigenspace two electrons have separate electrical eigenspaces (Fig. 1).

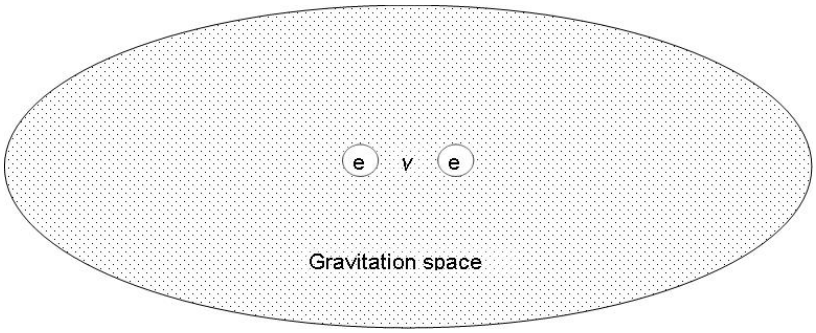

Fig. 1. Separate electrons e in the gravitation space.
γ - intermediate particle (photon)

The interaction is possible only by virtual photons (intermediate particles). If two electrons have a common electrical eigenspace they are entangled (Fig.2.).

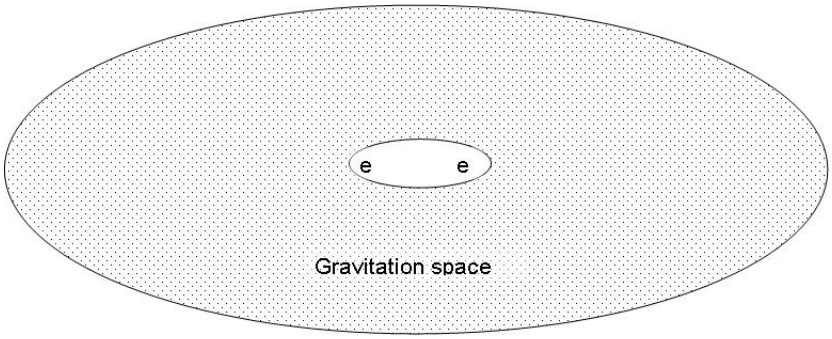

Fig. 2. Entangled electrons in gravitation space.

The electric forces are common for both electrons. No intermediate particles are necessary. When entangled electrons move in the gravitation eigenspace, nothing changes in the electric eigenspace. Entanglement remains at any distance between the electrons in the gravitation eigenspace (Fig.3.).

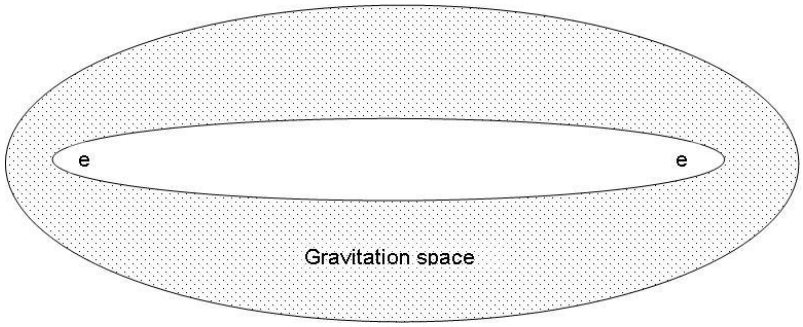

Fig.3. Entangled electrons at a distance in the gravitation space.

In this case there is no action at a distance because the distance between electrons in the electric eigenspace remains close. An observer in a gravitation eigenspace sees only the overlap of the gravitation eigenspace by electric forces. He does not see an electric eigenspace; for this reason, it seems that a "spooky action" at a distance is happening.
To remove entanglement one must alter the electric eigenspace of electron.
The above-mentioned applies to all the particles and objects having their own force fields.

Conclusions

Theoretically, the use of quantum entanglement in engineering has an overwhelming technical potential. It is the theoretical base for far-reaching investigations in wide range applications from entanglement of qubits in quantum computers to energy transmission over large distances. Nowadays expensive and lossy high voltage lines between generation and distribution stations for energy transmission are used (Fig. 4).

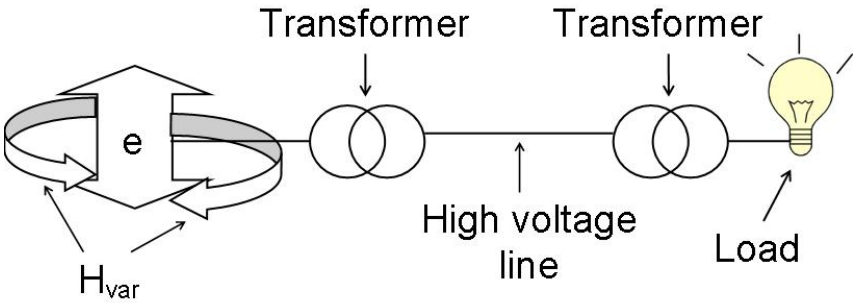

Fig. 4. Principle of present energy transmission.

The variable magnetic field H_{var} forces the electrons *e* to move. The result is electric current. It is supplied to customers (Load) by means of transformers and electric lines.

If an entangled electric or magnetic eigenspace binding together generation and distribution stations can be created, the energy transmission may be performed without

any losses over any distance (Fig. 5.) in a gravitation space. It could supply energy to moving objects such as airplanes, drones, spacecraft. Aircraft is now forced to carry tons of fuel. By using quantum entanglement, a useful load could be carried instead. In this way, the energy from solar panels on the Moon can be delivered to consumers on Earth.

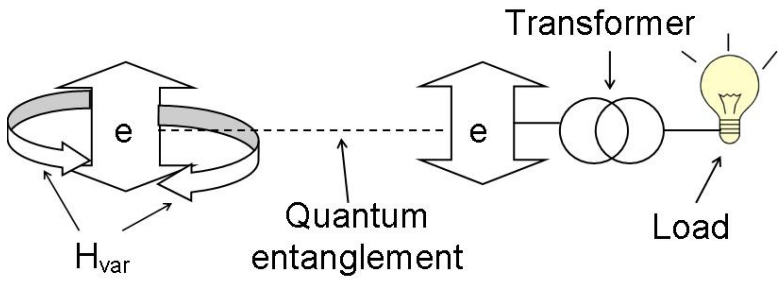

Fig. 5. Quantum entangled power transmission.

The variable magnetic field H_{var} forces the electrons *e* to move. The result is electric current. The current is supplied to the distribution transformer near the customer by means of electrons in the entangled state.

Practically, there are many unresolved problems. For example, 2e+19 entangled electrons are needed to get 1.6 A current. Nowadays only some pairs of electrons are entangled in the laboratory.

References

1. Einstein A, Podolsky B, Rosen N (1935). "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?". *Phys. Rev.* **47** (10): 777–780.

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