Taking into account the random component in the quantum representation of particles

Vorontsov V.A.

National Research Nuclear University (Moscow Engineering Physical Institute)

Moscow, Kashirskoe Shosse, 31

vva@inbox.ru

Abstract

Dynamic chaos is observed experimentally in macro objects, but did not receive a proper explanation. To take it into account in the quantum representation of the particle motion, an attempt was made to introduce a random component into the equation of motion. Its magnitude depends on the intrinsic energy of the particle, equal to the resting energy. The total energy of the particle is equal to the sum of the deterministic and random energy. The deterministic energy of the particle is equal to the kinetic energy of the particle and the energy of the field in which it is located. The dynamics of the particle movement is considered in a quantum representation. A system of ordinary differential equations in finite differences is obtained. The principle of minimal action is carried out without taking into account the random component of the movement and without taking into account the second boundary condition. The division of motion into deterministic and random components is discussible. The calculation technique was tested on data depicting the movement of an electron in in a hydrogen atom around its nucleus in the form of a proton. Estimates showed a satisfactory coincidence of calculated and experimental data. Quantum approximation was also used to infer a number of equations of physics. It includes the derivation of the equations of classical mechanics describing translational and rotational movements. Then, in the same way, the equations of classical electrodynamics bearing the name Maxwell were deduced. This was followed by the conclusion of the equation of non-relativistic quantum mechanics, called the Schrödinger equation. Then the equation of relativistic quantum mechanics, known as the Klein Gordon equation, was derived. Finally, the same approach was used to infer the first onset of thermodynamics.

The possibilities of obtaining a number of basic equations of physics from the principle ab initio are considered. Usually the conclusion of these is related to the use of operators, lagrangian and the principle of minimum action. In this work, they are derived from representing an action quant in general as the sum of a scalar and a vector action. The equations of mechanics for translational and rotational motion, the equations of classical electrodynamics in the form of four Maxwell equations, the Schrödinger equation of non-relativistic quantum fur-nica, the Klein-Gordon equation for relativistic quantum mechanics [1], as well as the second beginning of thermodynamics [2] are derived.

As a basis for deriving the equations of physics, expressions are used for the quantum of action, scalar and vector

$$S=-Et+Pr \qquad S=r\times P \qquad (1)$$

From them are obtained the equations of classical dynamics for translational and rotational movements

$$t=\frac{\hbar}{E} \qquad r=\frac{\hbar}{P^2}p \quad \frac{E}{r}=\frac{P}{t}=F \quad \frac{dS}{dt}=r\times F \qquad (2)$$

To derive the equations of classical electrodynamics
write expressions for action through the quanta of the electromagnet field, and we get the following expressions

$$S=Q\Phi+\int\nabla\times A\,dS\,\Phi \qquad S=Q\Phi+\int\nabla\times A\,dS\,Q \qquad (3)$$

Varying them, we have

$$\delta Q=\int\left(\frac{\partial D}{\partial t}-\nabla\times\frac{\partial A"}{\partial t}\right)\delta t dS \qquad \delta\Phi=\int\left(\frac{\partial B}{\partial t}+\nabla\times\frac{\partial A}{\partial t}\right)\delta t dS \quad (4)$$

From here we get Maxwell's equations

$$\nabla D=\rho \quad \nabla B=0 \quad \frac{\partial D}{\partial t}=\nabla\times H \quad \frac{\partial B}{\partial t}=-\nabla\times E \qquad (5)$$

When deriving the Schrödinger equation

$$i\hbar\frac{\partial\psi}{\partial t}=\left(-\frac{\hbar 2}{2m}\Delta+U\right)\psi \qquad (6)$$

after representation of time and coordinates through energy and pulse, respectively

$$t=\frac{\hbar}{E} \quad r=\frac{\hbar}{p^2}p \qquad (7)$$

get the Schrödinger equations in integral form

$$h=\int_0^t\left(\frac{p^2}{2m}+u\right)dt \qquad (8)$$

Similarly, the Klein-Gordon equation and the first beginning of thermodynamics are derived.
As for the Klein-Gordon equation, it can be interpreted as the sum of deterministic and random movements. In this case, it breaks down into two wave equations for deterministic and random movements.

$$\frac{\partial^2\psi}{c^2\partial t^2} - \Delta\psi = 0 \qquad \frac{\partial^2\psi}{c^2\partial\tau^2} - \Delta\psi = 0 \tag{9}$$

With respect to the first beginning of thermodynamics, it can also be obtained from the quantum principle.

$$S = Qt - (U+A)t \qquad \delta S = \delta Q\, t = (dU+\delta A)\, t + (Q - U - A)\delta t$$

$$\delta S = \delta Q\, t = (dU+\delta A)\, t \qquad \delta S = (\delta Q - (dU+\delta A))\, t$$

$$\delta Q = dU + \delta A \tag{10}$$

$$t = \frac{\hbar}{E} \qquad r = \frac{\hbar}{p2}p$$

Conclusion

Thus, it has been shown that many equations of physics can be derived from a single quantum principle, including the separation of deterministic and random. movements.