The paper describes an alternative technique for time and space quantization. Interpretation of the Dirac equation as applied to the technique proposed is presented. An assumption on the existence of a united mechanism of the "arrow of time" realization and entropy process direction is considered.

Typically, the assumption that any quantum jump increases the system entropy and shifts time by one point forward looks perplexing. Indeed, it is not evident at all. The energy dissipation law is based on statistic categories of thermodynamics and has no formal basis on the quantum level. However, a quantum jump can be characterized by a specific (implicit) mechanism that gives rise to an entropy increase resulting from the chain of transformations. It seems to me that the model proposed will help us to reveal the association between the entropy and arrow of time.

To better analyze this association, the time quantization can be graphically illustrated. As one of great scientists said, attempts to graphically illustrate the microcosm objects are hopeless but give an ILLUSION that we understand quantum processes. Please, be charitable and take the picture just as illusion of understanding what we deal with and what we want to obtain finally.

It seems convenient to draw the picture in the 5D space with topology similar to the Kaluza topology. Perhaps, it will be useful to describe briefly the Kaluza position. As the basis, he took the Minkowski time-space where four axes x, y, z, t are represented in the Cartesian coordinates. Since the gravitation theory and thermodynamics use complex calculus, Kaluza separates out the imaginary axis as an additional, fifth, dimension. Since these parameters are represented in the form $e^{i\alpha}$, they can be easily approximated by a function that represents a

circular curve in the complex plane. Therefore, he came up with the idea to describe the fifth dimension in the 1D spherical frame of references. Thus, the Kaluza 5D theory is constructed in the 4+1 metrics where the Minkowski space-time is provided with an external cyclic imaginary space coordinate.

Now let us consider metrics we propose. On the one hand, the microparticle intrinsic time should be discrete, on the other hand, we should be able to "elevate" it into the laboratory coordinate system. In this case, it is convenient to use the metrics where the cyclic coordinate is time, while 4 Cartesian coordinates are space (three real coordinates and one imaginary).

Let us choose for the analysis the model of electron, since it is the most convenient quantum object. As it is known, a relativistic electron can be represented by the Dirac equation, i.e., by a four-component wave function that characterizes the particle location in space and time. Commonly, the wave function is a complex variable and has components with both positive and negative energies. It is commonly assumed that such a function has no real physical sense; in this case, the squared wave function is interpreted as amplitude of probability. Using such a representation, we can’t indicate the electron location prior to wave function reduction. We can assume that, being in the superposition state, the electron is fundamentally isolated from the "common" world and have another metrics that ensures the non-locality mechanism.

The wave function imaginary component is, by definition, orthogonal to the 4D plane; hence, it can be regarded as the 5th dimension. Time will be regarded as a cyclic coordinate. This can be explained by the fact that the microparticle propagation is of the wave-like character. Time is adequate to the wave function phase; this point can be interpreted as a cyclic time increment.

At the moment of reduction, the Dirac equation symmetric and asymmetric tensors are equal to each other; this means that they are zero (since only zero can be equal to itself under the given conditions); therefore, we have a right to say

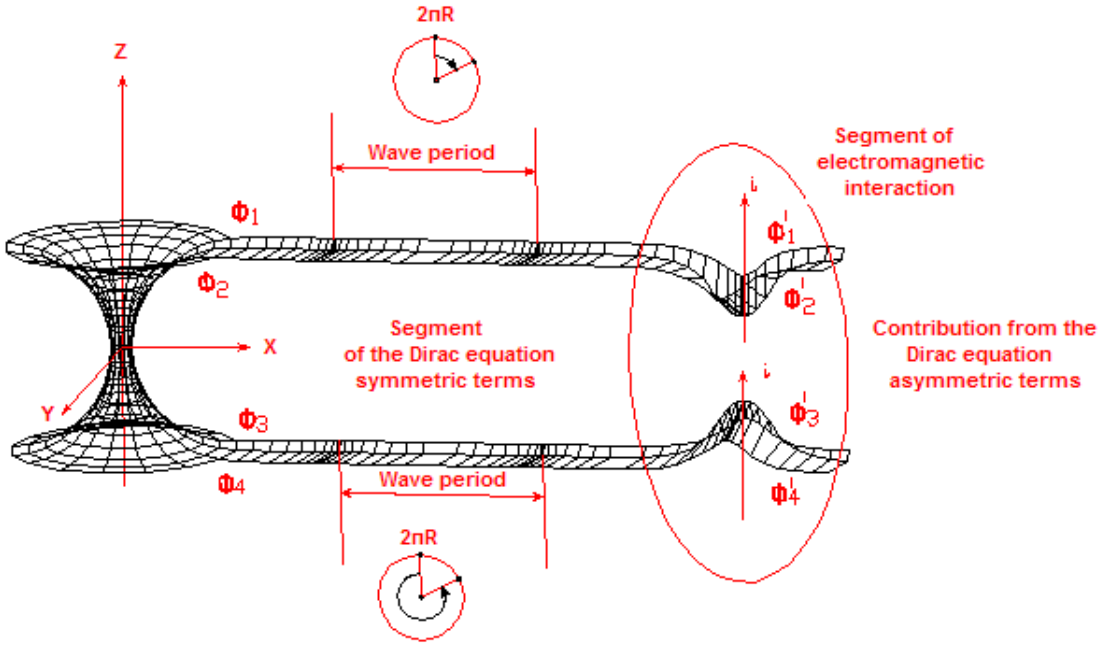
that the space is singular. This is the moment when the electron can be regarded as an object "non-isolated" from the 4D space-time frame of references. Such a state of electron can be represented as microscopic black hole.

Electron is typically represented as the Kerr-Newman black hole, namely, it is regarded as a massive charged rotating black hole with the rotary (gyroscopic) momentum unambiguously bound with the microparticle spin momentum.

In the case under consideration, it is more convenient to use not the Kerr solution but Raissner-Nordstrom solution that assumes that the black hole is massive and electromagnetically charged but not rotating. The case is that the cyclic time coordinate allows us to analyze time in both the positive and negative projections for one and the same event. The angle can be measured both clockwise and counter-clockwise. This fact is important in considering the right- and left-oriented spinors. Using this topology, we can consider all four components of the Dirac equation equivalently (two spin states with positive and negative energies in the positive and negative time projections, respectively). In this case the wave function superposition is a combination of two hypersurfaces.

Notice that, since the solutions for 4 possible states are symmetric about the 4D hypersurface (for the positive and negative time projections), the picture depicts only the electron alone (without a positron). This is a significant difference between our interpretation and Wheeler's one within which the electron is bound with positron in the form of "mole hole".

Now let us draw the picture.



To depict the multidimensionality in the plane drawing, we should get rid of unnecessary degrees of freedom. Let us use for this purpose the Schwarzchild method. Represent the black hole cross-section as the XY plane and fix the time. Now we can plot the black hole light cone prolonging it to both the positive and negative energy spaces. Since time in the case under consideration has a cyclic coordinate, whereas time in the figure is fixed, this thesis can be represented as a longitudinal wave on the light cone surface. This wave period is proportional to the cyclic coordinate, and, hence, to the particle energy.

For the free electron:

In the picture segment where states Φ_1 , Φ_2 and Φ_3 , Φ_4 are symmetric about the hypersurface, the light cone looks plane.

In case the electromagnetic field is "on":

The Dirac equation is supplemented with antisymmetric components along the axis of imaginaries. Assume that Φ_1' is asymmetric to Φ_2', while Φ_4' is asymmetric to Φ_3'. We can show in the picture that this asymmetry gives rise to the light cone curvature.

The imaginary axis *i* will be always orthogonal to the light cone (when passing through the singularity, it should change its sign to the opposite one), i.e., its image in the picture will be always directed upward. This allows us to depict the Dirac asymmetric components in the symmetric projection (the curvatures being directed one towards another).

Let us try to interpret the electron properties in this topology. Assume that the Observer has noticed the electron wave function reduction at moment T_0; at this moment the microparticle in the figure looks like a black hole. After this the singularity disappears, and the electron turns into a set of scalar fields Φ_1 , Φ_2 , Φ_3 , Φ_4; in this state it is isolated from the "common" world.

Assume now that the Observer switches on the electromagnetic trap. He creates a potential well that looks like the asymmetry of fields Φ_1', Φ_2', Φ_3' and Φ_4' in our picture. The electron tunnels into the region of the potential well where the wave function reduction takes place. The picture shows that "the weakest have the worst". The electron arises as some "breakdown" in the asymmetric states, as the space singularity, as a new black hole. The reduction allows us to create a new, more symmetric space configuration. In this case, the emitted photon can be represented as a front of the space variation wave. Notice that, when the Observer creates a potential well, he therefore artificially decreases the entropy in a certain area. The entropy reduction can be represented as asymmetry in the wave function states. The microparticle tends to compensate that asymmetry and manifests itself as a corpuscular at new time moment T_1.

From the External Observer's point of view, a certain time has passed from event T_0 to event T_1. However, from the point of view of the local (intrinsic) time of the electron, this time interval is not perceptible. Since the electron is not subject to any variations in the state of superposition, we can tell that it does not become older during this time interval, and its intrinsic (local) time can be assumed to be stopped.

Evidently, this thesis needs more arguments.

In macrosystems, the so called Newton's time is regarded as continuous (uninterruptible). This means that, from the Observer's point of view, the states of any system can be characterized by arbitrary close values; as a result, we can manipulate the time mathematically (add, divide, multiply). If the time is assumed to be discrete, the Observer can only fix the sequence of events taking place in the microsystem.

In this case, intrinsic local time of the quantum object is considered; it is reasonable to assume that it is associated with intrinsic local space. For example: let the reduction (moment T_0) take place; then a certain space configuration arises; then the next reduction occurs (moment T_1); and then another space configuration arises. If we take the reduction as an event, then quantization is performed according to the following scheme: event – space – next event – another space configuration, and so on.

If time is assumed to be discrete, it should be interpreted as accumulation of quantum variations that are associated as a "time river" only in our usual 4D world. The space can be defined as a combination of local spaces.

Probably, such an approach allows us to take a look in a new fashion at the effects that are conventionally associated with the so called "Action at a distance".

Conclusions The picture presented herein shows us the interrelation between three independent entities: 1) asymmetry of the electron wave function; 2) the entropy increment condition; 3) time arrow direction; all these effects can have one and the same realization mechanism.

ADDENDUM

The report has considered only the simplest quantum object. It has been assumed that the electron in the state of superposition can be regarded as a local space pattern. In the case of a more complex object, e.g., atom, local spaces can

be assumed to be mutually superimposed (just call to mind stable configurations of electron clouds in the atom). We can knock out an electron thus reducing artificially the atom entropy (naturally, due to the increase in the environment entropy). Nevertheless, the atom's ion will recover its electron cloud configuration at the first opportunity. Based on the model, we can make a conclusion that the space configuration cares in itself about taking the most stable configuration.

Properly speaking, this is not an innovation; this is only an interpretation of Geometrodynamics ideas. Indeed, Wheeler operated with such a kind of geometry that becomes plane in far areas of the microparticle vicinity, and its influence becomes negligible. Therefore, geometrodynamics fails to describe the matter self-organization mechanism. The gravitation theory has also appeared to be inefficient in this respect.

Within this model, space is of the wave-like character. The novelty is that such a space bears the information on its structure, and that information does not disappear at infinity. The rest mass of a microparticle is perceived as field of the self-coordinated space.

This thesis can be used in solving the problem of the matter self-organization. Here we speak about the system internal state in which it gets united (conformal) space. The principle of the space-time continuum conformity explains the mechanism of hierarchy formation and conformity of structures with different levels of complexity; in this case, individual elements could have lower energies of internal bonds, but in the hierarchic system they are forced to occupy more energetically profitable internal state because they obey the condition of conformity with other structure elements. Perhaps, the principle proposed can help us to appreciate also the mechanism of feedback (strange attractor) in the process of complex system self-organization.

Sincerely yours, A.F. Silin.