Underneath the wave function

What exists underneath the wave function?

Abstract

Nearly all tools that quantum physicists use are in some way based on the concept of the wave function. This means that such tools deliver a blurred view of the fine grain structures and fine grain behavior that these tools describe.

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The wave function

What is the wave function?
Let us focus onto the wave function in configuration space.

It is a probability amplitude distribution.

Its squared modulus is a probability density distribution.

That probability density distribution is a normalized continuous location density distribution.

Interpretation

Now interpret what this probability density distribution stans for.

1. It is the probability of detecting the owner of the wave function at the location that is defined by the parameter of the wave function.
2. It is a location density distribution
   a. That continuous location density distribution is the continuous description of a discrete location density distribution.
   b. This density distribution describes locations where the owner of the wave function can be.
   c. One of these locations is the currently actual location.

See the second interpretation as a dynamic process.

At each subsequent instance the owner uses a new location.

The locations form a coherent swarm and at the same time the locations form a path.

The owner hops along that path.

If the owner is actually detected, then the hopping stops. The path and the swarm are no longer developed further. With other words, ***the wave function collapses***.

Thus, underneath the wave function some ***fine grain structure*** exists and ***fine grain dynamics*** may occur.

Who has ever thought that a stochastic path may exist underneath the blurred description that the wave function represents?

The idea of the swarm and the stochastic micro-path can be exploited further. This opens a completely new and fresh view on the lowest levels of physics and what elementary particles could be. In the above sketched view they are ***point particles*** that have ***no internals***, but instead they have ***externals***: the swarm that includes a path. Most of the elements of the swarm are virtual locations that can be interpreted as past or future locations. Only one element represents the current location. However, the duration of that location is the duration of a very short progression step.

In a Hilbert space the elements of the swarm can be represented as eigenvalues of an operator. When a quaternionic Hilbert space is used, then these eigenvalues can cover progression and a 3D location. The corresponding eigenvectors span a subspace of the Hilbert space. With other words the swarm is represented by a subspace of the Hilbert space. When we want to go back to the wave function, then we must make use of the Gelfand triple. There an operator exists that corresponds to the swarm-element-location operator in the Hilbert space. That operator has a continuum eigenspace. Part of that continuum will represent the wave function.

Something is missing here. That is the parameter space of the wave function. This is delivered by another operator that also resides in the Gelfand triple. An equivalent of this parameter operator exists in the Hilbert space.

The wave function can be mapped back into Hilbert space, but this time the equivalent of the Gelfand triple parameter space operator is used as parameter space. The corresponding eigenvectors will now carry density values. Thus the map of the wave function back into the Hilbert space delivers a density operator. That density operator is derived from the wave function and as a consequence it still delivers a blurred view on the fine grain structure of the swarm and a blurred view of the fine grain dynamics of the elements of the swarm. For example the stochastic micro-path cannot be uncovered from the density operator.

This is typical for most tools that physicists apply. They blur fine grain structures and fine grain behavior.

On the other hand the continuous descriptors can use the full toolkit that Lie groups and Lie algebras offer. This leads to the usual equations of motion that quantum physics applies.

What are the equations for the fine grain behavior of the elements of the swarm?

The blurred tools fit the needs of applied quantum physics. They hide fine grain structure, but who cares? Only those that are interested in the origin of the phenomena and structure features might care. The blur easily leads to false interpretations of what really happens below the wave function. As long as these false interpretations do not harm applications this defect of the methodology does not matter.

Only people with enough free time (like me) can invest the resources in order to find out what exists down there.

The control of dynamical coherence has to do with the fit between the Hilbert space and the Gelfand triple. A perfect fit kills all dynamics. No control causes dynamical chaos. Ruled control is detectable (and is not yet detected). Stochastic based control fits to the stochastic nature of the wave function.

Generating the wave function

Take a particle

Embed it in a continuum.

At the next instance embed it at a slightly different location

This new location is NOT KNOWN IN ADVANCE.

After a while the set of locations looks like a swarm.

The stochastic characteristics of the process are constant.

Thus after a while the continuous location density distribution that describes the swarm no longer changes.

The normalized version of this continuous function is a probability density distribution.

It is the squared modulus of the wave function.

The probability density distribution has a Fourier transform. (Because the wave function has a Fourier transform.

As a consequence the swarm owns a displacement generator.

Thus at first approximation the swarm moves as one unit.

Further the probability density distribution is a wave package.

Multiple versions of the same type of particle can form detection patterns that look like interference patterns.

This can be interpreted as wave behavior.

This deliberation shows that it has sense to reason about what exists underneath the wave function.

Preparation in advance

It looks as if the swarm is prepared in advance.

At every progression instant only one of its elements is randomly selected in order to become the ACTUAL location of the particle.

This situation only lasts during a single progression step.

If swarms are prepared in advance, then different types of swarms can be prepared in seclusion.

These types may have different symmetries!

Three dimensional swarms may exist in 2^3=8 different symmetries..

Thus swarms may exist in at least 8 types.

Also continuous quaternionic functions exist in bundles that only vary in their symmetries.

Thus the quaternionic representation of the wave functions may exist in that many symmetry flavors.

The embedding continuum shows many aspects of a field and that field can be represented by a mostly continuous quaternionic function.

That function is not continuous at the location of the embedding of a particle.

However, due to the quick regeneration at a slightly different location, the singularities are effectively smoothened.

Thus in an averaged view the embedding continuum can be considered to be a continuous function. The particles exist in 8 symmetry flavors and embedding continuums also exist in 8 symmetry flavors. As a consequence, embedding offers 8x8 coupling versions.

Stochastic grain

Why is the wave function a probability amplitude distribution?

The swarm that is introduced above may be generated by a combination of a Poisson process and a binomial process. The binomial process is implemented by a three dimensional spread function. The Poisson process delivers the parameter for the spread function. The result is something that is close to a Gaussian location distribution (a 3D normal distribution).

When seen as a charge distribution rather than as a location distribution, then the swarm corresponds to a rather smooth potential that at short distance looks as Erf(r)/r and at somewhat greater distance as 1/r. Thus NO SINGULARITY!