Saving private geometric center

By J.A.J. van Leunen, a retired physicist

January 29, 2022

Abstract

A system of separable quaternionic Hilbert spaces implements a diverse and dynamic universe. Something must connect the members of the system such that these members can interact. This role is taken by state vectors.

The system of Hilbert spaces

The system of Hilbert spaces is described in detail in “Advanced Hilbert space technology” in https://vixra.org/author/j_a_j_van_leunen. This paper only highlights some interesting aspects of the system of Hilbert spaces.

All Hilbert spaces maintain a private version of a number system that is defined by a selected coordinate system. The calculation rules of the number system do not substantiate all selection freedom. The coordinate system removes all selection freedom from the number system. In that way, the coordinate system determines the symmetry of the selected version. Each Hilbert space owns a private parameter space that is maintained by its reference operator. The center of this parameter space is the geometric center of the Hilbert space. The private parameter space enables the Hilbert space to act as a function space.

The system of Hilbert spaces only accepts members for which the axes of the coordinate system are in parallel with the axes of the background coordinate system. This eases the determination of symmetry differences.

Except for the background platform, each member of the system of Hilbert spaces represents an elementary fermion. Each elementary fermion owns a provision for the detection of its geometric center by a vector of the underlying vector space. This vector is unique, and the Hilbert space archives the ongoing path that the vector takes through the private parameter space of the Hilbert space as a chain of quaternionic eigenvalues that each consist of a real number valued timestamp and a spatial number valued hop landing location. The unique vector is the state vector of the fermion, and its path represents the footprint of the fermion. The system of Hilbert spaces contains one background platform that manages the background parameter space of the system. All other members of the system float with their geometrical center over the background parameter space. The state vector embeds the footprint of the fermion into a dynamic continuum that applies the background parameter space as the parameter space of the function that describes the continuum.

The separable background Hilbert space owns a unique non-separable Hilbert space that embeds its separable companion. The non-separable Hilbert space also supports eigenspaces that are continuums. One of these continuums emerges from the background parameter space by adding the set of irrational numbers. This adds a limit to all converging series of the members of the continuum. The consequence is that the continuum can change. Without disturbing actuators nothing changes. If the state vector of a floating Hilbert space embeds into the changeable continuum, then the continuum can vibrate, deform, and expand. The embedding maps the footprint of the state vector into the dynamic continuum. The imaging process is controlled by an Optical Transfer Function. The Optical Transfer Function equals the Fourier transform of the location density distribution that describes the hop landing location swarm, which is caused by the hop landing location path that corresponds to the path of the state vector. The location density distribution that closely describes the resulting hop landing location swarm equals the square of the modulus of what physicists would call the wave function of the fermion.

The geometrical center

The path of the state vector regularly passes the close vicinity of the geometric center of the Hilbert space. Thus, the hop landing location swarm regularly results in a distribution that can closely be described by a stable continuous location density distribution. This holds better when the swarm contains more hop landing locations.

Inside the fermion, the geometric center is the seat of the symmetry-related charge. If the charge differs from zero, then it represents a source or sink of a corresponding symmetry-related field. Thus, the geometric centers of the fermions couple the universe to the symmetry-related fields. The electromagnetic field represents changes in the symmetry-related fields. The value of the symmetry-related charge equals the difference in the symmetry between the background platform and the floating platform. This difference can range from -3, -2, -1, 0, +1, +2, and +3. This corresponds to electric charges that are factor -3 smaller.

Embedding process

The geometric center including the symmetry-related charge is mapped onto the universe field. Depending on the difference in the symmetry between the background parameter space and the parameter space of the floating Hilbert space that represents the fermion the hop landings can cause spherical shock fronts inside the embedding continuum. To react with a spherical shock front, the continuum requires an isotropic symmetry difference. Quarks do not fulfill this requirement, but they can combine into baryons that can produce an isotropic symmetry difference in the combined hop landing.

The embedding process can be considered as a stochastic process that is a combination of a Poisson process and a binomial process. The binomial process is implemented by the location density distribution.

If the hop landing deforms the embedding continuum, then the Optical Transfer Function of the imaging process is multiplied by the Fourier transform of the blurring by the spherical shock fronts.

Powerful views

Complex-number based Hilbert spaces inside Quaternionic Hilbert spaces

Hilbert spaces can be manipulated to enable several powerful views. A quaternionic Hilbert space contains many complex-number-based Hilbert spaces as its subspaces. This can be demonstrated by taking a spatial direction and collecting all eigenvectors that belong to eigenvalues that correspond to this spatial direction. The eigenvectors that belong to real-number-valued eigenvalues will also be included in the set of mutually orthogonal eigenvectors that is used to generate the wanted complex-number-valued Hilbert space. This trick is valuable when the local behavior of the quaternionic Hilbert space must be comprehended in isotropic spatial situations. It also works in slightly deformed spatial continuum eigenspaces. Thus, it helps in understanding the emission and absorption of photons by atoms or in comprehending the apparent annihilation and creation of elementary particles.

The position space and the change space

It is difficult to comprehend a Fourier transform in a quaternionic Hilbert space, but it is simple in a complex-number-based Hilbert space. This helps in the definition of the position space and the change space.

First, we set the subspace apart that contains all eigenvectors that belong to real-number-valued eigenvalues. This can be done by splitting the reference operator into a Hermitian part and an anti-Hermitian part. The Hermitian part contains the eigenvectors that belong to the real-number-valued eigenvalues. The anti-Hermitian part contains the eigenvectors that belong to the spatial-number-valued eigenvalues. These eigenvectors span the subspace that we will call the position space. This subspace can also be spanned by other orthogonal bases. One of these bases is the change base. It is formed by eigenvectors of the change operator that is known as the first-order partial differential operator. For each change eigenvalue, each of the eigenvectors is a linear combination of all the eigenvectors of the position operator. All superposition coefficients have the same norm. A function in position space corresponds to the Fourier transform of that function in change space. Sometimes the name momentum space is used for the change space. The characteristic function of the stochastic mechanism that generates the path of the state vector is defined in change space. Its Fourier transform describes the hop landing location swarm that is recurrently regenerated by the ongoing hop landing location path.

Observables

In physical theories that apply complex-number-based Hilbert spaces, the observables are usually represented by Hermitian operators, and time is not considered as observable. This is comprehensible in change space when the Lie algebra of Lie groups are considered as observable values. This way of interpretation is developed by the adherents of Willard Gibbs and Oliver Heaviside. The Lagrange equations support this picture. (https://en.wikipedia.org/wiki/History_of_quaternions). In contrast, in quaternionic Hilbert spaces, the Hermitian part of the reference operator represents time, which is treated as an observable. The anti-Hermitian part of this operator represents an observable spatial property. For dynamic continuums, the Hermitian operators represent scalar fields, and the anti-Hermitian operators represent vector fields. This view differs considerably from the Gibbs-Heaviside view and leads to much confusion by students that are educated in the Gibbs-Heaviside tradition. In quaternionic Hilbert spaces, the quaternionic differential equations replace the role of the Lagrange equations.

The influence of Gibbs and Heaviside overshadowed Hamilton's quaternionic approach and around the turn of the century, it caused the oblivion of quaternion-based analysis. This fact still controls the way that quantum physics is taught in traditional universities.

The author considers the quaternionic Hilbert space view easier comprehensible and more clarifying.

Elementary modules

The name elementary fermion is used because these objects show a great resemblance with the elementary fermions that are described by the Standard Model of the elementary fermions, which is part of the Standard Model of the elementary particles. This Standard Model is the handbook of experimental particle physicists.

Elementary fermions behave as elementary modules. Together they constitute all massive objects that reside in the universe. A notorious exception is a black hole. Conglomerates are defined in change space. The characteristic functions of their stochastic processes are superpositions of the characteristic functions of their components. The superposition coefficients determine the internal positions of the components. At small scales, they define internal oscillations.

Since position has no sensible interpretation in change space the definition of conglomerates in change space leads to the phenomenon that is known as entanglement. In conglomerates, the Pauli exclusion principle can lead to uncomprehensive actions at a distance.