A Simple Model

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Abstract

Within a few lines, a simple dynamic model of the universe can be constructed that is offering a life environment to modules and modular systems.

Base model

Discrete objects and fields that interact, need a realm that fits both categories and that elucidates their interaction. The easiest and to my opinion only way to achieve this is the application of a quaternionic separable Hilbert space and its unique non-separable companion Hilbert space.

The separable Hilbert space is a realization of an orthomodular lattice. The set of closed subspaces of the Hilbert space has exactly this lattice structure.
Every infinite dimensional separable Hilbert space owns a unique non-separable companion.
Thus, the orthomodular lattice is the foundation of the base model.
Hilbert spaces can only cope with real numbers, complex numbers, and quaternions.

The base model as a repository

The separable Hilbert space stores all relevant discrete dynamic geometric data in the eigenspaces of some of its operators. Quaternions are ideally suited for the storage of spatial locations that feature a timestamp. The non-separable Hilbert space can store the continuum data of the relevant fields in the continuum eigenspaces of some of its operators.

Dynamic model

A subspace that represents the data of the current static status quo can act as a vane that scans this base model as a function of progression.
The non-separable Hilbert space can be considered to embed the separable Hilbert space. The vane is the subspace in which this embedding occurs.

Observers travel with this vane. They get their information from the past. The information reaches them via vibrations and deformations of the field(s) that embed them.

Platforms

Quaternionic number systems exist in several versions that differ in the way that they are ordered. One of these versions is used for the specification of the inner product of the Hilbert spaces. The rational values of this number system are used to enumerate the members of an orthonormal base of the separable Hilbert space.
A specific reference operator uses the base vectors as its eigenvectors and it uses the enumerators as its eigenvalues. The eigenspace of this reference operator represents a background parameter space. Other versions of the quaternionic number system can be used to generate other reference operators and the corresponding parameter spaces will float with respect to the background parameter space.

Fields

Mostly continuous quaternionic functions that apply such a parameter space can allow the definition of a corresponding defined operator that reuses the eigenvectors of the reference operator and that uses the target values of the functions as its eigenvalues.

Merge of technologies

This approach merges Hilbert space operator technology with function theory and indirectly with differential calculus. It enables to model the interaction between discrete objects and continuums.

Views

While the proposed base model stores data in quaternionic and thus Euclidean format, will observers receive their information in spacetime format, which features a Minkowski signature. The two formats are related via a Lorentz transform.
The model offers two views. The first is the storage view. It offers access to all stored data, irrespective of their time stamp. Thus, irrespective of the fact that they belong to the past, to the current

static status quo, or to the future. This view is also called the creator's view.
The second view is the observer's view. It offers access to data that can be received by the observers.

Elementary modules

All discrete objects in the universe are modules or they are modular systems. Elementary modules exist that are not configured from other modules. All discrete objects that exist in the universe at a given instant are the active 'observers' at that instant. Thus, also the elementary objects are observers.
The elementary modules are represented by one-dimensional subspaces (rays) of the vane. The rays are spanned by eigenvectors of the operator that supplies the elementary particle with its locations. The operator is not the actor. It gets its eigenvalues from a mechanism, which applies a stochastic process that produces the spatial locations. That mechanism is not part of the Hilbert spaces. At every progression instant, the elementary particle gets a new location.

Gravity

Gravity is the part of physics that investigates the interaction between discrete objects and fields. The field would be flat when no discrete objects would disturb it. All elementary particles appear to have mass and all elementary particles are point-like. Static point-like objects cannot have many properties. The properties must be a consequence of their behavior.

Interaction

The interaction between these elementary particles and the field that embeds them is caused by the fact that the point-like particle hops around in a stochastic hopping path. After a while, the hop landings have formed a fairly coherent hop landing location swarm. The swarm contains a huge number of elements. It has a rather smooth location density distribution. This distribution equals the squared modulus of the wavefunction of the elementary particle.

The hop landings trigger a vibration of the embedding field. This vibration is a solution of a homogeneous second order partial differential equation that describes the dynamic behavior of the field. The equation has several possible solutions that become active depending on the kind of trigger. For example, periodic harmonic triggers cause corresponding waves. A one-dimensional one-shot trigger causes a one-dimensional shock front that we will call ***warp***. During their travel, warps keep their amplitude.
A three-dimensional isotropic one-shot trigger causes a spherical shock front. We call this solution ***clamp***. The amplitude of this front diminishes as 1/r with distance r of the location of the trigger. Integration of the front over a long enough period results in the Green's function of the field. This function has the same shape as the shape of the front amplitude diminishing function. Thus, the Green's function represents the averaged deformation, which is caused by the hop landing.
If nothing else happens, then the deformation will quickly fade away. However, a stream of a myriad of hop landings superpose each other's effects and form a steady and quite a significant deformation of the embedding field.

Gravity and quantum physics

This explanation shows that mathematics can quite well explain the phenomenon of gravity. Here it is shown for elementary particles. Since all modules are configured from elementary modules, the story also holds for modules and modular systems.
The common opinion is that gravity and quantum physics cannot be unified. This explanation contradicts this opinion. The behavior of elementary particles is such that their presence and their stochastic hopping dance produce a significant deformation of the embedding field.

Typical deformation

If the location swarm has a Gaussian distribution, then the error function divided by its argument: ERF(r)/r describes the shape of the deformation. This is a very smooth function that in contrast to the Green's function does not show a singularity.

Our living space is the superposition of all deformations that are due to the existence of an elementary particle.

See: docs.com/hans-van-leunen for more details.