Thou shalt construct in a modular way

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Abstract

Look around and you become easily convinced from the fact that all discrete objects are either modules or modular systems. With other words, the creator of this universe must be a modular designer. His motto is “Construct in a modular way”. However, also non-discrete items exist. Universe contains continuums and these continuums appear to relate to the discrete objects. Further, we as observers of these facts, want to place everything into an appropriate model, such that we can comprehend our environment.

If you think, then think twice.
In any case, think frankly.

Modular construction

Diving deep into the foundations of physical reality requires a deep dive into advanced mathematics. Usually this goes together with formulas or other descriptions that are incomprehensible to most people. The nice thing about this situation is that the deepest foundation of reality must be rather simple and as a consequence it can be described in a simple way and without any formulas. For example the most fundamental law of physical reality can be formulated in the form of a commandment:
“THOU SHALT CONSTRUCT IN A MODULAR WAY”
This law is the direct consequence of the structure of the deepest foundation. That foundation restricts the types of relations that may play a role in physical reality. That structure does not yet contain numbers. Therefore it does not yet contain notions such as location and time.
Modular construction acts very economic with its resources and the law thus includes an important lesson. "DO NOT SPOIL RESOURCES!"

Modular design

Understanding that the above statements indeed concern the deepest foundation of physics requires deep mathematical insight. Alternatively it requests belief from those that cannot (yet) understand this methodology. On the other hand intuition quickly leads to trust and acceptance that the above major law must rule our existence!
Modular design is a complicated concept. Successful modular construction involves the standardization of module types and it involves the encapsulation of modules such that internal relations are hidden from the outside. Systems become complicated when many relations exist inside that system, which must be reckoned when the system is operated or changed. This plays a significant role during system configuration. The ability to configure modular systems relies heavily on the ability to couple modules and on the capability to let these modules operate in concordance.

The modular design method becomes very powerful when modules can be constructed from lower level modules. The standardization of modules enables reuse and may generate type communities. The success of a type community may depend on other type communities.

An important category of modules are the elementary modules. This are modules, which are themselves not constructed from other modules. These modules must be generated by a mechanism that constructs these elementary modules. Each elementary module type owns a private generation mechanism.
Another category are modular systems. Modular systems and modular subsystems are conglomerates of connected modules. The constituting modules are bonded. Modular subsystems can act as modules and often they can also act as independent modular systems.
The hiding of internal relations inside a module eases the configuration of modular (sub)systems. In complicated systems, modular system generation can be several orders of magnitude more efficient than the generation of equivalent monoliths.

The generation of modules and the configuration of modular (sub)systems can be performed in a stochastic or in an intelligent way. Stochastic (sub)system generation takes more resources and requires more trials than intelligent (sub)system generation.
If all discrete objects are either modules or modular systems, then intelligent (sub)system generation must wait for the arrival of intelligent modular systems.
Intelligent species can take care of the success of their own type. This includes the care about the welfare of the types on which its type depends. Thus for intelligent modular systems, modularization also includes the lesson "TAKE CARE OF THE TYPES ON WHICH YOU DEPEND".

In reality the elementary modules appear to be generated by mechanisms that apply stochastic processes. In most cases system configuration occurs in a trial and error fashion. Only when intelligent species are present that can control system configuration will intelligent design occasionally manage the system configuration and binding process. Thus in the first phase, stochastic evolution will represent the modular system configuration drive. Due to restricted speed of information transfer, intelligent design will only occur at isolated locations. On those locations intelligent species must be present.

Mathematical model

Now we treat some aspects that involve advanced mathematics. We do that in a descriptive way.

In a modular system relations play a major role. The success of the described modular construction methodology depends on a particular relational structure that characterizes modular systems. That relational structure is in mathematics known as "orthomodular lattice". This lattice acts as the foundation of each modular system. Orthomodular lattices extend naturally into separable Hilbert spaces. Separable Hilbert spaces are mathematical constructs that act as storage media for dynamic geometric data. The set of closed subspaces of a separable Hilbert spaces has exactly the relational structure of an orthomodular lattice. However, not every closed subspace of a separable Hilbert space represents a module or modular system. Elementary modules are represented by one-dimensional subspaces of the Hilbert space, but not every one-dimensional subspace of the Hilbert space represents an elementary module. However, if the one-dimensional subspace represents an elementary module, then the spanning Hilbert vector is eigenvector of a normal operator that connects an eigenvalue to the elementary module. Hilbert spaces can only cope with number systems that are division rings. This means that every non-zero element of that number system owns a unique inverse. Only three suitable division rings exist. These are the real numbers, the complex numbers and the quaternions. The quaternions form the most elaborate division ring and comprise the other division rings.

Quaternions can be interpreted as a combination of a scalar progression value and a three dimensional spatial location. The scalar part is the real part of the quaternion and the vector part is

the imaginary part. Quaternions can represent other subjects, but in this paper the representation of dynamic geometric data plays a major role.
Thus in this view the elementary module is represented by a single progression value and a single location. In reality elementary modules are characterized by a dynamic geometric location. Thus we must extend the representation of the elementary module such that it covers a sequence of locations that each belong to a progression value. After ordering of the progression values the elementary module appears to walk along a hopping path and the landing positions form a location swarm.
From reality we know that the hopping path is not an arbitrary path and the location swarm is not a chaotic collection. Instead the swarm forms a coherent set of locations that can be characterized by a rather continuous location density distribution. From physics we know that elementary particles own a wave function and the squared modulus of that wave function forms a continuous probability density distribution, which can be interpreted as a location density distribution of a point-like object.
The location density distribution owns a Fourier transform and as a consequence the swarm owns a displacement generator. This means that at first approximation the swarm can be considered to move as one unit. Thus the swarm is a coherent, rather smoothly moving object, which represents the violent stochastic hopping of a point-like object. The fact that at every progression instant the swarm owns a Fourier transform means that at every progression instant the swarm can be interpreted as a wave package. Wave packages can represent interference patterns, thus they can simulate wave behavior. The problem is that moving wave packages tend to disperse. The swarm does not suffer that problem because at every progression instant the wave package is regenerated. The result is that the elementary module shows wave behavior and at the same time it shows particle behavior. When it is detected it is caught at the precise location where it was at this progression instant.

Next we construct a vane that splits the Hilbert space such that all elementary module eigenvalues that have a selected real value have the corresponding eigenvector inside the vane. Thus the vane splits the Hilbert space in an historic part, the vane itself and a future part. The vane then represents a static status quo that corresponds to the current state of the universe.
This represents an interesting possibility. The Hilbert space can be seen as a storage medium that contains a repository of all historic, present and future data. Or it can be interpreted as a scene that is observed by objects that travel with the vane. These observers know the stored history, but have no notion of the future. Information that inside the vane is generated at a distance has still to travel through space in order to reach the observer. The encounter will take place in the future. Information that reaches the observer arrives from the past.
The vane forms a subspace of the Hilbert space and for each elementary module that subspace contains a single Hilbert vector that plays as eigenvector for the corresponding geometric location. This location is the landing point of a hop rather than the geometric center of the location swarm.

Each infinite dimensional separable Hilbert space owns a unique companion non-separable Hilbert space that features operators, which have continuum eigenspaces. Such eigenspaces can form flat parameter spaces or dynamic fields. The hopping path that represents an elementary particle, corresponds to a coherent location swarm, which is characterized by a location density distribution. Via the convolution of the Green's function of the field and this location density distribution, the swarm corresponds to a deformed part of the field that in this way describes all elementary modules. The convolution means that the Green's function blurs the location density distribution. This can be interpreted as if the hopping landing locations influence the field, but the alternative interpretation is that the field is a kind of descriptor of the hopping landing locations. Anyway the landing locations and the discussed field are intimately coupled.

The mechanisms that generate the hopping landing location control the dynamics of the model. These mechanisms use stochastic processes. These processes appear to belong to a category which is

mathematically known as inhomogeneous spatial Poisson point processes. In more detail these processes probably are modified Thomas processes.
Physical theories stop at the wave function of particles. This exposure dives deeper and reaches the characteristic function of the stochastic process that controls the generation of the landing locations that form the hopping path.

More detail

Those that possess sufficient knowledge of mathematics might be interested in the paper "The Hilbert Book Test Model"; This pure mathematical model exploits the above view. See: http://vixra.org/abs/1603.0021