Dynamic quantum logic

Abstract
Quantum logic has the structure of an orthomodular lattice. This defines a static skeleton. There is nothing in QL that restricts dynamics. There is also nothing that withholds dynamic events of occurring within this skeleton. There is a need to add axioms to QL that convert it into a suitable dynamic quantum logic. It appears that inertia offers a useful guidance on how to proceed.

Logic
There exist several types of logic. One of them is classical logic. It is well known, then its structure is rather simple and can be visualized with Venn diagrams. It is the logic that regulates our dialogs. It is also the logic that rules classical physics. The discovery of quantum physics introduced a corresponding quantum logic that has a much richer structure. However, like classical logic, its structure is static. Since nature is very dynamic there exists a need to extend quantum logic to a dynamic version. Currently exist some serious trials. One of them is Logic of quantum actions (LQA). Apart from its static base, which is similar to quantum logic, it uses operational elements that introduce dynamics.

Representation
Where the propositions of a classical logic system can be represented by regions in a Venn diagram, can the propositions of a quantum logical system be represented by the closed subspaces of a Hilbert space. The operational elements that are introduced by the LQA can be represented by unitary transforms and some binary operations, such as sign selections. These sign selections depend on the number field that is used to define the Hilbert space or more specific, they depend on the number field that is used for eigenvalues, because observations are packed in those numbers. So, LQA seems to be derived from the representation of QL in Hilbert space.

Transitions that involve emission or absorption of items by another item form a different category. Further, macroscopic dynamics occur according to another process than microscopic dynamics, which takes place inside items and that include harmonic movements. Harmonic movements and possibly all internal dynamics of items are governed by eigenfunctions of a Fourier-like operator. Fourier transforms also belong to the category of unitary transformations.

A more fundamental approach
The unitary transformations are supposed to move the subspaces that represent propositions about items around in Hilbert space, or they exchange the content of the subspace against another content. For the consequences it does not matter what is moved. Only the relative movement counts. The difference comes into view when global issues are considered. This occurs when inertia comes into the picture. Inertia is caused by the universe of items or in logical terms, by the total collection of propositions that take these items as their subject. Analysis of inertia shows, that the move of a subspace may go together with the existence of a field. These fields implement their influence via the action of the unitary transform that moves the subspace. With other words fields are more fundamental as source of dynamics than the unitary transforms. Inertia plays on a

macroscopic scale. It is questionable whether fields play a role in the internal dynamics of micro-items.

Logical interpretation

When the subspace moves, then the observable values connected with this subspace change. They are exchanged against other values. What happens is, that the atomic propositions about these observable values are exchanged. Inertia learns that when the exchange occurs in an orderly fashion, thus when the subspace moves with uniform speed, then no field is raised. However, when the exchange is done disorderly, thus in case of an accelerating subspace, then a field goes together with that acceleration. The field is raised by the community of all items. However, the contribution of an item depends on the inter-distance to the considered item.

Interpretation

When this feature must be translated into logical terms, then the following facts must be resolved:

- A specification of well ordered versus disordered exchange of atomic propositions
- An account of the strength of the influence that is exerted due to the disordered exchange
- The distance between actor and subject

Inertia guides the way. The investigation of Dennis Sciama of inertia is elucidating.

Observations

In addition to dynamics, current quantum logic is also not clear about observations. The result of an observation is an atomic proposition. QL says nothing about who is observing and what can be observed. The implementation in a quaternionic Hilbert space shows that most observations are affected by a quaternion waltz that is caused by a manipulating unitary transformation that also moves the subspaces that represent items (or propositions about that item). The real part of an observable does not take part in the dynamics of the model. Thus, dynamic observables are always imaginary.

Steps

A replacement step relates to a “time” step. This time step is NOT the coordinate time step. It is the manipulator step. It must become clear to what extent the manipulator steps will be synchronized. It is imaginable that a single dynamical manipulator serves the whole universe. Coordinate time is always connected to an observation of the position of an item. Thus it has only a local significance. Spacetime is an artificial construct that also introduces coordinate time and this construct leads to a Minkowski metric and the occurrence of special relativity. The manipulated universe is independent of observations and has a Riemannian metric. The manipulator time may have a global scope.

Dynamic operators

Dynamic operators, such as the dynamic manipulator (which is locally and temporary equal to an infinitesimal unitary transform), can be mimicked by a trail of infinitesimal static operators. This also holds for observables. Trails enable the use of higher dimensional 2^n-ons as eigenvalues, because locally and temporary these values resemble lower dimensional numbers, such as quaternions or even complex numbers. The higher dimensional 2^n-ons enable curved manifolds of elements that locally resemble lower dimensional 2^m-ons. The 2^n-on numbers with high n can also store a large number of characteristics of the fields that they represent. Thus, they are ideally suited to support quantum field theories.

References

See: http://www.scitech.nl/English/Science/Exampleproposition.pdf.