The concept of time

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Abstract

In physics, the begin of the universe poses interpretation problems. This can be resolved by restricting the range of proper time to a subset of the range of events.

1 Physical reality

Physical reality appears to exist for about 13.8 billion years. Thus, after that starting instant the proper time clock ticks. Before that instant the creation of physical reality must have taken some action but that phase is not covered by the proper time range that observers can perceive. Any model of physical reality must incorporate this preparation phase and must deliver a proper explanation why the observable proper time range starts after the preparation phase finished. With other words the model of physical reality must belong to the category of the self-creating models.

2 Modeling physical reality

The preparation phase must generate a base model in which physical reality can evolve from a founding structure to a full-blown dynamic model that can be observed as the dynamic field that represents the universe, which exists in physical reality. That universe must be filled with all the discrete objects that can be observed in this field.

3 The Hilbert Book Model

The Hilbert Book Model is a self-creating model that owns a simple foundation from which a base model emerges that offers a huge structured read-only repository that archives all dynamic geometric data of all elementary particles that are embedded in a dynamic field.

It uses quaternions as storage bins that contain a scalar time-stamp and a three-dimensional location. After sequencing the time-stamps, the archived hopping path tells the life story of the elementary particle in the realm of its floating platform. That platform is implemented by a private quaternionic separable Hilbert space.The range of proper time values corresponds to the range of the archived time-stamps. Thus, this arrangement fits the requirements for the self-creating model.

In the preparation phase, for each elementary particle, a private stochastic process generates the hop landing locations of an ongoing hopping path that recurrently regenerates a coherent hop landing location swarm. The characteristic function of this process ensures that the same location density distribution describes this hop landing location swarm.

The life story of the particle corresponds with the ongoing embedding of the hop landing locations into the dynamic field that we call our universe, and that is implemented by a continuum eigenspace of a normal operator that resides in a background non-separable Hilbert space. All elementary particles embed their hop landings in this dynamic field.

The elementary particles act as elementary modules. Together they constitute all modules and modular systems that exist in our universe. Thus this dynamic field reflects the activity of all elementary particles. It tells the livestory of all massive objects. Each module can act as an observer. All observers must travel with a scanning proper time window. They can only receive information via the embedding field, and for them, that information was archived with a historical timestamp.

Thus, in conclusion, the model covers a larger number of activities than the observable range of proper time covers.

3.1.1 Proper time

The range of proper time corresponds to the range of archived timestamps. Observers can only receive information from events that were archived with for them historic timestamps.

The notion of time in the Hilbert book model only means something in relation to the archived timestamps. This means that things could still take place before the first proper time instant. This includes, among other things, the preparation and archival of the dynamic geometric data of the elementary particles.

3.1.2 Clock rates

Proper time ticks with a minimum step. However, that does not mean that this minimum step is the same in the whole universe. It may depend on the local expansion rate of the universe and that local expansion rate varies with the nearby occurrence of deformation. This is due to the fact that the same mechanism that deforms the universe spreads this deformation over the whole universe by wiping it in all directions. Consequently, the deformation quickly fades away. To keep the deformation intact, it must recurrently be regenerated. However, the expansion persists. So, traversing a closed path through a deformed region can result in a difference in time count at the return point between the traveler and the object that stayed at that location because the traveler experienced a different expansion rate of the part of the universe that the traveler traversed. During his trip the clock of the traveler ran at a different rate than the clock of the staying object. These effects have been measured with accurate clocks.

The metaphor that the Hilbert Book Model steps through the universe with universe-wide progressions steps remains valid, but the page thicknessesin this metaphor can vary from place to place in a fluid way.

3.2 Two views

This is why the Hilbert Book Model supports a creator's view as well as an observer's view. The creator's view covers all activities. The perception of the modules is restricted to the observer's view.