The calculation rules of the universe

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

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Summary

In our living environment, several groups of calculation rules play an essential role. Each group operates a number system. Some of these number systems can be combined. Together, the number systems can cover our universe in many kinds of ways. These coverings determine the content and operation of the universe. A system of Hilbert spaces that all use the same underlying vector space describes the structure and behavior of what we call our universe.

Our universe

If you are curious about the structure and mechanisms of our living environment, then start by looking at people. People rely heavily on their ability to name or otherwise identify the things they think about and want to discuss with other people. We also need a clear and at least concise description of these topics. Normally, we don't realize that the reality around us can function without these tools. Our living environment does this very efficiently. Thus, it is wise to distinguish human activity from the activity of our environment.

Now let's talk about this environment. We can agree that this living environment is included in an all-encompassing space. One problem is that the word "space" is associated with many different descriptions. So we also need to agree on an appropriate description of what we mean by space. We have already said indirectly that space is a container. A container can be empty or there may be things in it. First, let's start with what empty space means. Empty space contains nothing you can refer to, it has no size, no center, no boundary. This emptiness represents the ultimate nothingness. Space can contain things. So we have to agree on the things that the concerned space can contain. I think we'll agree on the fact that this space can contain locations. Locations are represented by the smallest conceivable objects that can occupy a position in the room. Positions only make sense in relation to other positions. Positions thus become relevant in combination with other locations. Thinking about the content of the environmental space is especially useful if this space is covered with more and preferably with many locations. People can only handle this covering of the space if the positions of these locations can be identified. To navigate through these locations, a description is required. The description can be provided by a coordinate system. The coordinate system uses an imaginary network of locations that fully or partially cover the surrounding space. Numbers that obey calculation rules determine the network points. There are different types of numbers with associated calculation rules. Individually or in combination, the calculation rules provide number systems that can cover parts of the treated container. The calculation rules do not establish all options. As a result, there are different versions of the covering of the space using coordinates. It also means that of the number systems there are not only different types but also different versions of those number systems. To be able to deal with it properly, people need to bring structure and order to these possibilities.

Number systems enable the counting and ordering of imaginary locations. Sets of locations are countable when each member of the set can be identified by a separate natural number. It turns out that the set of all coordinate positions corresponding to fractions is countable. This means that in this set, all locations are surrounded by empty space so that other numbers with corresponding locations can be inserted into that void.

Some numbers cannot be represented as fractions. For example, the square root of 2 cannot be represented as a fraction. Nevertheless, it is possible to approach the square root of 2 arbitrarily close with a converging series of fractions. The set of all numbers that can be generated by arithmetic and that cannot be represented as fractions does not appear to be countable. If this set is mixed with the set of all fractions, then all converging series of these numbers end in a member of the combined set. If this happens to the actual locations in the ambient space, then something essential changes with the locations associated with these numbers. These locations are no longer surrounded by enough empty space for other locations to be added. The already covered space resists further addition.

This suddenly turns the discussed covering of the space into a compact coherent continuum.

Numbers whose square is always zero or equal to a positive member of the number system are called real numbers. In space, real numbers can be brought together on a single directional line. That directional line is then completely covered with corresponding coordinate locations. The directional line of the real numbers forms a continuum.

Numbers whose square is equal to a negative real number obey other calculation rules than the calculation rules that apply to real numbers. In this document, these numbers are called spatial numbers. In the ambient space, the spatial numbers can cover up to three mutually independent directional lines. These directional lines differ from the directional line of the real numbers. The spatial numbers can also form a continuum. This happens when all converging sequences of spatial numbers end in a member of this set of spatial numbers. The coherence in the spatial continuum works in all covered directions. As a result, in the event of disturbances, the spatial continuum behaves like a sticky medium.

The real numbers and the spatial numbers can be united in a mixed set. The directional line of the real numbers, together with a directional line of the spatial numbers, forms the two-dimensional complex number system. The directional line of the real numbers, together with three mutually independent directional lines of the spatial numbers, forms the four-dimensional number system of the quaternions.

The calculation rules do not evade all freedom of choice. Application of the coordinate locations, eliminates the freedom of choices. Especially in the case of quaternions, the elimination of choices influences the applicable calculation rules and the behavior of the locations in the corresponding covering of the room.

The fact that in continuums all converging rows of locations lead to a location in the continuum means that the continuum is differentiable, and that differential calculus describes the behavior of the continuum. Differential calculus is a form of arithmetic of changes. This means in so many words that a continuum can change. Without a cause, nothing changes. Change requires an interaction between a continuum and something that disrupts the continuum. In principle, a continuum can influence itself. For example, it will try to remove distortions. Thus, an isotropic pulse-shaped distortion will be removed as quickly as possible by sending away the inserted volume in all directions until the disturbance disappears into infinity. Inside a single directional line, a pulse will cause a distortion that disappears to infinity in both directions. Both reactions are accurately described by solutions of differential equations.

Vectors and the Hilbert space

The considered space offers even more unexpected possibilities. The empty space can be covered with vectors. A vector consists of a base point and an arrowhead. A directional line connects both points. A simple number indicates the length of the vector. Shifting the vector along the directional line does not change the integrity of the vector. Also, shifting the vector parallel to the directional line does not change the integrity of the vector. Vectors can be added up by joining the base point of one vector and the arrowhead of the other vector by a parallel shift to create a new vector that applies the base point of the second vector and the arrowhead of the first vector. With such vectors, all locations in space can be reached. Adding vectors to the empty space turns this space into a vector space. It is possible to point vectors to all locations identified by numbers that exist in the vector space.

Paul Dirac discovered a bra-ket combination that turns a vector space into a Hilbert space. The resulting Hilbert space behaves like an archive in which number sets and even continuums can be stored in a structured way so that these numbers and continuums can be read back in an orderly manner. This means that the space under discussion has its private resources for managing numbers and continuums.

A Hilbert space can only work with one version of a mixed number system. That is a considerable limitation. However, a system of Hilbert spaces exists in which all members use the same underlying vector space. This system has an enormous storage capacity and can elucidate the interaction of continuums with disruptive actors.

This system has striking similarities with part of the Standard Model of experimental particle physicists.

Summary

Calculation rules determine how numbers can cover space. However, these rules do not fix all selection freedom. Apart from the calculation rules of the real numbers exist the calculation rules for spatial numbers (also called imaginary numbers) These two number types can mix in the two-dimensional complex numbers and in the four-dimensional quaternions. Space is usually seen as a three-dimensional container. Thus, the three-dimensional spatial numbers fit the three-dimensional space. Since the intervention by Albert Einstein space is also considered as a four-dimensional container. However, spacetime is not a Cartesian four-dimensional coordinate system. The Lorentz transform is a hyperbolic coordinate conversion. Einstein also discovered that the spatial continuum can deform. The combination of the hyperbolic transform and the deformation of the spatial continuum confuses most physicists. Space contains more than three spatial coordinates and one time coordinate. It can be covered with a huge number of versions of the quaternionic number system. These versions all take a role in what we call our universe. Scientists still do not use a good interpretation of what our universe comprises. A mathematical structure exists that brings order in this mash. That structure is a system of Hilbert spaces that all apply the same underlying infinite-dimensional vector space.

Paul Dirac discovered the bra-ket combination. This set of calculation rules turns an infinite dimensional vector space into a Hilbert space. Hilbert spaces can archive numbers and continuums. That can be done in many ways. Via the underlying vector space, the system can enable the interaction between numbers and continuums. Our universe is a complicated structure that is best described as a system of Hilbert spaces. This universe is not a simple space.

The document "Advanced Hilbert Space Technology";
https://vixra.org/abs/2201.0009
tells you all the details of how a dynamic universe emerges from empty space