A brief note on space-time spin

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Abstract: Space-time signature can be derived via a simple sort of spin-formalism. This formalism is described in a short comment .It comes from a simple Boole-algebra.

Key-words: spacetime-signature; spin-formalism; boole-algebra; rank;dual-system.

1. Introduction:

In classical local flat spacetime of tangential space in Minkowski-type but also in description of GRT and gravity there is used a four-dimensional form of spacelike and timelike dimensions of signature in main diagonal-line of a fundamental tensor: $s=(+1/+1/+1/-1)$ or $s=(-1/-1/-1/+1)$ [1.],[2.],[3.]. Since in Minkowski-space covariant and contravariant vectorfields are indistinguishable, the choice of version is arbitrary there but in GRT there must be told, which form is used [4.],[5.],[6.].

2.Concrete modelling:

The imaginary, concrete model (analog to Maxwells methods) on which the problem is based consists of an electric circuit diagram of a lamp and two switches. There are four possibilities:
1. Both switches A,B closed, - lamp lightning,
2. Switch A closed, switch B opened, - lamp out,
3. Switch A open, switch B closed, - lamp out,
4. Both switches A and B open, - lamp out.

3.Calculation:

Each state of the switches can be related to a defined form of spacetime-spin in a system:
the different states are called SpIN and SpOUT.

1. $\psi_1 \Rightarrow \Leftarrow \psi_2$ means $s=-1$, timelike state of spacetime: “SpIN-SpIN”,
2. $\psi_1 \Leftarrow \Leftarrow \psi_2$ means $s=1$, spacelike state of spacetime: ”SpOUTSpIN” , (1.a-1.d)
3. $\psi_1 \Rightarrow \Rightarrow \psi_2$ means $s=1$, spacelike state of spacetime: “SpIN-SpOUT”,
4. $\psi_1 \Leftarrow \Rightarrow \psi_2$ means $s=1$. spacelike state of spacetime: “SpOUT-SpOUT”.

The arrows explain the spacetime spin-state direction, however these will be interpreted.
Remark: Instead of speaking of “up and down” like ordinary spin-system its here the meaning of “in and out” . This also can be written in a version of Diracs bracket-notation $\langle SpIN|SpOUT\rangle$ or in formulation of QFTH with creation- and annihilation quantum operators a^{+1}, a^{-1} . Possibly these states can be connected to causal ingoings and outgoings of an fourevent in lightcone- or conoid-description.
Furthermore this spin system confirms a simple form of a Boole-Algebra:

$$\begin{array}{ll} \psi_1 \wedge \psi_2 = W & 1 \wedge 1 = 1 \\ \neg\psi_1 \wedge \psi_2 = F & 1 \wedge 0 = 0 \\ \psi_1 \wedge \neg\psi_2 = F & 0 \wedge 1 = 0 \\ \neg\psi_1 \wedge \neg\psi_2 = F & 0 \wedge 0 = 0 \end{array} \quad \rightarrow \quad , \qquad (2.a\text{-}2.d)$$

where 1 means “SpIN” and 0 means “SpOUT”.

This corresponds with the signature structure of $(+1/-1/-1/-1)$ of the local classical four-spacetime. The inverted analogon of signature s then can be constructed via an “or”- relation in Boole-algebra:

$$\begin{array}{ll} \psi_1 \vee \psi_2 = W & 1 \vee 1 = 1 \\ \neg\psi_1 \vee \psi_2 = W & 0 \vee 1 = 1 \\ \psi_1 \vee \neg\psi_2 = W & 1 \vee 0 = 1 \\ \neg\psi_1 \vee \neg\psi_2 = F & 0 \vee 0 = 0 \end{array} \quad \rightarrow \qquad (3.a\text{-}3.d)$$

And this structure corresponds with signature-form s of $(+1/+1/+1/-1)$.

4. Conclusion and Summary:

The structure of signature form s of real spacetime can be reduced to a form of spinning system, which gives the tension of the four- spacetime dimension system in a real simple dual quality of SpIN and SpOUT. That completeness of description may be one reason, why classical spacetime is a fourdimensional manifold and has no other dimension-number.

5. References:

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6.Verification:

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