Informational Time

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Abstract

I call any subjects, connected with an information the informational objects. It is clear that information received from such informational object can be expressed by a text which is made of sentences. I call a set of sentences expressing information about some informational object *recorder* of this object.

Some recorders systems form structures similar to clocks.

The following results are obtained from the logical properties of a set of recorders:

First, all such clocks have the same direction, i.e. if an event expressed by sentence *A* precedes an event expressed by sentence *B* according to one of such clocks then it is true according to the others.

Secondly, time is irreversible according to these clocks, i.e there's no recorder which can receive information about an event that has happened until this event really happens

Thirdly, a set of recorders is naturally embedded into metrical space.

Fourthly, if this metrical space is Euclidean, then the corresponding "space and time" of recorders obeys to transformations of the complete Poincare group. If this metric space is not Euclidean then suitable non-linear geometry may be built in this space.

Here I use numbering of definitions and theorems from book [1] which contains detailed proofs of all these theorems.

1. RECORDERS

Any information, received from physical devices, can be expressed by a text, made of sentences.

Let <u>***a***</u> be some object which is able to receive, save, and/or transmit an information. A set ***a*** of sentences, expressing an information of an object <u>***a***</u>, is called *recorder* of this object. Thus, statement: "Sentence «*A*» is an element of the set ***a***" denotes : "<u>***a***</u> has information that the event, expressed by sentence «*A*», took place". In short: "<u>***a***</u> knows that *A*". Or by designation: "$\boldsymbol{a}^{\bullet}$«*A*»".

Obviously, the following conditions are satisfied:

I. For any ***a*** and for every *A*: false is that $\boldsymbol{a}^{\bullet}(A\&(\rceil A))$, thus, any recorder doesn't contain a logical contradiction.

II. For every ***a***, every *B*, and all *A*: if *B* is a logical consequence from *A*, and $\boldsymbol{a}^{\bullet}A$, then $\boldsymbol{a}^{\bullet}B$.

III*. For all ***a***, ***b*** and for every *A*: if $\boldsymbol{a}^{\bullet}\ll\boldsymbol{b}^{\bullet}A\gg$ then $\boldsymbol{a}^{\bullet}A$.

2. TIME

Let's consider finite (probably empty) path of symbols of form $\boldsymbol{q}^{\bullet}$.

Def. 1.3.1 A path α is *subpath* of a path β (design.: $\alpha \prec \beta$) if α can be got from β by deletion of some (probably all) elements.

Designation: $(\alpha)^1$ is α, and $(\alpha)^{k+1}$ is $\alpha(\alpha)^k$.

Therefore, if $k \leq l$ then $(\alpha)^k \prec (\alpha)^l$.

Def. 1.3.2 Path α is *equivalent* to path β (design.: $\alpha \sim \beta$) if α can be got from β by substitution of subpath of form $(\boldsymbol{a}^{\bullet})^k$ by a path of the same form $(\boldsymbol{a}^{\bullet})^s$.

In this case:
III. If $\beta \prec \alpha$ or $\beta \sim \alpha$ then for any *K*:

if $\boldsymbol{a}^{\bullet}K$ then $\boldsymbol{a}^{\bullet}(K\&(\alpha A) \rightarrow \beta A))$.

Obviously, III is a refinement of condition III*.

Def. 1.3.3 Natural number q is *instant*, at which $\boldsymbol{a}$ registers B according to k-*clock* $\{\boldsymbol{g}_0,A,\boldsymbol{b}_0\}$ (design.: $q = [\boldsymbol{a}^{\bullet}B \uparrow \boldsymbol{a},\{\boldsymbol{g}_0,A,\boldsymbol{b}_0\}]$) if:

1. for any K: if $\boldsymbol{a}^{\bullet}K$ then

$$\boldsymbol{a}^{\bullet}(K\&(\boldsymbol{a}^{\bullet}B \rightarrow \boldsymbol{a}^{\bullet}(\boldsymbol{g}_0^{\bullet}\boldsymbol{b}_0^{\bullet})^{q}\,\boldsymbol{g}_0^{\bullet}A))$$

and

$$\boldsymbol{a}^{\bullet}(K\&(\boldsymbol{a}^{\bullet}(\boldsymbol{g}_0^{\bullet}\boldsymbol{b}_0^{\bullet})^{q+1}\,\boldsymbol{g}_0^{\bullet}A \rightarrow \boldsymbol{a}^{\bullet}B)).$$

2. $\boldsymbol{a}^{\bullet}(B\&(\neg\, \boldsymbol{a}^{\bullet}(\boldsymbol{g}_0^{\bullet}\boldsymbol{b}_0^{\bullet})^{q+1}\,\boldsymbol{g}_0^{\bullet}A))$.

Def. 1.3.4 k-clocks $\{\boldsymbol{g}_1,B,\boldsymbol{b}_1\}$ and $\{\boldsymbol{g}_2,B,\boldsymbol{b}_2\}$ have *the same direction* for $\boldsymbol{a}$ if the following condition is satisfied:

If

$$r = [\boldsymbol{a}^{\bullet}(\boldsymbol{g}_1^{\bullet}\boldsymbol{b}_1^{\bullet})^{q}\,\boldsymbol{g}_1^{\bullet}B \uparrow \boldsymbol{a},\{\boldsymbol{g}_2,B,\boldsymbol{b}_2\}],$$

$$s = [\boldsymbol{a}^{\bullet}(\boldsymbol{g}_1^{\bullet}\boldsymbol{b}_1^{\bullet})^{p}\,\boldsymbol{g}_1^{\bullet}B \uparrow \boldsymbol{a},\{\boldsymbol{g}_2,B,\boldsymbol{b}_2\}],$$

$$q < p$$

then

$$r \leq s.$$

Th. 1.3.1 All k-clocks have the same direction.

Thus a recorder with a k-clock puts in order its' elements. And this order is linear and doesn't depend on which k-clock it is established.

Def. 1.3.5 k-clock $\{\boldsymbol{g}_2,B,\boldsymbol{b}_2\}$ is k times *more precise* than k-clock $\{\boldsymbol{g}_1,B,\boldsymbol{b}_1\}$ for recorder $\boldsymbol{a}$ if for every C the following condition is satisfied: if

$$q_1 = [\boldsymbol{a}^{\bullet}C\uparrow\boldsymbol{a},\{\boldsymbol{g}_1,B,\boldsymbol{b}_1\}],$$
$$q_2 = [\boldsymbol{a}^{\bullet}C\uparrow\boldsymbol{a},\{\boldsymbol{g}_2,B,\boldsymbol{b}_2\}]$$

then

$$q_1 < q_2/k < q_1+1.$$

Def. 1.3.6 Sequence $\underline{\mathbf{H}}$ of k-clocks: $<\{\boldsymbol{g}_0,B,\boldsymbol{b}_0\}, \{\boldsymbol{g}_1,B,\boldsymbol{b}_1\}, .., \{\boldsymbol{g}_j,B,\boldsymbol{b}_j\}, ..>$ is called *an absolutely precise* k-clock of a recorder $\boldsymbol{a}$ if for every j exists a natural number kj so that k-clock $\{\boldsymbol{g}_j,B,\boldsymbol{b}_j\}$ is kj times more precise than k-clock $\{\boldsymbol{g}_{j-1},B,\boldsymbol{b}_{j-1}\}$.

In this case if

$$q_j = [\boldsymbol{a}^{\bullet}C \uparrow \boldsymbol{a},\{\boldsymbol{g}_j,B,\boldsymbol{b}_j\}]$$

and

$$t = q_0+\textstyle\sum_j (q_j - q_{j-1}k_j)/(k_1k_2\, ..k_j),$$

then

$$t = [\boldsymbol{a}^{\bullet}C \uparrow \boldsymbol{a},\underline{\mathbf{H}}].$$

3. SPACE

Def. 1.4.1 A number t is called *a time, measured by a recorder* a *according to a* k*-clock* $\underline{\mathbf{H}}$ *during which a signal C did path* $\boldsymbol{a}^{\bullet}\alpha\boldsymbol{a}^{\bullet}$(design.:

$$t := \underline{\mathrm{m}}(\boldsymbol{a}\underline{\mathbf{H}})(\boldsymbol{a}^{\bullet}\alpha\boldsymbol{a}^{\bullet}C))$$

if

$$t = [\boldsymbol{a}^{\bullet}\alpha\boldsymbol{a}^{\bullet}C \uparrow \boldsymbol{a},\underline{\mathbf{H}}] - [\boldsymbol{a}^{\bullet}C \uparrow \boldsymbol{a},\underline{\mathbf{H}}].$$

Th. 1.4.1 $\underline{\mathrm{m}}(\boldsymbol{a}\underline{\mathbf{H}})(\boldsymbol{a}^{\bullet}\alpha\boldsymbol{a}^{\bullet}C)) \geq 0$.

Thus, any ”signal”, ”sent” by the recorder, ”will come back” to it not earlier than it was ”sent”.

Def. 1.4.2
1) for every recorder a: $(\boldsymbol{a}^{\bullet})^{\dagger} = (\boldsymbol{a}^{\bullet})$;
2) for all paths α and β: $(\alpha\beta)^{\dagger} = (\beta)^{\dagger}(\alpha)^{\dagger}$.

Def. 1.4.3 A set **Ř** of recorders is *an internally stationary system* for a recorder ***a*** with k-clock $\underline{\mathbf{H}}$ (design.: **Ř** is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$) if for all sentences *B* and *C*, for all elements $\boldsymbol{a}_1$ and $\boldsymbol{a}_2$ of set **Ř**, and for all paths α, made of elements of set **Ř**, the following conditions are satisfied:

1) $[\boldsymbol{a}^{\bullet}\boldsymbol{a}_2^{\bullet}\boldsymbol{a}_1^{\bullet}C \uparrow \boldsymbol{a},\underline{\mathbf{H}}] - [\boldsymbol{a}^{\bullet}\boldsymbol{a}_1^{\bullet}C \uparrow \boldsymbol{a},\underline{\mathbf{H}}] = [\boldsymbol{a}^{\bullet}\boldsymbol{a}_2^{\bullet}\boldsymbol{a}_1^{\bullet}B \uparrow \boldsymbol{a},\underline{\mathbf{H}}] - [\boldsymbol{a}^{\bullet}\boldsymbol{a}_1^{\bullet}B \uparrow \boldsymbol{a},\underline{\mathbf{H}}]$;
2) $\underline{\mathrm{m}}(\boldsymbol{a}\underline{\mathbf{H}})(\boldsymbol{a}^{\bullet}\alpha\boldsymbol{a}^{\bullet}C)) = \underline{\mathrm{m}}(\boldsymbol{a}\underline{\mathbf{H}})(\boldsymbol{a}^{\bullet}\alpha^{\dagger}\boldsymbol{a}^{\bullet}C))$.

Th. 1.4.2 $\{\boldsymbol{a}\}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$.

Def. 1.4.4 A number *l* is called *an* $\boldsymbol{a}\underline{\mathbf{H}}(B)$*-measure* of recorders $\boldsymbol{a}_1$ and $\boldsymbol{a}_2$ (design.: $l = \ell(\mathrm{a},\underline{\mathrm{H}},B)(\boldsymbol{a}_1,\boldsymbol{a}_2)$) if

$$l = [\boldsymbol{a}^{\bullet}\,\boldsymbol{a}_1^{\bullet}\boldsymbol{a}_2^{\bullet}\,\boldsymbol{a}_1^{\bullet}B \uparrow \boldsymbol{a},\underline{\mathbf{H}}] - [\boldsymbol{a}^{\bullet}\boldsymbol{a}_1^{\bullet}B \uparrow \boldsymbol{a},\underline{\mathbf{H}}].$$

Lm. 1.4.2 If $\{\boldsymbol{a},\boldsymbol{a}_1,\boldsymbol{a}_2\}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$ then for all *B* and *C*: $\ell(\mathrm{a},\underline{\mathrm{H}},B)(\boldsymbol{a}_1,\boldsymbol{a}_2)) = \ell(\mathrm{a},\underline{\mathrm{H}},C)(\boldsymbol{a}_1,\boldsymbol{a}_2))$.

Therefore, one can write expression of form ” $\ell(\mathrm{a},\underline{\mathrm{H}},B)(\boldsymbol{a}_1,\boldsymbol{a}_2))$” as the following:” $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2))$”.

Th. 1.4.3: If $\{\boldsymbol{a},\boldsymbol{a}_1,\boldsymbol{a}_2,\boldsymbol{a}_3\}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$ then
1) $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2) \geq 0$;
2) $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_1) = 0$;
3) $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2) = \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_2,\boldsymbol{a}_1)$;
4) $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2) + \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_2,\boldsymbol{a}_3) \geq \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_3)$.

Thus, all four axioms of the metrical space are accomplished for $\ell(\mathrm{a},\underline{\mathrm{H}})$ in an internally stationary system of recorders.

Consequently, a set or recorders is a metrical space with $\ell(\mathrm{a},\underline{\mathrm{H}})$ as distance.

Def. 1.4.6: *B* took place in *the same place* as $\boldsymbol{a}_1$ for ***a*** (design.: $\#(\boldsymbol{a})(\boldsymbol{a}_1,B))$ if for every sequence α and for any sentence *K* the following condition is satisfied:
if $\boldsymbol{a}^{\bullet}K$ then $\boldsymbol{a}^{\bullet}(K\&(\alpha B) \rightarrow \alpha\boldsymbol{a}_1^{\bullet}B))$.

Th. 1.4.4: $\#(\boldsymbol{a})(\boldsymbol{a}_1, \boldsymbol{a}_1^{\bullet}B))$.

Th. 1.4.5: If $\#(\boldsymbol{a})(\boldsymbol{a}_1,B)$ and $\#(\boldsymbol{a})(\boldsymbol{a}_2,B)$, then $\#(\boldsymbol{a})(\boldsymbol{a}_2, \boldsymbol{a}_1^{\bullet}B)$.

Th. 1.4.6: If $\{\boldsymbol{a},\boldsymbol{a}_1,\boldsymbol{a}_2\}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$, $\#(\boldsymbol{a})(\boldsymbol{a}_1,B)$, and $\#(\boldsymbol{a})(\boldsymbol{a}_2,B)$, then $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2) = 0$.

Th. 1.4.7: If $\{\boldsymbol{a}_1,\boldsymbol{a}_2,\boldsymbol{a}_3\}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$ and there exists sentence *B* such that $\#(\boldsymbol{a})(\boldsymbol{a}_1,B)$, $\#(\boldsymbol{a})(\boldsymbol{a}_2,B)$ then $\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_3,\boldsymbol{a}_2) = \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_3,\boldsymbol{a}_1)$.

Def. 1.4.7 A real number *t* is *an instant of a sentence B* in *frame of reference* (Ŕ,***a***,H̲) (design.: $t = [B \mid$ Ŕ$,\boldsymbol{a},\underline{\mathrm{H}}])$ if
1) **Ř** is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$;
2) there exists a recorder ***b*** so that ***b*** is an element of **Ř** and $\#(\boldsymbol{a})(\boldsymbol{b},B)$;
3) $t = [\boldsymbol{a}^{\bullet}B \uparrow \boldsymbol{a},\underline{\mathbf{H}}] - \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a},\boldsymbol{b})$.

Def. 1.4.8 A real number *z* is *distance between B and C in a frame of reference* (Ŕ,***a***,H̲) (design.: $z = \ell($Ŕ$,\boldsymbol{a},\underline{\mathrm{H}})(B,C))$ if
1) **Ř** is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$;
2) there exist elements $\boldsymbol{a}_1$ and $\boldsymbol{a}_2$ of **Ř** so that $\#(\boldsymbol{a})(\boldsymbol{a}_1,B)$ and $\#(\boldsymbol{a})(\boldsymbol{a}_2,C)$;

3) $z = \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2)$.

According to Theorem 1.4.3 such distance satisfies conditions of all axioms of a metric space.

4. RELATIVITY

Def. 1.5.1: Recorders $\boldsymbol{a}_1$ and $\boldsymbol{a}_2$ *equally receive a signal* about B for a recorder $\boldsymbol{a}$ if

$$«\#(\boldsymbol{a})(\boldsymbol{a}_2, \boldsymbol{a}_1{}^{\bullet}B)» = « \#(\boldsymbol{a})(\boldsymbol{a}_1, \boldsymbol{a}_2{}^{\bullet}B)».$$

Def. 1.5.2: Set of recorders are called *a homogeneous space* of recorders if all its elements equally receive all signals.

Def. 1.5.3: A real number c is *information velocity* about B to the recorder $\boldsymbol{a}_1$ in frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$ if $c = \ell(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})(B, \boldsymbol{a}_1{}^{\bullet}B)/([\boldsymbol{a}_1{}^{\bullet}B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}] - [B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}])$.

Th. 1.5.1: In all homogeneous spaces: $c = 1$.

Th. 1.5.2: If $\acute{R}$ is a homogeneous space, then $[\boldsymbol{a}_1{}^{\bullet}B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}] \geq [B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$.

Consequently, in any homogeneous space any recorder finds out that B ”took place” not earlier than B ”actually take place”. *”Time” is irreversible*.

Th. 1.5.3 If $\boldsymbol{a}_1$ and $\boldsymbol{a}_2$ are elements of $\acute{R}$; $\check{\mathbf{R}}$ is $ISS(\boldsymbol{a},\underline{\mathbf{H}})$; $p := [\boldsymbol{a}_1{}^{\bullet}B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$; $q := [\boldsymbol{a}_2{}^{\bullet}\boldsymbol{a}_1{}^{\bullet}B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$; $z := \ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_1,\boldsymbol{a}_2)$ then $z = q - p$.

According to the Urysohn‘s theorem [2]: any homogeneous space is homeomorphic to some set of points of real Hilbert space. If this homeomorphism is not Identical transformation, then $\check{\mathbf{R}}$ will represent a non-Euclidean space. In this case in this ”space-time” corresponding variant of General Relativity Theory can be constructed. Otherwise, $\check{\mathbf{R}}$ is Euclidean space. In this case there exists coordinates system R^{μ} such that the following condition is satisfied: for all elements $\boldsymbol{a}_k$ and $\boldsymbol{a}_s$ of set $\check{\mathbf{R}}$ there exist points x_k and x_s of system R^{μ} such that

$$\ell(\mathrm{a},\underline{\mathrm{H}})(\boldsymbol{a}_k,\boldsymbol{a}_s) = \left(\sum^{\mu}{}_{j=1} (x_{s,j} - x_{k,j})^2\right)^{0.5}.$$

In this case R^{μ} is called *a coordinates system of frame of reference* $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$ and numbers $<x_{k,1},x_{k,2},..:, x_{k,\mu}>$ are called *coordinates of recorder* $\boldsymbol{a}_k$ in R^{μ}.

The coordinate system is defined to within transformations of shift, turn, and inversion.

Def. 1.5.4: Numbers $<x_1,x_2,..:,x_{\mu}>$ are called *coordinates* of B in a coordinate system R^{μ} of a frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$ if there exists a recorder $\boldsymbol{b}$ such that $\boldsymbol{b} \in \acute{R}$, $\#(\boldsymbol{a})(\boldsymbol{b},B)$, and these numbers are the coordinates in R^{μ} of this recorder.

Th. 1.5.4: In a coordinate system R^{μ} of a frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$: if z is a distance between B and C, coordinates of B are $<b_1,b_2,..,b_{\mu}>$, coordinates of C are $<c_1,c_2,.., c_{\mu}>$, then

$$z = \left(\sum^{\mu}{}_{j=1} (b_j - c_j)^2\right)^{0.5}.$$

Def. 1.5.5: Numbers $<x_1,x_2,..:,x_{\mu}>$ are called *coordinates of the recorder* $\boldsymbol{b}$ in the coordinate system R^{μ} at the instant t of the frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$ if for every B the condition is satisfied: if $t = [\boldsymbol{b}^{\bullet}B \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$ then coordinates of $«\boldsymbol{b}^{\bullet}B»$ in coordinate system R^{μ} of frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$ are the following: $<x_1,x_2,..:,x_{\mu}>$.

Let v be the real number such that $|v| < 1$.

Th. 1.5.5 In coordinates system R^{μ} of frame of reference $(\acute{R},\boldsymbol{a},\underline{\mathrm{H}})$: if in every instant t: coordinates of:

$\boldsymbol{b}$: $<x_{\boldsymbol{b},1}+vt, x_{\boldsymbol{b},2}, x_{\boldsymbol{b},3},\ldots, x_{\boldsymbol{b},\mu}>$;
$\boldsymbol{g}_0$: $<x_{0,1}+vt, x_{0,2}, x_{0,3},\ldots, x_{0,\mu}>$;
$\boldsymbol{b}_0$: $<x_{0,1}+vt, x_{0,2}+l, x_{0,3},\ldots, x_{0,\mu}>$ where l is a positive real number;
$t_C = [\boldsymbol{b}^{\bullet}C \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$;
$t_D = [\boldsymbol{b}^{\bullet}D \mid \acute{R},\boldsymbol{a},\underline{\mathrm{H}}]$;
$q_C = [\boldsymbol{b}^{\bullet}C \uparrow \boldsymbol{b},\{\boldsymbol{g}_0,A,\boldsymbol{b}_0\}]$;
$q_D = [\boldsymbol{b}^{\bullet}D \uparrow \boldsymbol{b},\{\boldsymbol{g}_0,A,\boldsymbol{b}_0\}]$

then

$$\lim_{l\to 0} 2l\cdot(1-v^2)^{-0.5}(q_D - q_C)/(t_D - t_C) = 1.$$

Th. 1.5.6 Let: v ($|v| < 1$) and l be the real numbers and k_i be natural ones.

Let in a coordinates system R^μ of frame of reference (Ŕ,***a***,H): in each instant t coordinates of:

$\boldsymbol{b}$: $\langle x_{\boldsymbol{b},1}+vt, x_{\boldsymbol{b},2}, x_{\boldsymbol{b},3},\ldots, x_{\boldsymbol{b},\mu}\rangle$;
$\boldsymbol{g}_j$: $\langle y_{j,1}+vt, y_{j,2}, y_{j,3},\ldots, y_{j,\mu}\rangle$;
$\boldsymbol{u}_j$: $\langle y_{j,1}+vt, y_{j,2}+l/(k_1\cdot\ldots\cdot k_j)y_{j,3},\ldots, y_{j,\mu}\rangle$:
for all $\boldsymbol{b}_i$: if $\boldsymbol{b}_i \in$ Á, then coordinates of
$\boldsymbol{b}_i$: $\langle x_{i,1}+vt, x_{i,2}, x_{i,3},\ldots, x_{i,\mu}\rangle$;
$\underline{\mathrm{T}}$ is $\langle\{\boldsymbol{g}_1,A,\boldsymbol{u}_1\}, \{\boldsymbol{g}_2,A,\boldsymbol{u}_2\}, ..,\{\boldsymbol{g}_j,A,\boldsymbol{u}_j\}, ..\rangle$.

In that case: Á is *ISS*(***b***,T).

Th. 1.5.7

Let:

1) in coordinates system R^μ of frame of reference (Ŕ,***a***,H): in every instant t:

$\boldsymbol{b}$: $\langle x_{\boldsymbol{b},1}+vt, x_{\boldsymbol{b},2}, x_{\boldsymbol{b},3},\ldots, x_{\boldsymbol{b},\mu}\rangle$;
$\boldsymbol{g}_j$: $\langle y_{j,1}+vt, y_{j,2}, y_{j,3},\ldots, y_{j,\mu}\rangle$;
$\boldsymbol{u}_j$: $\langle y_{j,1}+vt, y_{j,2}+l/(k_1\cdot\ldots\cdot k_j)y_{j,3},\ldots, y_{j,\mu}\rangle$:
for all $\boldsymbol{q}_i$: if $\boldsymbol{q}_i \in$ Á, then coordinates of
$\boldsymbol{q}_i$: $\langle x_{i,1}+vt, x_{i,2}, x_{i,3},\ldots, x_{i,\mu}\rangle$;
$\underline{\mathrm{T}}$ is $\langle\{\boldsymbol{g}_1,A,\boldsymbol{u}_1\}, \{\boldsymbol{g}_2,A,\boldsymbol{u}_2\}, ..,\{\boldsymbol{g}_j,A,\boldsymbol{u}_j\}, ..\rangle$;
C: $\langle C_1, C_2, C_3,\ldots, C_\mu\rangle$;
D: $\langle D_1, D_2, D_3,\ldots, D_\mu\rangle$;
$t_C = [C \mid$ Ŕ,***a***,H];
$t_D = [D \mid$ Ŕ,***a***,H];

2) in coordinates system $R^{\mu\prime}$ of frame of reference (Á,***b***,T):
C: $\langle C'_1, C'_2, C'_3,\ldots, C'_\mu\rangle$;
D: $\langle D'_1, D'_2, D'_3,\ldots, D'_\mu\rangle$;
$t'_C = [C \mid$ Á,***b***,T];
$t'_D = [D \mid$ Á,***b***,T].

In that case:

$$t'_D - t'_C = ((t_D - t_C) - v(D_1 - C_1))/(1-v^2)^{0.5};$$
$$D'_1 - C'_1 = ((D_1 - C_1) - v(t_D - t_C))/(1-v^2)^{0.5}.$$

This is the Lorentz spatial-temporal transformation.

CONCLUSIONS

Thus, if you have some set of objects, dealing with information, then "time" and "space" are inevitable. And it doesn't matter whether this set is part our world or some other worlds, which don't have a space-time structure initially.

I call such "Time" the Informational Time.

Since, we get our time together with our information system. All other notions of time (thermo dynamical time, cosmological time, psychological time, quantum time etc.) should be defined by that Informational Time.

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