THE INTRODUCTORY CONCEPTS AND OPERATIONS OF ST MATHEMATICS

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There is a need to develop an instrumental mathematical base for new technologies. The task of the work is to develop new approaches for this through the introduction of new concepts and methods.

**St - elements**

Definition 1. The set of elements \( \{a\} = (a_1, a_2, \ldots, a_n) \) at one point \( x \) of space \( X \) we shall call St - element, and such a point in space is called capacity of the St - element. We shall denote \( St_x(\{a\}) \).

Definition 2. An ordered set of elements at one point in space is called an ordered St - element.

It is possible to \( St_x(\{a\}) \) correspond to the set of elements \( \{a\} \), and to the ordered St - element - a vector, a matrix, a tensor, a directed segment in the case when the totality of elements is understood as a set of elements in a segment.

It is allowed to add St - elements: \( St_x(\{a\}) + St_x(\{b\}) = St_x(\{a\} \cup \{b\}) \).

**Self-capacity**

Definition 3. The self-capacity \( A \) of the first type is the capacity containing itself as an element. Denote \( S_1fA \).

Definition 4. The self-capacity of the second type is the capacity that contains the program that allows it to be generated. Let's denote \( S_2fA \). An example of self-capacity of the first type is a self-set containing itself. An example of self-capacity of the second type is a living organism, since it contains a program: DNA, RNA.

Definition 5. Partial self-capacity of the third type is called self-capacity, which contains itself in part or contains a program that allows it to be generated partially. Let us denote \( S_3f \).

**Connection of St – elements with self-capacities.**

For example, \( S_{g(\{R\})}f \) is the self-capacity of the second type if \( g(\{R\}) \) is a program capable of generating \( \{R\} \).

Consider a third type of self-capacity. For example, based on \( St_x(\{a\}) \), where \( \{a\} = \ldots \).
(a₁, a₂, ..., aₙ), i.e. n - elements at one point, it is possible to consider the self-capacity $S₃f$ with m elements and from {a}, at m<n, which is formed by the form:

$$w_{mn}=(m,(n,1)) \quad (1)$$

that is, only m elements are located in the structure $St^{(a)}_x$.

Self-capacities of the third type can be formed for any other structure, not necessarily St, only through the obligatory reduction in the number of elements in the structure. In particular, using the form

$$w_{m_1\cdots m_n}=(m_1,(m_2,(\ldots (m_n,1)\ldots))) \quad (2)$$

Structures more complex than $S₃f$ can be introduced.

**Mathematics itself**

Consider first the arithmetic of St:

1. Simultaneous addition of a set of elements $\{a\}=(a₁, a₂, \ldots, aₙ)$ are realized by $St^{(a+)}_x$.

2. By analogy, for simultaneous multiplication: $St^{(a*)}_x$, namely: enter the notation of the set B with elements , for any , without repetitions $b_{i₁i₂(\ldots i_m)} = (St^T_x \{a_{i₁} \ast a_{i₂} \ast \cdots \ast a_{i_m}\})_R$ for any $i_k(₁, i₂, \ldots, iₙ)$, $R=$ $\{St^{(i₁+ i₂+ \cdots iₙ)}\}$, R is the index of the lower discharge (we choose an index on the scale of discharges):

<table>
<thead>
<tr>
<th>index</th>
<th>discharge</th>
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<tbody>
<tr>
<td>n</td>
<td>n</td>
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<td>...</td>
<td>...</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>,</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>1st digit to the right of the point</td>
</tr>
<tr>
<td>-2</td>
<td>2nd digit to the right of the point</td>
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Then $St^{(R+)}_x$ gives the final result of simultaneous multiplication. Any system of calculus can be chosen, in particular binary. The simplest functional scheme of the assumed arithmetic-logical device for St-multiplication:

- Register of entering a set of numbers to multiply
- St-block of simultaneous multiplication in all chains of digits of the levels of these numbers
- St-block of simultaneous addition of the values of these products
- Register of saving the final result
1. Similarly for simultaneous execution of various operations: \( S_{t_x}^{(aq)} \), where \( \{q\} = \{q_1, q_2, \ldots, q_n\} \). q an operation, \( i = 1, \ldots, n \).

2. Similarly, for the simultaneous execution of various operators: \( S_{t_x}^{(fa)} \), where \( \{F\} = \{F_1, F_2, \ldots, F_n\} \). F is an operator, \( i = 1, \ldots, n \).

3. The arithmetic itself for self-capacities will be similar: addition - \( S_{1f}^{(a+)} \), (or \( S_{3x_f}^{(a+)} \) for the third type), multiplication \( S_{1f}^{(a*)} \), \( (S_{3x_f}^{(a*)}) \).

4. Similarly with different operations: \( S_{1f}^{(aq)} \), \( (S_{3x_f}^{(aq)}) \), and with different operators: \( S_{1f}^{(fa)} \), \( (S_{3x_f}^{(fa)}) \).

Operator itself.

Definition: An operator that transforms \( S_{t_x}^{(a)} \) into any \( S_{t_f}^{(b)} = 2,3 \); where \( \{b\} \subset \{a\} \); is the operator itself.

Example. The operator includes the set itself.

\[ \text{Lim itself.} \]

1. Lim St

2. For example, the double limit \( \lim_{x \to a_1} \lim_{y \to a_2} (G(x,y)) \) corresponds to \( S_{t_x}^{(G(x,y))} \).

3. Similarly for itself limit with n variables.

In the case of lim-itself, for example, for m variables, it is sufficient to use the form (1) of lim St, for n variables (n>m). Similarly, for integrals of variables m (for example, a double integral over a rectangular region, through a double lim).

The sequence of actions you can "collapse" into an ordered St element, and then translate it, for example, to \( S_{3f} \) capacity. As an example, you can take the receipt \( \frac{\partial^2 u}{\partial x^2} \). Here is the sequence of steps 1) \( \frac{\partial u}{\partial x} \rightarrow 2) \frac{\partial^2 u}{\partial x} \). "collapses" into ordered \( S_{i_x}^{(a_1, a_2, a_3)} \), ones that can be translated into the corresponding \( S_{1f} \). The differential operator \( S_{t_x}^{(\frac{\partial^2 u}{\partial x^2})} \) itself is also interesting.

Remark. We can consider the concept of St - element as \( S_{t_B}^B \), where A fits in capacity B. Then \( S_{t_B}^B \) it will mean \( S_{t_B}^B \) B. Then \( S_{t_B}^B \) it would mean \( S_{t_B}^B \). In particular, it allows you to determine the self-energy of DNA through \( S_{t_{DNA}}^{DNA} \), \( S_{t_Q}^{Q} \) - self-energy Q.

About St and Sf programming

The ideology of St and S3 can be used for programming. Here are some of the St programming operators.

1. Simultaneous assignment of the constants \( \{p\} = \{p_1, p_2, \ldots, p_m\} \) to the variables \( \{a\} = \{a_1, a_2, \ldots, a_n\} \). Implemented through \( S_{t_x}^{(a)p} \).

2. Simultaneous check the set of conditions \( \{f\} = \{f_1, f_2, \ldots, f_n\} \) for a set of expressions \( \{B\} = \{B_1, B_2, \ldots, B_n\} \). It is implemented through \( S_{t_x}^{(B\{f\})} \).

3. Similarly for loop operators and others.

\( S_{3f} \) - software operators will differ only in that aggregates \( \{a\}, \{p\}, \{B\}, \{f\} \) will be formed from corresponding St program operators in form (1) for more complex operators in form (2).

Quite interesting is the OS (operating system), the principles and modes of operation of the computer for this programming. But this is already the material of the next articles.
Conclusions: New concepts and new processing methods of information based on them and new software operators were introduced. Further development is associated with changing the structure of the arithmetic-logical device, the corresponding software and application for new technologies, in the light of the new approach.

References: