KYBERNETIKA — VOLUME 8 (1972), NUMBER 1

Example of the Function (Behaviour) of a System Element Consisting in Rudimentary Properties I

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Only one of many possible models is presented.

The paper is divided in two Parts. In Part I an Assumption about properties of element, of set of elements, of class of elements, and about collections of informations is made. The function (behaviour, functional relation) of an element is a compound function of functions of three kinds. Functions of first kind are functions of arbitrariness of information processing. Functions of second kind are functions of quantities of rudimentary properties. Functions of third kind are functions of quality types of rudimentary properties. A feedback of the element is given by means of a loop wave of activites or/and informations, in general. The element can optimize a strategy of pursuing of any of its goals.

In Part II an example of symbolics and mathematical formulation of functions of the single kinds will be derived from the given Assumption.

1. INTRODUCTION

First of all, it should be declared that the present model of element, of set and of class is only one of many possible models and is not intended to be anything more.

There is a number of set theories. The introduced model differs from those applied usually in set theories, for example from those given in [1], [2], [3] and [4]. The present paper being not a comparison of different set models (set theories), but an application of a certain set model to some problems of cybernetics, the single differences will not be treated here.

Attention will be focused on function of an element from cybernetical point of view, i.e. of an element of a certain class of cybernetical systems, of an element with given properties. For example the present element has its memory, can operate rudimentary properties, can process its informations. A feedback of the element is expressed by means of a wave of activities or of a wave of informations. Not only an operating of activities but also information processing, e.g. decision making, are developed in time flow, i.e. they are delayed, in general. Etc. The element can, for example, have a certain energy, mass, function, ability, aim, etc. The element can be a worker, an operator, a specialist, a machine, an engine, an industrial product, a device, etc.

In papers [5] and [6] a class of models of subsystems of a system has been introduced. A subsystem is composed of elements and each element consists in and of rudimentary properties. Each element exerts a function (behaviour) in such subsystem. The aim of the present paper is to introduce an example of such function. But the final goal of papers [5], [6] and of the present paper is to introduce a new description of problems occuring in different cybernetical systems, for example when solving problems of automatic control [7]. The corresponding mathematical expressions are subjects of Part II of the present paper.

It has to be noticed that, whereas the concept of subset and sub-subset is derived by deduction (i.e. by inference from general to particular), the concept of class and subclass is constructed by induction (i.e. by inferring a general concept from several particular cases). The concepts of rudimentary property and of time and space relations, further the function of quantities, are in accordance with those given in [5]. Function of quality types and function of informations (including the concept of set and of class) are new. The assumption about element has been revised. In the present model, the void set is not a set containing no elements, but the void set is a set the elements of which do not exist.

Any given element can operate only those sets of elements in a direct way, which are in adjacent environment and in medium of the given element — i.e. only those sets which are in the array of the direct influence of the given element at an instant.

In order to be able to construct the difference of two informations or of two activities, first the two given informations (activities) are to be ordered (and they can be ordered in two ways). Then the second information (activity) is to be inverted. A certain time interval elapses in course of the ordering and of the inverting, naturally. After that only, the difference is constructible by means of the union of the first information (activity) and of the inverted second one. As the ordering, the inverse and the union occur in time one by one, there is an increase or a decrease (the time steps can not be reordered) of the one information with respect to the other one. For that reason either a difference expressed by increases or a difference expressed by decreases is considered here besides the well known concept of a difference in the wide mathematical sense and besides the known concept of symmetric difference, the construction of which is not time dependent.

The relative great number of points of the assumption is due to an attempt at a system of assumption points closed as far as possible (although redundant to a certain extent and arrised from an effort to develop the concept of the element). For a quicker loop over the concepts treated in the assumption, certain terms are written in italics. The aim of the assumption is to provide a language in which a mathematically tractable model of system element may be stated.

2. AN EXAMPLE OF MODEL OF ELEMENT WITH PROPERTIES

As the present model of element is one of many possible models of element specified (characterized) by its properties, as well as the present model of set and of class are ones of many possible models of set or class specified (characterized) by their properties, an assumption will be made.

Assumption 1.

1. There are elements, each of which possesses (has) one or more *rudimentary properties* (*r-properties*), i.e. each of which consists in and consists of (is constructed of, is constituted of) one or more r-properties or, in each of which exists one or more r-properties. Each r-property belongs to an element (is included in an element, is member of an element). Each element

(i) has its *memory*,

(ii) can *operate* r-properties,

(iii) can perform a correspondence between *signal* and *information*,
(iv) can *process* informations.

Each *element is given* (or *specified*, or *characterized*)

(i) by its *r*-properties (point 12),
(ii) by its *locational relations* (point 27),
(iii) by its *time relations* (point 29),
(iv) by its informations (point 37),
(v) by its possible operations on rudimentary properties (point 40),
(vi) by *changes interpreted as signals* by its *symbolics* for its single informations, including symbolics for processing of informations (point 37).

2. Any two *r-properties* are either *identical* (both are the same *r*-property) or *non-identical*. Any two non-identical *r*-properties are either *equal* (to each other) or *unequal* (point 13).

3. There are certain possible *relations among elements*: identity, non-identity, equality, inequality or difference (point 45), equivalence, non-equivalence (points 14, 15, 16), correspondence or mapping (one element corresponds to the other, one element is mapped onto the other), non-correspondence (non-mapping), ordering (one element precedes or follows (succeeds) an other element), unordering, locational relations (point 17), time relations (point 29), information relations (point 38), relations between signals and symbolics for informations (point 37).

4. Let any *instant of time* be given (point 29). In the *medium* and *adjacent environment* (point 27) of each element at the given instant there are *sets* consisting (constituted) of one or more elements, i.e. sets constructed of one or more elements, i.e. sets including one or more elements (set of elements). There is a *void set*, the elements of which do not exist. Each set,. which includes one existing element at least, is *non-void set*. Each *set is given* (exists) at any instant by its elements, provided it has any. (There are elements only which can constitute a set.)

5. There are two possible *relations between an element and a set*:

a) *Membership* (the element is element of the set, the element belongs to the set, the element is included (exists) in the set, the set has the element).
b) *Non-membership* (the element is not element of the set, the element does not belong to the set, the element is not included (does not exist) in the set, the set does not have the element).

6. There are certain possible *relations among sets*: identity, non-identity, equality, inequality (differences), equivalence, non-equivalence (points 17, 18, 19, 21), correspondence (mapping), non-correspondence (point 7), ordering, unordering, inclusion, non-inclusion (point 7).

7. Let two or more sets of elements be given. Then there are certain *possible operations on the sets* of elements (including one-element set (set of one element) and void set):

a) *Union* of the given sets (the set of all and only all elements, each of which belongs to one of the given sets at least). The union is a *whole* and each of the given sets is a *part* (*subset*) of the whole. The union is *partly included* in any of the given sets. The relation of that given set and that union is *inclusion*. The relation of any further set, which is not included among the above mentioned given sets, and of that union is *non-icnlusion*. Each of the given sets *shares in the union* by itself.

b) *Intersection* of the given sets (the set of all and only all elements, each of which belongs to each of the given sets). Each of the given sets is a *whole* and the intersection is a *part* (*subset*) of the whole. The relation of that given set and that intersection is *inclusion*. The relation of any further set, which is not included among the above mentioned given sets, and of that intersection is *non-inclusion*. Each of the given sets *shares in any other* given *set* by intersection of the two sets.

c) *Correspondence* between two sets of the single pairs of the given sets, i.e. *mapping* of any one set (of any single pair of the given sets) into the other set. The set, which has been mapped, can be mapped again (*remapped*, successive mapping).

d) *Ordering* of the sets (one set *precedes* or *follows* another set) or *disordering* of the sets. The set, which has been ordered, can be *reordered*.

8. Let a single set be given out of medium and adjacent environment of a given element.

a) There is one possible operation on a single set. The set can be *partitioned* by the element in one or more ways into two or more sets which are its *parts* (of the set), i.e. into sets which are its *subsets*. The set is a *whole* which can be partitioned. A *void set* can be subset of each set.

b) Let the given set be non-void set. Let any one non-void subset of the above mentioned set be given. Let the subset be partitioned into two or more sets, which are its parts (subsets). Then each subset of the given subset is a *sub-subset* of the single set mentioned above.

If the set is partitioned into itself and the void set, each of the parts (subsets) is an *improper part* (*improper subset*) of the set. If the set is partitioned into two or more *non-void parts* (*non-void subsets*), the non-void parts (subsets) are *proper parts* (*proper subsets*) of the set.

9. Let any given element partition a set into subsets in any such way, that the intersection of each two subsets is a void set.

a) Then the given element can *choose* one (out of a non-void subset) or none element out of the single subsets. The elements of each single subset, as far as the elements exist, belong to an informational generalization (extrapolation) of a set – to a class – a *class of mutually equivalent elements* (point 14) All and only all chosen elements constitute a *choice*. The choice can be either a non-void or a void set. Out of each set one or more choices can be made.

b) Let any one non-void subset be partitioned in such a way that the intersection of each two sub-subsets is a void set. Then one or more or none element can be chosen out of the single sub-subsets. The elements of each single sub-subset belong to a *class in class*, i.e. to a *subclass* of mutually equivalent elements (subclass with respect to the above mentioned class). Every subclass is member of one class at least. Every class can have one or more subclasses.

10. Let a set out of medium and adjacent environment of any given element be given. Then the given element can *order the elements* of the set, *count the elements* of the set one by one, and *determine* the *number of the elements* of the set. The number of existing elements of any void set is *zero*. The number of existing elements of any nonvoid set is *nonzero*.

11. Let an arbitrary number of sets be given.

a) The *number* of elements of the single sets are either *equal* or *unequal* (*different*).

b) Let the intersection of each two of the given sets be a void set. Then the number of elements of union of the given sets is the *sum of the numbers* of elements of those sets.

c) Let the elements of any set be united one by one. Then the numbers of elements of the single ordered subsets are *natural ordered sequence of natural numbers.*

d) Let two sets M_1 and M_2 be given. If there is a such proper part M_1' of set M_1, that there is a one–to–one correspondence between sets M_2 and M_1', then the numbers of elements of M_2 and M_1' are *equal* and the numbers of elements of M_1 and M_2 are *different*. The number of elements of M_1 is *greater than* the number of elements of M_2. The number of elements of M_2 is *lesser than* the number of elements of M_1.

12. Rudimentary properties are of two or more *quality types*. Two quality types are either *identical* (*the same*) or *nonidentical* with each other (mutually). There is one and only one *opposite quality type* of r-properties to each quality type of r-properties. Each r-property *originates* out of an *unresolved pair of r-properties of mutually opposite quality types*. Each *r-property is given* by its quality type, by the pair from which it originates, and by the element to which it belongs. Each element posseses an *undefinite number of unresolved pairs* of r-properties in addition to its r-properties.

13. Each two *r-properties* of identical quality types (of the same type), but originated out of two pairs of *r*-properties, are *equal* to each other (mutually). Each two *r*-properties of non-identical quality types are *unequal* to each other (mutually).

14. Let two elements be given. If *one or more r-properties* of the one element are equal to the corresponding *r*-properties of the other element, the two *elements* are *equivalent* to each other (mutually) *in the given r-properties*. All and only all elements equivalent to each other constitute a class (*class of equivalence, equivalence class of elements*) of elements equivalent in the corresponding equal *r*-properties (*equivalence-class properties, or class properties*). Each *equivalence class is given* by all and only all class properties (*criterion of equivalence of elements* and *criterion of identity of classes*) of its elements.

15. Let two elements be given.

(i) If *all r-properties* of any one of the elements correspond to all *r*-properties of the other element one-to-one, i.e. if each *r*-property of the one element corresponds to one and only one *r*-property of the other element (and vice-versa), and

(ii) if each single pair of corresponding *r*-properties are two *r*-properties equal to each other,

then the *elements* are *equal* to each other (mutually) as well. All and only all elements, wh'ch are equal to each other, constitute a class (*class of equality, equality class of elements*) of elements (of *equality-class elements* or *class elements*) equal mutually. Any one of the elements is *representative* of the class of equality. Each *equality class is given* by its representative (*criterion of equality of elements*). Equality is a special case of equivalence. (The equal elements differ in their locational or time relation only.)

16. Let two elements be given.

(i) If all *r*-properties of any element correspond one-to-one to all *r*-properties of the other element, and

(ii) if both of the *r*-properties of each single pair of corresponding *r*-properties are identical *r*-properties (are the same *r*-property),

then the *elements* are *identical* as well (*criterion of identity of elements*). All and only all elements, which are identical to each other, constitute a class (*class of identity, identity class of elements*). Any of the mutually identical elements is the only element. Identity is a special case of equality. Each *identity class of elements is given* by its only element.

17. Let two sets be given.

(i) If all elements of any one of the given sets *correspond* to all elements of the other set *one-to-one*, and

(ii) if all elements both of the one set and of the other set belong to any but the same class of equivalence, then the two given *sets* are *equivalent* with respect to the class properties of their elements. All and only all sets, which are equivalent to each other, constitute a class of equivalence, *equivalence class of sets*. Each *equivalence class is given* by all and only all class properties (*criterion of equivalence of sets* and *criterion of identity of classes*) of its elements.

18. Let two sets be given.

(i) If all elements of any of the given sets correspond to all elements of the other set one-to-one, and
(ii) if all elements both of the one set and of the other set belong to any but the same class of equality,
the two given *sets* are *equal* (*criterion of equality of sets*). All and only all sets, which are equal to each other, constitute a class of equality, *equality class of sets*. Any one of the sets is *representative* of the class. Each *equality class of sets is given* by its representative.

19. Let two sets be given.

(i) If all elements of any of the given sets correspond to all elements of the other set one-to-one, and
(ii) if the elements of each single pair of mutually corresponding elements are identical with each other,
then the given *sets* are *identical*, they are *the same set* (*criterion of identity of sets*). All and only all sets, which are identical to each other, constitute a class of identity, identity class of sets. Any of the mutually identical sets is the only set. Each *identity class of sets is given* by the only set.

20. Each given set can be *evaluated as a whole*. The properties of the set as a whole are *resulting properties*, the properties of the single element of the given set are *component properties* with respect to any given element.

21. Let two sets be given. Let each of the sets be evaluated as a whole. Then the *sets* are *equivalent in their resulting properties* if the resulting properties of the single quality types of the one set are equal to the resulting properties of the same quality types, respectively, of the other set (*criterion of resulting equivalence of sets*). All and only all sets equivalent in their resulting properties constitute a *class of sets equivalent in resulting properties*.

22. Let two or more classes (subclasses) be given. Let one and only one element belonging to the single classes and subclasses be chosen. Let the set of the chosen elements be ordered in any way. Then the given *classes* (*subclasses*) are *ordered* too (Any classes or subclasses can be ordered only by means of ordering the set of elements belonging by one to the classes and subclasses.) The ordered classes (subclasses) are *priority classes* (*priority subclasses*). Any classes or subclasses are *kinds*. The relation among the ordered classes (subclasses), among the *ordered kinds*, is *priority relation*.

23. Let two elements be given. Each of the elements can

(i) either be a part of *medium* of the other, or
(ii) be a part of *adjacent environment* of the other, or
(iii) be a part of *nonadjacent environment* of the other.

The relations between two elements

(i) to be a part of medium,
(ii) to be a part of adjacent environment,
(iii) to be a part of nonadjacent environment,

are *locational relations between* the two *elements*.

24. Each existing *element is* a non-void *set of elements*, each of which is a part of medium of the other elements of the set. Each element, its medium and adjacent environment constitute an *elementary subsystem* of a *system*. Each elementary subsystem is a part of a *subsystem* of the system. Medium and adjacent environment of any element is the *array of direct influence* of the element.

25. Let two *r*-properties be given. Then the *locational relations of* the *r-properties* are identical with the locational relations of the elements to which the single *r*-properties belong. That is, each *r*-property can be either of medium, or of adjacent environment, or of nonadjacent environment of the other.

26. The *membership* of a given *r*-property in a given element can be *changed in non-membership*, and vice-versa.

27. Let two *r*-properties be given.

(i) Let first any of the two *r*-properties be a part of *medium* of the other one. If then the said *r*-property is of *adjacent environment* of the other one, the *locational relation* to be in medium, is (has been) *changed*.
(ii) Let first any of the two *r*-properties be a part of *adjacent environment* of the other. If then the said *r*-property is of *medium* of the other, the locational relation to be in adjacent environment, is (has been) *changed*.
(iii) Let first any of the two *r*-properties be a part of *adjacent environment* of the other. If then the said *r*-property is of *nonadjacent environment* of the other, the locational relation to be in adjacent environment, is (has been) *changed*.
(iv) Let first any of the two *r*-properties be a part of *nonadjacent environment* of the other. If then the said *r*-property is of *adjacent environment* of the other, locational relation to be in nonadjacent environment, is (has been) *changed*.

Here (i), (ii), (iii) and (iv) are *changes of locational relations of r-properties* or *locational changes* of *r*-properties or *operating* the *r*-properties.

28. Each two locational changes of r-properties occur

(i) either *in coincidence* (at the same instant of time, at identical instants), or
(ii) *in sequence* (in different instants, in non-identical instants).

Coincidence and sequence are *possible relations of locational changes*. Sequence or coincidence are *time relations* among locational changes of r-properties.

29. All and only all these locational changes of r-properties, which *occur* at mutually *identical instants of time*, constitute a *class of coincidence* (*coincidence class*), i.e. constitute the *instant*. The sequence of all coincidence classes (instants) is the *time sequence* or *sequence of instants*, or *flow of instants* or *time flow* or simply *time* (sequence of instants is not a set). Let any three instants be given. Let the *first* of the three *instants* precede the second one and the third one. Let the said second of the three instants precede the third one, i.e. let the said second instant *be between* the first and the third. Then all and only all instants, which are between the mentioned first one and the mentioned third one, constitute (are included in) an *open interval of time* (*open time interval*). The union of the mentioned first and third of the three instants with the open interval is a *closed interval of time* (*closed time interval*). Union of the mentioned first instant with the open interval of time is a time interval *left-closed right-open*. Union of the said third instant with the open interval is a time interval *left-open right-closed*. The said third instant of any closed interval or of any left-open right-closed interval is the *last instant* of the interval. If in any open interval not any non-identical instant is between the said first and the said third instant, the time interval is a *void interval*. Union of the void interval either only with the said first instant or only with the said third instant is a *time step*, either left-closed right-open or left-open right-closed. Each *interval of time is given* by its instants. Each two *time intervals* with pairwise identical instants of the two intervals, are *identical*. Each two time intervals with equal numbers of time steps are *equal intervals*.

30. Any left-closed right-open time interval is a non-void *union* of ordered left-closed right-open *time steps*. Any left-open right-closed time interval is a non-void union of ordered left-open right-closed time steps.

31. Let any instant be given. Then there is one and only one left-open right-closed interval – an *initial time interval* – including

(i) all and only all instants preceeding the given one, and
(ii) the given instant.

32. Let two time intervals be given. If all instants of any one of the intervals are also instants of the other interval, then that any time interval is a *time subinterval* of the mentioned other time interval.

33. Each r-property is an *acitivity*. All r-properties of each given element are *activity of the element.* The element can an activity interprete as a *demand*, a *wish*, a *desire*, a *supply*, a *bid*, an *offer*, a *force*, or other information.

34. Each element *is acting on* (*exerts* its *own* (*intrinsic*) *action on*, *controls*) the single elements and unresolved pairs out of its medium and adjacent environment. Each element *is acted*(*influenced*, *controlled*, *under control*) by *extraneous* (*extrinsic*) *activities*, i.e. by the activities of the single elements of its medium and adjacent environment.

35. The activities constituted by the single r-properties of any given element or/and of its medium and adjacent environment are of two classes of activities: set of own (intrinsic) activities of the element and set of activities extraneous (extrinsic) to the element. Each of those sets can be partitioned into subsets, the elements of each of which belong to a class of activity. If the representative of the classes are ordered by the element, the classes become *relative* (i.e. with respect to the element) *priority classes of activities* (priority classes of own (intrinsic) activities of the element, priority classes of extraneous (extrinsic) activities).

36. Each *element observes direct* (each element is a *direct observer* of) its instantaneous medium and adjacent environment by means of changes of its own r-properties influenced by that medium and adjacent environment. Each element *can influence direct* or *control direct* its instantaneous medium and adjacent environment only. Each element can observe and influence or control its instantaneous non-adjacent environment by means of its adjacent environment only.

37. Each r-property, each element, each set of elements, further each change of r-property, of element, or of set is a *signal*, which is a *carrier* (a *representation*, a *symbol*)

(i) *of* its own *intrinsic information* (by which the r-property, the element, the set of elements, further the change of the r-property, the change of the element, or the change of the set is given, respectively);

(ii) of one or more or none *extrinsic information* (i.e. *information mapped* onto the r-property, the element, the set, the change of the r-property, the change of the element, the change of the set, respectively).

38. *Information*

a) about an r-property is (point 12)
   (i) its quality type,
   (ii) the unresolved pair from which it originates,
   (iii) the element to which it belongs;

b) about an element is (point 1)
   (i) its r-properties,
   (ii) its locational relations,
   (iii) its time relations,

(iv) its own informations and informations mapped onto it,
(v) its possible operations on *r*-properties,
(vi) its symbolics for the single informations and for processing of the informations;

c) about a set are all and only all elements included (existing) in the set (point 4),
d) about a class of equivalence are all and only all its class properties (points 14, 17),
e) about a class of equality is its representative (points 15, 18),
f) about an identity class
(i) of elements is its only element (point 16),
(ii) of sets is its only set (point 19).

39. The element at any instant

(i) *has* its *informations*,
(ii) *gains* some *informations* from its medium and adjacent environment, being inflenced by the medium and adjacent environment,
(iii) *processes its informations* when it is mapping its stored informations,
(iv) *transfers* some of its *informations* towards its medium and adjacent environment when it is acting on the medium and adjacent environment.

40. Let an element, its medium and its adjacent environment be given. Holding all other points of the Assumption, the given *element can operate r-properties* of itself, of its medium and of its adjacent environment (see also point 53):

a) the given element can *gain* an *r*-property from an element out of its medium or adjacent environment *by means of its own activity*;
b) the given element can *receive* an *r*-property from an element out of its medium or adjacent environment *by means of activity of elements of its* (of that given element) *medium and adjacent environment*;
c) the given element can *loose* (*rid of, relax*) its *r*-property for an element out of its (of the given element) medium or adjacent environment *by means of its own* (of that given element) *acitivity*;
d) the given element can *lose* its *r*-property in a gain of an element out of its medium or adjacent environment *by means of activity of elements of its* (of that given element) *medium and adjacent environment*;
e) the given element can *resolve an unresolved pair* (of *r*-properties of two mutually opposite quality types) out of its medium or adjacent environment;
f) if the given element, having some *r*-properties (*original properties*), gains or receives an *r*-property of quality type opposite to any one of its original *r*-properties, the *r*-properties of the two opposite quality types *merge mutually in an unresolved pair*;
g) the given element can *replace* its *r*-property (*original property*) of a given

quality type by another *r*-property *of the same (identical) quality type* by means of its own activity;

h) *r*-property (original property) of the given element *can be replaced* by another *r*-property *of identical quality type* by means of activity of elements out of medium and adjacent environment of that given element;

i) the given element can *replace* its *r*-property (original property) of a given quality type by *r*-property *of another quality type* by means of its own activity; if the mentioned other quality type is just the opposite, the *replacement* is the *inversion of* that *original r-property (inverted r-property)*;

j) *r*-property (original property) of a given quality type out of the given element *can be replaced* by *r*-property *of another quality type* by means of activity of elements out of medium and adjacent environment of that given element; if the mentioned other quality type ist just the opposite, the replacement is the *inversion* of that *original r-property (inverted r-property)*.

k) the given element, when acting on its medium and adjacent environment, *can be acting* in the gaining, receiving, loosing (relaxing), lossing, replacing or inversion of one or more *r-properties of any other element* out of its (of the given element) medium and adjacent environment;

l) the given element can be acting in the inversion of all *r*-properties of any other element out of its (of the given element) medium and adjacent environment, i.e. it can be acting in the *inversion of* the whole other *element*;

m) the given element, when acting on its medium and adjacent environment, can be acting in the inversion of all elements of a set of elements chosen out of its (of the given element) medium and adjacent environment, i.e. it can be acting in the *inversion of* the mentioned *set* of elements.

41. *Let* the *element process its informations*, about classes and subclasses:

a) There are two *possible relations among equivalence classes* or/and among equivalence *subclasses of elements*: ordering, unordering. There are two *possible processings* of those classes or/and subclasses: ordering processing, disordering (disordering processing).

b) There are two *possible relations among equality classes of elements*: ordering, unordering. There are two *possible processings* of those classes: ordering processing, disordering.

c) All and only all those *relations among identity classes of elements* are possible, which are possible among elements in general (point 3). All and only all those *processings of identity classes of elements* are possible, which correspond to possible operations with elements in general (point 7, if any set is constituted of any one element only).

d) There are two *possible relations among equivalence classes (subclasses) of sets*: ordering, unordering. There are two *possible processings* of those classes (subclasses): ordering processing, disordering.

e) There are two possible relations among *equality classes of sets*: ordering, unordering. There are two *possible processings* of those classes: ordering processing, disordering.

f) All and only all *relations among identity classes of sets* are possible, which are possible among sets in general (point 6). There are possible all and only all *processings of identity classes of sets*, which correspond to possible operations with sets in general (point 7).

g) There is one and only one *possible relation among coincidence classes of locational changes of r-properties* – their sequence. There is *no possible processing of* those *coincidence classes.*

h) There are two *possible relations between a class and a subclass*: either membership or non-membership of the subclass in the class.

42. Let two elements be given. Among its *r*-properties, each of the two elements has one or more or none *r*-property each of which and only of which equals to corresponding *r*-properties of the other element. Then there is one or more or none further *r*-property either of which (constituting an *excess in r-properties*) any one element *exceeds* (the element with *relative excess*) the other element, or in which (constituting a *lack in r-properties*) the any one element *is lacking* (the element with *relative lack*) with respect (*relative*) to the other element. The processing if informations about the two elements, i.e. *determining the excesses or lacks* in *r*-properties of the two elements, is a *comparing of* the two given *elements.*

43. Each element can *develop itself* and *be developed* in time flow. Let two *states* of the development of any element be *compared.* Let the compared states be ordered according to the corresponding instants of time, i.e. let the compared *states* be *time-ordered.*

a) Let the state with a non-void or void relative excess of the element in any given quality type be the first, and the state with a non-void or void relative lack of the element in the identical quality type be the second. Then the relative lack of the second state is a non-void or void *decrease* of (*loss* on, *ridance* on) the element in the quality type.

b) Let the state with non-void or void relative lack be the first and the state with non-void or void relative excess be the second. Then the relative excess of the second state is a non-void or void *increase* of (*gain* for, *yield* for) the element in the quality type.

c) Both the increase and the decrease in *r*-properties is a *difference* of the two states, i.e. a change of the said first state. Each element *is changing* (*developping*) *itself* or *is changed* (*developped*) either in increases or in decreases.

d) The element in the mentioned one state and the element in the other state are of *the same* (*identical*) *development of element* (*element development*). Any two elements of the same (identical) element development belong to a *class* *of development identity* given by and only by *identical r-properties of the two states.* Any two elements of the same class of development identity are *development-identical elements.*

44. Let any two time-ordered development-identical elements be given. Then the *increase in r-property* of any given quality type of the second element is (is identical with) the *decrease in r-property of the just opposite quality type* of the second element, and vice versa.

45. Let two elements be given.

a) Let the following operations be performed:

(i) Let the elements be ordered.
(ii) Let the *first* element be inverted.
(iii) Let the first inverted element and the second element be united.
Then that union is the *difference* (expressed by increases) *of* the *two elements.* In this way the *elements are compared by difference (comparison by difference) expressed by increases.*

b) Let the following operation be performed:
(i) Let the elements be ordered.
(ii) Let the *second* element be inverted.
(iii) Let the first element and the inverted second element be united.
Then that union is the *difference* (expressed by decreases) of the two elements. In this way the *elements are compared by difference (comparison by difference) expressed by decreases.*

46. Let a set of any *number* of mutually equal elements be given as a *whole* or as a *unit* of the given elements. Let the number (denoted for example by n) of the elements of the given set be determined. Then the single *elements share equal parts in the set.* The part is the *share of the element in the set.* The *quotient of the share* is the *n-th part of the whole* (the *n-th part of the unit*), i.e. the quotient is *one n-th of the unit*, or simply, the quotient is *one n-th.*

47. a) Let a set of any number of mutually equal elements be given as a whole or as a unit of the given elements. Let any subset of the given set be given. Let the number of elements of the given set be n, and the number of elements of the given subset be n_1. Then the *share of the subset in the set* is n_1 elements, i.e. the share of the subset in the set is *n_1-multiple of one element,* where n_1 is *multiplicity* of the subset *with respect to one element. Quotient of the share* is the *n_1-multiple of one n-th part of the unit,* or n_1 *n-th parts,* or n_1 *n-ths. Sets of equal elements are compared by shares (comparison by shares).*

b) *Quotients* of shares can be *natural ordered* with respect to the natural ordering of multiplicities of the subsets, i.e. with respect to the number of elements of the subsets. Let two subsets M_1 and M_2 of any set M of mutually equal elements be given. Let the numbers $n_1 \equiv n(M_1)$, $n_2 \equiv n(M_2)$, $n \equiv n(M)$ be given. If $n_1 < n_2$ then the *quotient* p_1 of share of the set M_1 into the set M is *lesser then* the *quotient* p_2, which is *greater than* p_1, of the share of the set M_2 into the set M_1.

48. Let two sets of elements be given, any of which containing, among others, respectively, one or more elements different from the other elements (*sets of unequal elements*). Let

(i) a correspondence among elements of the one set and elements of the other set be given, and
(ii) differences of corresponding elements be determined.

Then the two sets of unequal elements are compared by means of the *comparison of each element of any one of the two sets with corresponding elements of the other set.*

49. Let any possible number of non-void subsets of a non-void set of any number of mutually equal elements be given. Let the intersection of each two the of given subsets be a void set. Let the shares and quotients of the shares of the single subsets in the given set be *determined.* Then the *resulting share* of all those subsets in the given set is the union of all mentioned *shares.* The *resulting quotient* of all those shares is the *sum of the single quotients.*

50. Let a set of one or more mutually equal elements be given. Let any non-void subset (*first subset*) of the given set be given. Let any non-void subset (*second subset*) of the given subset (first subset) be given, i.e. let a certain *sub-subset* of the given set be given. Let the *quotient of share* (*first share*) *of the mentioned first subset in the set* be determined. Let the quotient of share (*second share*) of the said second subset in the mentioned first subset be determined, i.e. let the *quotient of the second share in the first share* be determined. Then the *resulting quotient of the share of the second subset in the given set is the product of the two quotients.*

51. Let two subsets of a set of any number of mutually equal elements be given. Then the *shares* of the single subsets in the set can be either *equal* or *unequal* (*different*). *Differences of* the *two shares* can be *determined.* Let the quotients of the single two shares be given. Then the *difference of* the *two quotients* can be determined too (difference expressed either by increases or by decreases).

52. Each element includes either one or none r-property of each single quality type at every instant. Each element includes an undefinite number of unresolved pairs of r-properties. Thus, the *share of r-properties of each single quality type in the element* at any instant is either one r-property or none r-property. The quotient of the share of r-properties of any given quality type in the element at a given instant is either *one unit* (or simply *one* or *unit*), or *zero* (*no unit*). The quotient can increase (from zero) or decrease (from one) by one unit.

53. Let any two elements be given. If and only if one of the elements is acting on the other, then the two elements constitute a *contact* (constitute a *pass*, are *in contact*, are *in touch*, are *contiguous*) with each other and with *transit* (*pass, permeability, transitivity, conductivity*) *direction* from the acting element to the other or with opposite direction. The acting element

(i) either *supplies* (*bids, offers*) or *is forcing* some of its activities and some of its informations to (towards) the other element, or
(ii) *demands* (*wishes, desires, is searching for*) some activity or information from the other element,
(iii) *denies* the supplies or demands because of its strategy, or
(iv) *resists* to the forces by means of its *r*-properties.

54. Each *r*-property of each quality type

(i) is either a *supply* (*bid, offer*) or a *force* of itself, and
(ii) a *demand* of (*wish* of, *desire* of, *search* for) an *r*-property of the opposite quality type.

55. Each element is a *source* (a *carrier*)

(i) of either supplies or forces, and
(ii) of demands (That means: Each element *is capable* to *fulfil* (*realize, complete, serve,* to *render service* of) those demands of the other elements, which are equal to its supplies or forces.)
(iii) of denies of demands
(iv) of *resistance* to the forces.

56. Let two elements in contact be given. The mentioned contact is an *output* for the acting element and an *input* for the other element. The supplies or forces or demands of the acting element are *input supplies* (*input forces, input demands*) in activities or informations for the mentioned other element (*supplied* or *forced* or *demanded input activity* or *input information*) and *output supplies* (*output forces, output demands*) in activities or informations for the acting element (supplied or forced or demanded *output activity* or *output information*).

57. Let two elements in contact be given (point 53). The said other element

(i) can *take over* (*gain, receive, get possession of*) one or more or none supply, force or demand on activities or information from the acting element, which *looses* or *losses* that activity and *transfers* that information,
(ii) can *deny* (need *not receive, serve, realize, complete*). The activity or information being taken over (beeing received) is *transferred* (is *passing*) through the contact (*activity transfer, information transfer*).

58. Let any element be given. Let the state of the element at any instant be given. Then the time sequence of the states of the development-identical elements in any given interval of time constitutes a *development of the element* in that interval. The time sequence of states of activities of the development-identical elements in the interval of time is a *development of activities of the element* in that interval. The time sequence of states of informations of the development-identical elements in the time interval is a *development of informations of the element* in that interval. Information about any possible state of the element (state of activities, state of informations) at any given instant is a *possible model of the state* (*possible model of state of activities, possible model of state of informations*, respectively) of the element. Information about any possible development of the element (development of activities, development of informations) in the given interval of time is a *possible model of the development* (*possible model of development of activities, possible model of development of informations*, respectively) *of the element* in that time interval.

59. Let elements of a subsystem or of a system at any instant be given. Let the states of all the elements at the instant be given. Then the states of all the elements at the given instant constitute a *state of the subsystem or system*, respectively. The time sequence of the states of the subsystem (system) in any given interval of time constitutes a *development of development-identical subsystems* (*development-identical systems*) in that interval. The activities of the elements of the subsystem (system) at any given instant constitute a *state of activities of the subsystem* (*system*). The informations of the single elements of the subsystem (system) at any given instant constitute a *state of informations of the subsystem* (*system*). The time sequence of states of activities of development-identical subsystems (systems) in the interval of time is a *development of activities of the subsystem* (*system*) in that interval. The time sequence of states of informations of development-identical subsystems (systems) in the time interval is a *development of informations of the subsystem* (*system*) in that time interval. Information about any possible state of a subsystem (system) at any instant is a *possible model of the state* (*possible model of state of activities, possible model of state of informations*, respectively) *of the subsystem* (*system*). Information about any possible development of the subsystem (system) in the given interval of time is a *possible model of the development* (*possible model of development of activities, possible model of development of informations*, respectively) *of the subsystem* (*system*) in that time interval.

60. Let any element have any possible models of a state (possible models of a state of activities, possible models of a state of informations) of the element or a subsystem or a system at identical instants. Then the element can map the possible models of the state of itself or of the subsystem or of the system, respectively, into an arbitrary natural ordered sequence of natural numbers, i.e. then the element can *classify the models of the state*. Each such class is an *instantaneous relative priority class of equivalent models of the state* – a class related to the classifying element. The instantaneous classification (mapping) of the models of the state is developped in time.

61. Let any element have any possible models of a development (possible models of a development of activities, possible models of a development of informations) of the element or a subsystem or a system, respectively, in identical intervals of time. Then the element can *map* the possible models of the development of itself or of the subsystem or of the system in that time interval, respectively, into an arbitrary natural ordered sequence of natural numbers, i.e. then the element can *classify the models of the development*. Each such class is an *instantaneous relative priority class of equivalent models of the development* – a class related to the classifying element. The instantaneous classification of models of the development is developped in time.

62. Let any instant of time be given. Then all instants *preceeding* the given instant, constitute a *relative past* (with respect to the given instant which is the *relative present*). All instants *succeeding* the given instant constitute a *relative future* (with respect to the given instant). Any model of development passing in a part of a relative past, is a *model of* (relative) *past development* or a *sequence* of models of past states. Any model of development which will be passing in a part of a relative future, is a *model of* (relative) *future development* or a *sequence* of models of future states with respect to relative present state at the relative present.

63. Let any element be given. Among its possible models of state or models of development (future development, past development) of an development-identical element or subsystem or system, respectively, let the tiven element choose one or more or none model representing a *state desired* at an instant by the given element *for a given instant*, or representing a *development desired* at an instant by the given element *for a given time interval*. Then the chosen desired models are *instantaneous aims (goals) of the* given *element*.

64. The element can (but need not) *transfer information* about some or all or none of its aims to any element of its medium and adjacent environment. The element can (but need not) *accept* and *store in its memory an information accepted* from any element of the mentioned medium and adjacent environment about aims of arbitrary elements. The given element can (but need not) *map* the stored aims of itself and of the other elements into an arbitrary natural ordered sequence of natural numbers, i.e. the element can *classify the stored aims (goals)*. Each such class is an *instantaneous relative priority class of aims (goals)* – a class related to the classifying element. The element can develop in time the instantaneous classification of instantaneous aims (goals) of any element.

65. Let any element be given at any instant.

a) Then the element can *map* informations about itself and all elements of its medium and adjacent environment into an arbitrary natural ordered sequence of natural numbers, i.e. the element can *classify itself and elements of its medium and adjacent environment*. Each such class is an *instantaneous relative priority class of elements* – a class related to the classifying element. The element can develop in time the instantaneous classification of elements.

b) Let the single possible quality types of *r*-properties of the single elements be given. Then the given element can *map* the quality types of *r*-properties of each single element into an arbitrary natural ordered sequence of natural numbers, i.e. the *given element can classify the quality types* of *r*-properties *of a single element*. Each such class is an *instantaneous relative priority class of possible quality types* of *r*-properties of the single element – a class related to the classifying element. The element can develop in time the instantaneous classification of quality types.

c) Let the element *store informations* in its *memory* or *erase stored informations* about any element at any instant. Then the given element can map its stored informations both about any development-identical element and about any elements into an arbitrary ordered sequence of natural numbers, i.e. the given element can *classify* the *informations about any elements*. Each such class is an *instantaneous relative priority class of informations* – a class related to the classifying element. The classifying element can develop in time its instantaneous classification of any its stored informations.

66. The element can *collect informations about* an *r*-property, an element, a set, a class, a subsystem or a system. That *collecting* is an *identification* of the *r*-property, element, set, class, subsystem and system, respectively. The *collection of informations* is a *model of a state of informations* or a *model of a development of informations* about that *r*-property, element, set, class, subsystem and system, respectively.

67. The element can *develop in time its instantaneous models.*

68. *Instantaneous strategy* of the element is given by its instantaneous classification

(i) of elements,
(ii) of input informations and of output informations, (e.g. the elemenu regards only forces the probability (see points 93, 95) or the sum of which within a given time interval exceedes a certain value – a *threshold value*),
(iii) of goals, (e.g. having accepted an *r*-property, the element accepts a further *r*-property only after a certain *time of regeneration* or with a certain *probability of regeneration*),

(iv) of quality types of input activities and of output activities.

The instantaneous strategy of the element can be developed in time.

69. Any of aims (goals) of any given element can be *reached* or *approximated* or *pursued* in one or more or none possible model of development of the given element

(i) either by means of a *possible strategy of the given* development-identical *element*, or
(ii) by means of a *possible strategy of* one or more *other elements*, or
(iii) by means both of (i) and of (ii).

The element can map informations about its single possible strategies into an arbitrary natural ordered sequence of natural numbers, i.e. the element can *classify its possible strategies*. Each such class is an *instantaneous relative priority class of possible strategies of the given element* – a class related to the classifying element. Each instantaneous classification of possible strategies of the classifying element is a *decision* of the element. The element can develop in time its instantaneous classification of ist possible strategies, i.e. it can develop its *decision making*.

70. The element can collect informations about possible strategies and/or possible aims (goals) of another element. The collection of informations of the given element about a possible strategy and/or a possible aim (goal) of any element is a *possible model of the possible strategy* and/or a *possible model of the possible aim* (*goal*). The element can map possible models of possible strategies of itself and/or of other elements into an arbitrary natural ordered sequence of natural numbers, i.e. the element can classify the possible models of possible strategies of the single elements. Each such class is an *instantaneous relative priority class of possible models of possible strategies of the single elements* – a class related to the classifying element. The element can develop in time its instantaneous classification of its possible models of possible strategies of the single elements.

71. Let any development in any time interval be given. Then each of all other developments in identical time intervals is a *development condition* of the given development. Let any subsystem at any instant be given. Then the state of each of all other subsystems in the identical instants is a *state condition* of the given subsystem.

72. Let any element *pursue its aim* (*goal*) in time flow. The *pursuit* can be performed by one or more or none development condition. The element can *make* its *decision* in relation with one or more *chosen past states conditions* (of one or more states) or in relation with one or more *chosen past development conditions*. Then the chosen past states conditions or the chosen past development conditions constitute a *chosen instantaneous criterion* (i.e. a *chosen criterion* *condition*) of *relative approach to the aim* (of *approximation of the aim*). The element determines the differences between

(i) the criterion in a preceeding state or in a past time interval, and
(ii) the corresponding criterion in the aim (goal).

The element can map informations about those differences into further informations, i.e. the element can *evaluate the differences into one or more further criteria.* When decreasing or non-increasing (increasing) the first difference (see point 74k) between any criterion condition in the aim of the element and the corresponding criterion condition in the element, its medium and environment at any future time step, the decision belongs to *good* (*bad*) *decisions.*

73. Each *r*-property of any element is a *cell of memory* of the element to *store* (*accumulate*) *an information* or to *erase stored information* of the element. Each element is a *processor* and *memory* of its informations. The relation among informations and signals is a *symbolics* of the element. The element can develop its symbolics in time. (See also points 37, 38, 39.)

a) Each element can *interpret* (being an *observer* of activities) or *choose* (being a *source* of activity)
   (i) single activities,
   (ii) a coincidence of activities,
   (iii) a sequence of coincidences of activities
   as single to transfer informations.
b) Each element can *define symbolics*
   (i) bot for its single informations, and
   (ii) for any *collection of informations*,
   i.e. each element can *determine relations* between signals and informations, or, each element can *perform a correspondence* (*mapping*) between signals and informations. When mapping any of its informations in its *r*-properties, the element *accumulates* (*stores*) those informations in its memory, the element determines a carrier for its information.
c) Each element can *interpret* a transit (pass, permeability, transitivity, conductivity) as a *mapping* in the given direction.

74. When processing informations, the element can *determine* (*construct*) *an information*. That means, the element can

a) *interpret* one or more states or developments of activities as expression of an information (see points 1, 37),
b) *express* (*denote*) an information, when mapping it in signals, (see points 1, 7, 37),
c) *store* (*accumulate, record*) information in its memory (see points 39, 73),
d) *decise a choice* of information, when choosing any of informations with respect to a criterion (see points 9, 14–21, 69),

e) *replace* any of its stored informations by another information (see point 40),

f) *invert* any of its stored informations, i.e. construct the just opposite information (see point 40),

g) *unite* any of its stored informations (when *erasing* its stored information, the element unites them with the just opposite information), (see points 7),

h) *order* any chosen informations (see point 7),

i) *disorder* any ordered informations (see point 7),

j) *partition* any of its informations,

k) *compare* or *evaluate* any two of its informations, i.e.

(i) *determine* either a difference (*first difference*) *by increases* (see points 45, 51), or

(ii) *determine* a difference (*first difference*) *by decreases* (see point 45), or

(iii) *determine the share relations* (see points 7, 47, 50, 51),

(iv) *determine difference of* any two *differences*, i.e. *evaluate* the two differences; (The first difference of two stored first differences is a *second difference*. The first difference of two stored second differences is a *third difference*. An so on),

(v) *determine difference of* any two *shares*, i.e. evaluate the two shares,

(vi) *determine share of share*,

(vii) *determine share of difference*,

(viii) *determine* a relation between a *more general information* and a *more particular information*, included in the said more general,

(iv) determine a relation between a *resulting information* about a subsystem and a *component information* about any element of the subsystem,

l) from any given information *infer an implication of an information* included but not plainly expressed in the given one,

m) from one or more particular informations *induce* (*induction of information*) an information more general with respect to the said particular (e.g. see a "class"),

n) from a general information *deduce* (*deduction of information*) an information more particular with respect to the said general (e.g. see an "intersection"),

o) *assume* an information (see this Assumption),

p) *map* (*transform*) informations into informations (see point 60, 61, 64, 65), when developing a transit (pass, permeability, transitivity, conductivity) among the corresponding signals (carriers). Any transit can but need not be *interpreted as a mapping*. Each constructed information is a *statement*. Any statement can but need not *implique* another statement.

75. With respect to other elements, the given element can

(i) have, gain, receive, loose (rid, relax), lose, replace, invert an information (see also point 40),
(ii) supply (bid, offer), force, demand (wish, desire, search for) an information (see also point 53),
(iii) fulfil (realize, complete, serve) a demand on information (see point 55) or deny it,
(iv) take over (get possession of), transfer an information (see also points 57, 64),
(v) deny (refuse, unserve, unrealize, uncomplete) an information (see point 57),
(vi) have an aim (goal); the *aim can be denoted as*

a) an activity, a gain, a receiving, a loose (a ridance, a relaxation), a loss, an *inertia*, a possession, an existence,
b) a decrease, an increase, an excess, a lack,
c) a comparison, a difference, a share,
d) an input or output supply (a bid, an offer) or a force, an input or output demand (a wish, a desire, a search (for), a *hunting*),
e) an input or output information, a mapping, a symbolics, a collection of information,
f) a state, a development, a model, a *wave*,
g) an assumption, a strategy, a realization (a completion, a fulfilling, a service),
h) a deny (unservice, unrealization, uncompletion, refusion) of demands,

either with respect to the element itself or to another element.

76. The element performs any processing of its informations either in one (*one-step processing*) or in more (*sequential processing, multi-step processing*) time steps. The information processing is delayed.

77. Let any subsystem constituted of elements be given. Then the memories of the single elements constitute a *memory of the subsystem*. The given subsystem is a *processor* of informations of its elements. The symbolics of the single elements constitute a *symbolics of the subsystem*.

78. Let any element and elements of its medium and adjacent environment be developed in time flow. Let any quality type of r-properties be given. Let any two of the elements be chosen at any instant. Let the *informations* about the chosen elements be *ordered*. Then at the given instant

(i) either there is (exists) an activity of the given quality type *in direction* from the given first to the given second element, i.e. the given instant is *an instant of activity* in the given quality type of the said first element onto the said second element, or
(ii) there is (exists) an activity of the given quality type *in direction* from the given second to the given first element, i.e. the given instant *is not any*

instant of activity in the given quality type of the said first element onto the said second element, or

(iii) there is not (does not exist) any activity of the given quality type neither in direction from the given first onto the given second element, nor in the *opposite direction* from the given second element onto the given first element, i.e. the given instant *is not any instant* of activity in the given quality type of the said first element onto the said second element.

79. Any instant of any activity of an element onto another element, is

(i) an *instant of contact* (touch) between the two elements with a transit (pass, permeability, transitivity, conductivity) direction, and

(ii) an *instant of information* mapped into that activity.

80. Let any element, its medium and adjacent environment be developed in time flow. If any instant of activity (contact, information, respectively) of the given element onto any one element of the medium and adjacent environment *precedes* one or more *instants* of activity (contact, information, respectively) of the said one element onto any further element, then all the three *included elements propagate a wave of activities* (or a *wave of contacts* or also a *wave of informations*) with *direction* from the given element to the said further element. (See also [6].)

81. Let any given element, any one element out of its medium and adjacent environment and one or more succeding elements propagate a wave in the direction from the given element to the last of the succeeding elements in a time interval. If the last of the succeeding elements is development-identical with the given element in the time interval, then the included elements propagate a *loop wave of activity* (*loop wave of contacts*, or *loop wave of informations*, respectively) in the given time interval. If there is no such succeeding element to be development-identical with the given element in the time interval, then the included elements propagate a *branch wave of activity* (*branch wave of contacts* or *branch wave of informations*, respectively) in the given time interval. Let any element out of any loop wave be chosen. Then all other elements of the loop wave constitute a *feedback of the* chosen *element.*

82. Let any development-identical element be given in a time interval. Then the time sequence of media of the element in that time interval is a *path* of the development-identical element in the time interval (see also point 87).

83. Let a development-identical element, its medium and adjacent environment be given in a time interval. Let any development-identical element out of that medium and adjacent environment be chosen. Then each flow of each time intervals is a *flow of informations* about the time intervals:

a) Let those and only those subintervals out of the given time interval be chosen, in which the given element *supplies* (*bids, offers*) its r-properties of any identical quality type to the chosen element (see point 53). Then all and only all the chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of supplies* made by the given element in the given quality type towards the chosen element in the given time interval.

b) Let those and only those subintervals out of the given time interval be chosen, in which the given element *is forcing* its *r*-properties of any identical quality type towards the chosen element (see point 53). Then all and only all the chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of forces* exerted by the given element in the given quality type towards the chosen element in the given time interval.

c) Let those and only those subintervals out of the given time interval be chosen, in which the given element *demands* (*wishes, desires, is searching for*) *r*-properties of any identical quality type from the chosen element (see point 53). Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of demands* (*desires*) of the given element in the given quality type onto the chosen element in the given time interval.

d) Let those and only those subintervals out of the given time interval be chosen, in which the given element *gains* or *receives* *r*-properties of any identical quality type from the chosen element (see points 40, 57). Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of gains of* (*receivings by*) the given element in the given quality type from the chosen element in the given time interval.

e) Let those and only those subintervals out of the given time interval be chosen, in which the given element *looses* (*rids of, relaxes*) or *losses* *r*-properties of any identical quality type for a gain of the chosen element (see points 40, 57). Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of relaxations or losses* of the given element in the given quality type in gain of the chosen element in the given time interval.

f) Let those and only those subintervals out of the given time interval be chosen, in which the given element *denies* (*unserves, unrealises, uncompletes*) the demands (the desires) on *r*-properties of any identical quality type of the chosen element (see point 55). Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of demands* (*desires*) *denied* (*refused, unserved, unrealized, uncompleted*) by the given element in the given quality type for the chosen element in the given time interval.

g) Let those and only those subintervals out of the given time interval be chosen, in which the given element *resists* to the forcing of *r*-properties of any identical quality type of the chosen element (see points 53, 55). Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of resistance* of the given element in the given quality type to the chosen element in the given time interval.

h) Let those and only those subintervals out of the given time interval be chosen, in which the demands (desires) on *r*-properties of any identical quality type of the given element are denied (unserved, unrealized, uncompleted) by the chosen element. Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of denied* (*refused, unserved, unrealized, uncompleted*) *demands* (*desires*) of the given element in the given quality type by the chosen element in the given time interval.

i) Let those and only those subintervals out of the given time interval be chosen, in which the given element has (*includes*) *r*-properties of any identical quality type. Then all and only all chosen subintervals in the time flow constitute a *flow* (*stream*) *of time intervals of existence* (*inclusion, belonging, waiting*) of *r*-properties of the given quality type in the given element and in the given time interval.

84. Any flow of time intervals of any activities of any element onto another element is also

(i) a *flow of time intervals of contacts* (*touches*) between the two elements,

(ii) a *flow of time intervals of a transit* (*pass, permeability, transitivity, conductivity*) from one element towards the other (see point 53),

(iii) a *flow of time intervals of information mapped* into those activities.

85. The given element can map

(i) both the single flows of informations about supplies (bids, offers), forces, demands (wishes, desires, searches), gains, receivings, looses (relaxations, ridances), losses, denies (refuses, unservices, unrealizations, uncompletions), resistances, existences (inclusions, belongings, waitings), contacts (touches), passes (permeabilities, transitivites, conductivities), mappings (transformations), and

(ii) the informations related to any single instant

into *zero* (point 10) or in an *arbitrary natural ordered sequence of natural numbers* or in *quotients of shares*, i.e. the given element can classify (*map by a mathematical function*) both the single flows of informations related to any identical given time interval, and the *single informations* related to any identical instants. Function of function is a *compound function*.

86. Let a (*first*) development-identical element, its medium and adjacent environment be given in a time interval. Let any (*second*) development-identical element out of that medium and adjacent environment be chosen. Let any further (*third*) development-identical element out of the mentioned medium and adjacent environment be chosen. Then *informations about flows of r-properties* of any given quality type can be constructed:

a) Let informations about those and only those *r*-properties of any identical quality type be chosen which have been *gained* or *received* by the given first element from the chosen second element within the given time interval. Then all and only all mentioned *r*-properties constitute an *input flow* (*input stream*) *of r-properties* of the given quality type for the given first element or constitute a *flow of r-properties propagating in the given first element* and from the chosen second element within the given time interval.

b) Let informations about those and only those *r*-properties of any identical quality type be chosen, which have been *loosed* or *lost* by the given first element in gain of the chosen third element within the given time interval. Then all and only all mentioned *r*-properties constitute an *output flow* (*output stream*) *of r-properties* of the given quality type for the given first element or constitute a *flow of r-properties propagating from the given first element* and towards the chosen third element within the given time interval.

c) Let informations about that and only that *r*-property of any given quality type chosen, which *exists in* (*is waiting in, is included in, belongs to*) the given first element within the given time interval. Then that mentioned *r*-property is an *inert r-property* of the given quality type for the given first element within the given time interval.

d) Let informations about those and only those *r*-properties of any identical quality type be chosen, which *belong* both to the *input flow* and to the *output flow* of the given first element within the given time interval. Then all and only all mentioned *r*-properties constitute a *flow* (*stream*) *of r-properties propagating through the given first element* (*a through flow*) within the given time interval.

e) Let the mentioned second and third element be in contact within the given time interval. Let informations about those and only those *r*-properties of any identical quality type be chosen, which constitute an *output flow* of *r*-properties for the chosen *second* element and constitute an *input flow* of the *r*-properties for the chosen third element within the time interval. Then all and only all mentioned *r*-properties constitute a *flow* (*stream*) *of r-properties propagating beside the given first element* (*a beside flow*) *within the given time interval.*

f) All and only all *r*-properties of all quality types existing in (waiting in, included in, belonging to) the given first element within the given time interval constitute an *inertia* of the element in the time interval.

g) All and only all flows (streams) of *r*-properties of all quality types propagating through the given first element within the given time interval, constitute a *flow* (*stream*) *of media propagating through* the given first *element* within the given time interval.

h) All and only all flows (streams) of *r*-properties of all quality types propagating beside the given first element within the given time interval, constitute a *flow* (*stream*) *of adjacent environments propagating beside the* given first *element* within the given time interval.

87. Let any element be given.

(i) Let any flow (stream) of media propagating through the given element within any time interval be given. Then the media constitute a *path of propagation of the element* in the time interval (see also point 82). Each element constituting any medium (constituting any path) is a *mediumistic element*.

(ii) Let any flow (stream) of adjacent environments propagating beside the given element within any time interval be given. Then the adjacent environments constitute an *adjacent environment of the path of propagation of the element* in the time interval.

(iii) Let the media constituting a path of propagation of the element in a time interval be equivalent to each other. Let the adjacent environments constituting adjacent environment of the path be equivalent to each other in the time interval. Then the path is an *inertial path* of the element in the time interval and the propagation of the element on the path is an *inertial propagation*.

88. Let any element be given. Let a propagation of any r-property of any quality type through the element be given in any time interval. Then the number of time steps elapsing between the *instant of the input* of the r-property in the given element and the *instant of the output* of the identical r-property from the given element is a *slowness of propagation of* that *r-property through the element*.

(i) Let the *given r-property* of any quality type propagate through any *two elements*. Then the differences of numbers of time steps elasping between the instant of the input and the instant of the output of the r-property in and from the single given elements, are *differences in slownesses of propagation* of the same (identical) r-property through the two single elements.

(ii) Let any *two r-properties* of any quality types propagate through any *given element*. Then the differences of (number of time steps elapsing between) the instant of the input and the instant of the output of the single r-properties in and from the given element, are *differences in slownesses of propagation* of the single r-properties through the given element.

(iii) Let any *two elements* be given in any time interval. Let any *two r-properties* of any quality types be given. Let any one of the r-properties propagate through any one of the elements, and let the other of the r-properties propagate through the other element. Then the differences of numbers of time steps elapsing between the instant of the input and the instant of the output of the single r-properties in and from the single given elements are *differences in slownesses of propagation* of the single r-properties through the single elements.

89. Let any path of any element be given in any time interval. Then the number of *mediumistic elements* (of media of the given element) runned through by the given element in the given time interval is a *relative velocity of propagation of the element by (along) the given path* with respect to the given time interval.

(i) Let any *two time intervals* constituted of equal numbers of time steps be given. Let *any element* running by (along) *any path* be given. Then the differences of numbers of mediumistic elements runned through by the given element along the path in the single time intervals are *differences in relative velocities of propagation of the element by (along) the given path* in the two time intervals.

(ii) Let any *time interval* be given. Let *two elements* running along any path be given. Then the differences of numbers of mediumistic elements runned through by the single given elements along the path in the given time interval are *differences in relative velocities of propagation of the two elements along the path* in the time interval.

(iii) Let any *time interval* be given. Let any two elements be given each running along its one of *two given paths*. Then the differences of numbers of mediumistic elements runned by the single given elements along their paths in the given time interval are *differences in relative velocities of propagation of the two elements along the two paths* in the time interval.

90. Let the activity be given which have caused any difference (first, second, etc., e.g. in locational relation) in slownesses, in velocities etc. Then the difference is *followed (succeeded)* by (or *results (effects) in*) *a resolution* of one or more *unresolved pairs* of r-properties at the next time step (*conversion* of quality types). The r-properties out of the resolved pairs

(i) have such locational relations, and

(ii) are of such quality types,

that they are acting by and only by an *activity inverse* to the activity which have caused the difference.

91. Out of its stored informations the development-identical element

(i) can *construct* or *assume a construction of* a *model of a possible flow (stream)* of r-properties of any given quality type or of a flow of contacts, transists, informations, respectively, related to the element itself or to another given element as to a *model element* in a time interval, or

(ii) can construct or assume a construction of a *collection of* such models of flows in *equivalent-model elements* and in *equivalent time intervals*,

(iii) can *assume a construction of a collection of models of all possible flows (streams)* of the given r-properties, contacts, transits, informations, respectively, related to any given equivalent-model elements in equivalent time intervals.

92. Let any collection of models (*m-models*) of possible flows (streams) of any given

r-properties, contacts, transits, informations, respectively, related to any given development-identical element in any time interval be given. Let any instant out of the given time interval be chosen. Then the collection of models can be partitioned into two parts (*subcollections*):

(i) the models (*a-models*) in which the given instant *is an instant of activity* of the mentioned r-properties, of contacts, transits, informations, respectively, and

(ii) the models (*n-models*) in which the given instant *is not any instant of activity* of the r-properties, of contacts, transits, informations, respectively.

The element can infer a *class of models* equivalent with respect to the given instant both from any of the two mentioned subcollections of models and of the mentioned collection. Mapping of any a-model into zero (in each instant being not any instant of activity) and one (in each instant being an instant of activity) is a *characteristic function of the a-model.*

93. Let any subcollection of a-models of any collection of flows of any given r-properties, contacts, transits, informations, respectively, related to any given development-identical element in any time interval be given. Let the class (*m-class*) of models of flows of the r-properties (contacts, transits, informations, respectively) be inferred. Let the class (*a-class*) of models be inferred out of which the given instant is an instant of the mentioned activity. Let numbers of models both of the mentioned collection and of the subcollection be given.

(i) Then *quotient of share* of the given subcollection on the mentioned collection of models is an *approximation of instantaneous probability of* the mentioned *activity* in the flows related to the given development-identical element – which *instantaneous probability* is an *assumed quotient of share* of the a-class on the m-class. The m-class is a *stochastis (probabilistic) process* and each of the m-models (of possible flows) is a *possible realization of the process.* Any state given by probabilities of activities is a *stochastic (probabilistic) state.* Characteristic function of an a-model belonging to any stochastic process is a *stochastic (probabilistic) characteristic function* of the a-model.

(ii) The element has to determine a *collection of equivalent time intervals* out of its one and only one time flow or/and determine a *collection of equivalent-model elements* for each of the time intervals, when constructing a collection of m-models of any possible flows.

94. Each element *appears (becomes evident)* by its function (behavior, functional relation) in the system or subsystem. In general, the function (behavior, functional relation) of the element is a compound function of functions of three kinds:

(i) *functions of arbitrariness of information processing – function of autonomy of the element,*

(ii) *functions of quantities of r-properties,*
(iii) *functions of relation among quality types.*

95. Each activity or information in any stochastic model is given by *probability of the activity or information*, respectively.

96. When *constructing the inversion* of any given its *information* possible under a state or development condition, the element

(i) has to collect or assume a *collection of all and only all informations possible under identical conditions,*
(ii) select those and only those informations out of the mentioned all possible informations, which are not identical with the given information.

(Received August 18, 1971.)

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Příklad funkce systémového prvku tvořeného prvotními vlastnostmi I

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Je předložen jen jeden z mnoha možných modelů.

Článek je rozdělen do dvou částí. V první části je učiněn předpoklad o vlastnostech prvku, o množině prvků, o třídě prvků a o souboru informací. Funkce (chování) prvku je funkcí složenou z funkcí tří druhů. Funkce prvního druhu jsou funkce libovolnosti zpracování informací. Funkce druhého druhu jsou funkce množství prvotních vlastností. Funkce třetího druhu jsou funkce kvalitativních typů prvotních vlasností. Zpětná vazba prvku je obecně určena smyčkovou vlnou aktivit nebo informací. Prvek může optimizovat strategii sledování kteréhokoliv ze svých cílů.

Ve druhé části článku bude z uvedeného předpokladu odvozen příklad symboliky a matematické formulace funkcí jednotlivých druhů.

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