AN INTRODUCTION TO INFORMATIONAL ALGEBRA

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This article deals with algebraic concepts of information and brings five basic algebraic systems, called self-informational, general informational, implicatively informational, equivalence informational, and modal informational algebraic system, which are listed at the end of the article. Informational algebra considers the informational nature of its entities - operands and operators, and in this relation, it introduces traditional logical operators (implication, equivalence, disjunction, conjunction, etc.) as particularities, which project a self-informational or general informational algebra into a particular domain (for instance, implicative, equivalence, modal, etc.). The way to an informational logic is paved with basic reflection and determinations (definitions), which root in informational logic [1, 2, 3, 4]. This article shows, how a new paradigm in formalizing and automatizing of informational concepts can become possible. In this way, it is also a proposal for a sufficiently diverse but constructive mathematical and technological treatment of the arising informational phenomenology - also of the needs arising in the domain of the so-called information-oriented technology [12].

UVOD V INFORMACIJSKO ALGEBRO. Članek se ukvarja z algebraičnimi koncepti informacije in prikaže pet osnovnih algebraičnih sistemov, in sicer samo-informacijskega, splošno, implikativno, ekvivalenčno in modalno informacijskega, ki so zapisani na koncu članka. Informacijska algebra upošteva informacijsko naravo svojih entitet - operandov in operatorjev in tako uvaja tradicionalne logične operatorje (npr. implikacijo, ekvivalenco, disjunkcijo, konjunkcijo itd.) le kot posebnosti, ki projicirajo samo-informacijsko ali splošno informacijsko algebro v posebno področje (npr. implikativno, ekvivalenčno, modalno itd.). Pot do informacijske logike je podložena z osnovno refleksijo in opredelitvami (definicijami), ki temeljijo v informacijski logiki [1, 2, 3, 4]. Članek pokaže, kako lahko nova paradigma formalizacije in avtomatizacije informacijskih konceptov postane mogoča. V tem smislu je članek tudi predlog za dovolj diverzno vendar konstruktivno matematično in tehnološko obravnavo nastajajoče informacijske fenomenologije - tudi potreb v območju t.i. informacijsko usmerjene tehnologije [12].

... A priori and irrespective of any hypothesis concerning the essence of matter it is evident that the matter-of-factness of a body does not end there where we touch it. The body is present everywhere where its impacting can be sensed. Its force of attraction - if we speak only of it - acts upon sun, planets, maybe also upon the entire universe.

Henri Bergson [10] 159-160

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0. INTRODUCTION

A priori and irrespective of any hypothesis concerning the essence of information it is evident that the informing of information does not end there where it is coming into existence. Information is present everywhere where its informing can be sensed. Its impacting - if we speak only of it - can inform living beings as well as the entire universe.

Paraphrasing Henri Bergson informationally

Informational algebra or algebra of information is a set of definitions concerning informational axioms and informational rules for formatting of formulas by which the construction or deduction of formulas or their transformation becomes constructively possible. Informational formulas are compositions of informational entities marking various informational processes and consisting of the so-called informational operands and informational operators. By this approach, informational algebra becomes an informational calculus not only for informational or informationally mechanical generation of formulas within a given algebraic system, but also for informational decomposition and through it for informational enriching, development, interpretation, and modeling of living and artificial informational systems. In this sense, systems represented by formulas are open, i.e., constructively growing, steady, and/or reducing formal systems. In general, an informational system is an informationally arising (changing) system, in which each informational entity possesses the possibility of informing, i.e. of informational arising.

Every algebraic approach concerns logical means, shaping the nature or the background of the algebraic approach. In this respect, informational algebra is logically grounded in informational logic [1, 2, 3, 4] and various concepts belonging to it [5, 6, 7, 8]. Informational algebra concerns informational entities which are informational operands and operators, aggregated to formulas. An informational formula marks descriptively a specific operand and so, can be informationally operated again. Within an informational algebra several categories of operands and operators can be distinguished, e.g., implicit and explicit ones, particularized and universalized ones, etc. Further, such algebra considers that informational operands can be decomposed into formulas which bring to the surface new operands and operators. In a similar way, informational operators can be decomposed, showing operational components of an operator decomposition. Thus, algebraic composition (building of operands, operators, and formulas) and decomposition (determining of operands' and operators' details) of informational entities, of operands as well as operators, are the most natural means of an informational algebra.

Within the study of informational algebra also the axiomatic nature of information can be considered and recognized. For instance, how does information perform as informational phenomenon of its own informing, how the marking or symbolism of informational phenomenology can be introduced, and last but not least, how informational arising, which is the phenomenon of informing of information, can be semantically captured, pragmatically composed and decomposed, and operationally marked and symbolized. It becomes evident that a symbolism possessing informational meaning, generality, and particularity is needed and has to be introduced in such a manner that it will embrace already existing mathematical and new informational conceptualism. For this purpose the consequent informational style of thinking and understanding becomes necessary, living existing formal and particularly mathematical doctrinairism behind it and surpassing the doctrinaire blocking by informational constructiveness and meaning. This does not mean at all that informational algebra cannot be concise, compact, and self-constructive discipline. However, it might be said that informational algebra will be conceptually broader from the standpoint of existing and abstractly comprehended algebraic disciplines, integrating them into a new, informational realm.

Introduction to informational algebra in this essay is the only beginning of such algebra, which as a new discipline is looming on the horizon of informational logic. The goal of such algebra is to enable formal analysis and modeling of various living and artificial informational system, for instance, compose them globally and decompose them into detail, particularize them on a given point of view and later on universalize them and enable their further decomposition, etc. At this time, introduction means also that some distinguished domains of informational algebra are yet not elaborated into the necessary detail. This essay is on the way to reveal significant and controversial details, particularities, and formalism of the future informational algebra.

1. CLASSICAL LOGICAL AND ALGEBRAIC APPROACH

At the beginning it is to stress that in the conceptualization of informational logic and informational algebra it would not be recommendable to proceed from the usual predicate calculi being determined within various mathematical theories. All these calculi are based on the category of truth and falsity which represents a very particular informational entity of belief or mathematical disciplinarity. Such determinism of research would fatally narrow the naturally open realm of informational investigation and exclude the main informational phenomenology from the formally structured and organized discourse. However, this does not mean that predicate calculi of mathematics would be excluded from the formal informational discourse; on the contrary, they can be integrated into the realm of informational investigation and present usable particularities of an informational calculus. Further, set-theoretical symbolism in its various form can be applied too, etc.

Let us show a set of rules of deduction as it appears within the classical logic. Let us introduce two separation symbols, '[' and ']', for expression of formal units. Let us introduce informational entities α, β, and γ, representing rather informational and not only propositional operands, and five "propositional" connectives: '$\neg$' for negation, '$\vee$' for disjunction, '$\wedge$' for conjunction, '$\Rightarrow$' for implication, and '$\equiv$' for equivalence. Under these conditions it is possible to accept or postulate some rules of deduction, belonging to a particular (informational, or in our case also propositional) language:

[1.1]:

$[\alpha \Rightarrow [\beta \Rightarrow \alpha]]$

$[[\alpha \Rightarrow [\alpha \Rightarrow \beta]] \Rightarrow [\alpha \Rightarrow \beta]]$

$[[\alpha \Rightarrow \beta] \Rightarrow [[\beta \Rightarrow \gamma] \Rightarrow [\alpha \Rightarrow \gamma]]]$

$[[\alpha \wedge \beta] \Rightarrow \alpha]$

$[[\alpha \wedge \beta] \Rightarrow \beta]$

$[[\alpha \Rightarrow \beta] \Rightarrow [[\alpha \Rightarrow \gamma] \Rightarrow [\alpha \Rightarrow [\beta \wedge \gamma]]]]$

$[\alpha \Rightarrow [\alpha \vee \beta]]$

$[\beta \Rightarrow [\alpha \vee \beta]]$

$[[\alpha \Rightarrow \gamma] \Rightarrow [[\beta \Rightarrow \gamma] \Rightarrow [[\alpha \vee \beta] \Rightarrow \gamma]]]$

$[[\alpha \equiv \beta] \Rightarrow [\alpha \Rightarrow \beta]]$
$[[\alpha \equiv \beta] \Rightarrow [\beta \Rightarrow \alpha]]$
$[[\alpha \Rightarrow \beta] \Rightarrow [[\beta \Rightarrow \alpha] \Rightarrow [\alpha \equiv \beta]]]$
$[[\alpha \Rightarrow \beta] \Rightarrow [[\neg \beta] \Rightarrow [\neg \alpha]]]$
$[\alpha \Rightarrow [\neg [\neg \alpha]]]$
$[[\neg [\neg \alpha]] \Rightarrow \alpha]$

etc. Such kind of rules can be replaced by more general as well as more precise ones. For instance, instead of

[1.2]: $[\alpha \Rightarrow [\beta \Rightarrow \alpha]]$

there will be the first or universalized step

[1.3]: $[\alpha \models [\beta \models \alpha]]$

This will be followed by the second and more precise step

[1.4]: $[[[\alpha \models] \models [[\beta \models \alpha] \models]]] \models]$

In the third step the last formula can be particularized, e.g., into

[1.5]: $[[[\alpha \models_T] \models_{\Rightarrow} [[\beta \models \alpha] \models_T]]] \models_T]$

The meaning of operators $\models$ and $\models_T$ and expressions of the form $[\alpha \models]$ will be explained later.

Let us introduce also the universal and the existential quantifier, i.e., $\forall$ and $\exists$. In the framework of informational logic and informational algebra we will use also particularized quantifiers, i.e., $\forall_\pi$ and $\exists_\pi$, denoting the possibility π of $\forall$ and $\exists$, and reading them as "it is possible that for all" and "it is possible that there exist(s)", respectively. In the framework of informational logic, the rule [1.2] can be postulated as

[1.6]: $[[\exists_\pi \beta] \centerdot [\alpha \Rightarrow [\beta \models \alpha]]]$

This formula is read as "it is possible that there exist an informational operand β such that (operator $\centerdot$) if α is an informational operand, then (operator $\Rightarrow$) operand β informs (operator $\models$) operand α.

For the second rule in [1.1] there would be, for instance, in the framework of informational logic

[1.7]: $[[[\forall \alpha] \exists \beta] \centerdot [[\alpha \models [\alpha \models \beta]] \Rightarrow [\alpha \models \beta]]]$

The curiosity of this formula is, for instance, that existential quantifier $\exists$ performs as an explicit binary operator between operands $[\forall \alpha]$ and β and that $[[\forall \alpha] \exists \beta]$ is the left operand of operator $\centerdot$. Thus, this formula is read as "for all α there exists β such that if α informs $[\alpha \models \beta]$, then $[\alpha \models [\alpha \models \beta]]$ can be replaced by $[\alpha \models \beta]$. Thus, rule [1.7] can become a practical rule of formula reduction within informational algebra. Certainly, it is not necessarily true that

[1.8]: $[[\alpha \models [\alpha \models \beta]] \Rightarrow [\alpha \models \beta]]$

is an informationally valid formula, since in the left part $[\alpha \models [\alpha \models \beta]]$ of implication the process α informs the process $\alpha \models \beta$, and this informing might not be the same as $\alpha \models \beta$ on the right side of implication. In many cases it can be understood that $[\alpha \models \beta]$ is an indivisible process and in this manner α can impact this process merely as its entire structure. Thus, if $[[\alpha \Rightarrow [\alpha \Rightarrow \beta]] \Rightarrow [\alpha \Rightarrow \beta]]$ is proposition-logically acceptable, its informational counterpart $[[\alpha \models [\alpha \models \beta]] \Rightarrow [\alpha \models \beta]]$ might be not. This example shows the problem of informational universalization of proposition-logical formulas as truth and falsity are characteristically narrowed informational categories.

The difference which exists between the classical algebraic and logical approach on one side and informational approach on the other side lies in the fact that the first approach deals with rather static entities whereas the second one deals with processes and not only propositions in mind. In a similar manner, informational formulas have to be understood as processes by themselves and in this sense they underlie the principle of informational arising, i.e. development of given formulas as formulas through composition, decomposition, universalization, particularization, or simply by changing of formulas' instantaneous structure.

2. INFORMATIONAL OPERATORS

2.0. Introduction

The informational operand is determined to be informational entity marking an informational process which is comprehended as informational unity. Irrespective of the complexity of an informational operand which can be composed of various explicit and implicit informational operands and informational operators, this operand performs informationally, i.e., informs, counter-informs and embeds the self-produced and the arrived information.

An informational operand informs as informational unity and in this respect it informs self-informationally. In this paragraph we have to answer basic algebraic questions concerning the self-informational nature of informational operands. As it is already understood, an informational operand is in no way an informationally non-operative entity. It functions as an operand or as an operated entity merely in relation to operators being superior to it, which have the power to operate it informationally. However, within itself, an informational operand operates and is operated according to its informational constituents, which are informational operands as well as informational operators. And several components of an informational operand can operate within other informational operands. In this way it is to understand that an informational operand is a specific part of an informational system, of an informationally marked and operatively connected net of informational entities, which are informationally perplexed, interwoven, interactive, distributive, and distributed.

In this respect, the basic question which arises is how to ensure the expression of the described complexity and of the arising nature of information in a formal or symbolic manner. We shall recognize how the introduction of the metaoperator of informing $\models$ will explicitly keep the arising nature of informational entities occurring in a formula alive. Therefore, this implicit arising power has to be given to any operator of the type $\models$, regardless in which way it is or can be particularized or universalized. Usually we suppose that operator $\models$ performs as an expert operator (system) in the domain (field, discipline, realm, etc.) of its possible particularization or universalization.

2.1. On the Nature of Operator $\models$

In our further discussion we shall consequently use the symbol $\models$ as a general operator variable, which can be substituted by any other operator variable possessing a more precise or more determined operational meaning. Further, irrespective to the degree of its determination, any informational operator can be universalized with the intention to analyze or investigate the informational consequences of a particularized operator. For instance, logical or arithmetic operators will be replaced by more general operators with the intention to study more general properties of an informational operand (formula) which does not concern merely the informationally narrowed (particularized) aspects of logical truth or falsity and numerical value, respectively. On the other side, it will be possible to keep mathematically defined entities algorithmically stable in cases of necessity of artificial, technological, and symbolic systems (for instance, for the needs of today's artificial intelligence and classical mathematical systems).

In fact, the introduction of the notion of the informational metaoperator $\models$ [9] and its still general (universal) operational derivatives (for instance, $\Dashv$, $\nvDash$, $\not\Dashv$, $\VDash$, $\DashV$, $\nVDash$, $\not\DashV$, $\vdash$, $\dashv$, $\nvdash$, $\not\dashv$, $\Vdash$, $\dashV$, $\nVdash$, $\not\dashV$, etc.) enables the development of the concept of informational arising. The nature of this operator is informing of operands to which this operator belongs and informing is by definition nothing else than informational arising in one or another way. Thus, the formula $\alpha \models$ expresses the property of informational operand α that it is in the process of informing, of sending or transmitting of information through its own informing. If we would write $\alpha \models_\pi$, it would mean that entity α can inform; but α as information can inform in each case. For instance, in the case of modal logic we could introduce the following definition:

[2.1]:

$$(\alpha \models) =_{Df} (((\forall \mathfrak{M}) \wedge (\forall (\beta \in \mathfrak{M}))).(\alpha \models_{\mathfrak{M},\beta}))$$

Here, $\mathfrak{M}$ is the so-called model of possible worlds and β is a possible world. The operator $\models_{\mathfrak{M},\beta}$ is already the particularized form of operator $\models$. Simply, it is possible to say that operator $\models$ is determined within the informational domain $(\mathfrak{M}, \beta)$, which can be understood to be sufficiently general, adapted to instantaneous need and application. In this case, each informational entity α has the possibility to send information, to inform. This case represents the active role of information and also of data. $\alpha \models$ means that α informs in all models of possible worlds and in each possible world of the model.

The form $\models \alpha$ expresses the property of informational entity α to be informed, to be sensible to some extent for the reception of information by informing in itself as well as by informing of other informational entities. If we would write $\models_\pi \alpha$, we would say that information α could be informed. By definition, data as a particular, informationally restricted entity, cannot accept (receive) information. Thus, for instance, $\nvDash \alpha$ is valid. In the framework of modal logic it could be possible to set the following informational definition:

[2.2]:

$$(\models \alpha) =_{Df} (((\exists \mathfrak{M}) \wedge (\exists (\beta \in \mathfrak{M}))).(\models_{\mathfrak{M},\beta} \alpha))$$

In this case, informational entity has the possibility to receive information or to be informed by itself or by other informational entities. This role of information lies in the activity of its receiving of information. Thus, $\models \alpha$ means that there exist suchlike models of possible worlds and a possible world β within them that α can be informed.

Operator $\models$ (and in this respect any informational operator) can perform as unary, binary, or multiplex operator. In the case $\alpha \models$, $\models$ is a unary, postfix operator, whereas in the case $\models \alpha$, $\models$ is a unary prefix operator. A binary form is, for instance, $\alpha \models \beta$, and a multiplex one, for instance, $\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta$. Various informational operators have been discussed in [2]. However, some definitions of informational operators may be helpful for more exhaustive understanding of their nature.

2.2. Implications and Definitions Concerning Unary Informational Operators

In general, every informational operator can appear as unary operator being connected with one or more operands. Let us discuss merely cases of the most general unary informational operators.

2.2.1. The Case 'α informs'

The form $\alpha \models$ or $\Dashv \alpha$ says that α informs. This formulas are implicatively open in the following sense:

[2.3]:

$$(\alpha \models) \Rightarrow$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \models \xi, \eta, \ldots, \zeta));$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \Dashv \alpha))$$
$$\Leftarrow (\Dashv \alpha);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If α informs, then there may exist some informational entities $\xi, \eta, \ldots, \zeta$, which are informed by α. The consequence of this implication might be the implication

[2.4]: $(\alpha \models) \Rightarrow (\exists_\pi (\alpha \models \alpha))$;
$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\}$;

$$(\exists_\pi (\alpha \Dashv \alpha)) \Leftarrow (\Dashv \alpha);$$
$$``\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If α informs, then it could inform itself. Logically, the following inverse implication can be adopted:

[2.5]:
$$(\alpha \vDash \xi, \eta, \ldots, \zeta) \Rightarrow (\alpha \vDash);$$
$$``\vDash" \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\Dashv \alpha) \Leftarrow (\xi, \eta, \ldots, \zeta \Dashv \alpha);$$
$$``\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If α informs informational entities $\xi, \eta, \ldots, \zeta$, then it informs in general too. The particular case of this implication is

[2.6]:
$$(\alpha \vDash \alpha) \Rightarrow (\alpha \vDash);$$
$$``\vDash" \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\Dashv \alpha) \Leftarrow (\alpha \Dashv \alpha);$$
$$``\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If α informs in itself, then it informs. Now, we can adopt the following complete list of implications proceeding from the previous discussion, which concern general informational operators (the so-called "informing" operators and the so-called "non-informing" ones), which perform (inform) from the left to the right and vice versa, i.e., operators $\vDash$, $\VDash$, $\vdash$, $\Vdash$, $\nvDash$, $\nVDash$, $\nvdash$, $\nVdash$, $\Dashv$, $\DashV$, $\dashv$, $\dashV$, $\not\Dashv$, $\not\DashV$, $\not\dashv$, and $\not\dashV$:

[2.7]:
$$(\alpha \vDash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \vDash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \VDash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \VDash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \vdash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \vdash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \Vdash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \Vdash \xi, \eta, \ldots, \zeta));$$

$$(\alpha \nvDash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \nvDash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \nVDash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \nVDash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \nvdash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \nvdash \xi, \eta, \ldots, \zeta));$$
$$(\alpha \nVdash) \Rightarrow ((\exists_\pi \xi, \eta, \ldots, \zeta).(\alpha \nVdash \xi, \eta, \ldots, \zeta));$$

$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \Dashv \alpha)) \Leftarrow (\Dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \DashV \alpha)) \Leftarrow (\DashV \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \dashv \alpha)) \Leftarrow (\dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \dashV \alpha)) \Leftarrow (\dashV \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \not\Dashv \alpha)) \Leftarrow (\not\Dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \not\DashV \alpha)) \Leftarrow (\not\DashV \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \not\dashv \alpha)) \Leftarrow (\not\dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \not\dashV \alpha)) \Leftarrow (\not\dashV \alpha)$$

At this occasion it becomes evident that it is possible to particularize the general informational operator $\vDash$ by the so-called general operators (metaoperators) $\vDash$ and $\nvDash$, general parallel operators $\VDash$ and $\nVDash$, general cyclic operators $\vdash$ and $\nvdash$, and general parallel-cyclic operators $\Vdash$ and $\nVdash$. Thus,

[2.8]:
$$(\alpha \vDash) =_{Df} ((\alpha \VDash) \vee (\alpha \vdash) \vee (\alpha \Vdash));$$
$$(\alpha \nvDash) =_{Df} ((\alpha \nVDash) \vee (\alpha \nvdash) \vee (\alpha \nVdash));$$
$$(\alpha \vDash) \Rightarrow ((\alpha \vDash) \vee (\alpha \nvDash))$$

This definition says simply that α informs or does not inform in a parallel, cyclic, and/or parallel-cyclic manner. The parallel-cyclic case is to be understood as a parallel and cyclically perplexing complex mode of informing of an informational entity.

In the similar way the performance of operator $\Dashv$ can be defined. This operator demon-strates the diversity and alternativeness against the general operator $\vDash$. It can be showed how in cases of anthropological discourse this explicit informational operator becomes the necessity, delivering the unrevealed informing which lurks or waits in the background of each living informing and non-informing (for instance, as skepticism, unbelief, or simply counter-informing). Thus, adequately to [2.8] there is

[2.9]:
$$(\Dashv \alpha) =_{Df} ((\DashV \alpha) \vee (\dashv \alpha) \vee (\dashV \alpha));$$
$$(\not\Dashv \alpha) =_{Df} ((\not\DashV \alpha) \vee (\not\dashv \alpha) \vee (\not\dashV \alpha));$$
$$(\Dashv \alpha) \Rightarrow ((\Dashv \alpha) \vee (\not\Dashv \alpha));$$

It is to understand that if operators $\vDash$, $\VDash$, $\vdash$, $\Vdash$, $\nvDash$, $\nVDash$, $\nvdash$, and $\nVdash$ inform in one way, then their counterparts $\Dashv$, $\DashV$, $\dashv$, $\dashV$, $\not\Dashv$, $\not\DashV$, $\not\dashv$, and $\not\dashV$ inform in another way. This verbal difference between the first and the second case (class) of various informational operators ensures that the alternative horizon of informing comes explicitly (formally) into existence too. Further, it is to understand that $\alpha \vDash$ can have the meaning (or metameaning) of $\Dashv \alpha$ too.

The first two formulas in expressions [2.8] and [2.9] state that in the domain of informational connectedness, which can be at most a cyclic, parallel, parallel-cyclic, parallel-serial, or parallel-sequential structure, general informing or non-informing is nothing else than a type of these kinds of informing. The last formula in [2.8] and [2.9] implicates merely the metarole (metameaning) of operators $\vDash$ and $\Dashv$, respectively. At last, operator $\vDash$ can take over the role to be the only informational metaoperator. Thus, for instance, $\alpha \vDash$ can have the meaning of $\alpha \vDash$ as well as of $\Dashv \alpha$, etc.

Up to now we have examined cases in which it was not said anything about the complexness or composedness of operands. In our case, operands are informational formulas marking informational composites of informational processes. Certainly, if α marks an operand, then $\alpha \models$ marks a formula of a single operand and operator, and this formula can be taken as operand too. Thus, it is possible to continue the discourse of unary informational operators concerning formula $\alpha \models$ as an operand.

By definition, if α marks an informational entity, then α informs. Inductively, on the basis of this fact, it is possible to construct an indefinite number of implications, namely,

$$
\begin{aligned}
[2.10]: \quad & \alpha \Rightarrow (\alpha \models); \\
& (\alpha \models) \Rightarrow ((\alpha \models) \models); \\
& ((\alpha \models) \models) \Rightarrow (((\alpha \models) \models) \models); \\
& \ldots\ldots\ldots\ldots\ldots\ldots \\
& \text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\}
\end{aligned}
$$

Thus, by the property of transitivity, there is

$$
\begin{aligned}
[2.11]: \quad & \alpha \Rightarrow (\ \ldots\ ((\alpha \models) \models)\ \ldots \models); \\
& \text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\}
\end{aligned}
$$

This formula says that informational entity can inform in all possible ways concerning informational operators $\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash$. It says in a formally explicit way that α can be perplexedly complex in respect to parallel, serial, and parallel-serial informing. Thus, informational entity α marks a system or network of informational processes which constitute it informationally. By this, an informational entity becomes a systemic notion or notion of an informational network.

Formula [2.11] is an explicit expression (through the use of explicit informational operators of the type $\models$) of the arising nature of informational entity α. Besides of this explicitness of informational arising, there exists, by definition, also the operational implicitness (an implicit form of informational arising) of an informational entity α. This operational implicitness is coming to the surface when, for instance, an informational entity marked by α, is decomposed, and thus explicating its informational components (a composition of informational operators and operands). The origin of this discussion can be the following:

$$
\begin{aligned}
[2.12]: \quad & (\alpha \models) \Rightarrow \mathfrak{I}_{\rightarrow}(\alpha) \text{ or simply} \\
& (\alpha \models) \Rightarrow \mathfrak{I}(\alpha)
\end{aligned}
$$

where $\mathfrak{I}$ (or $\mathfrak{I}_{\rightarrow}$) is the implicit operator of informing or non-informing (or informing or non-informing from the left to the right). $\mathfrak{I}(\alpha)$ is a sort of functional expression which points out the operational component $\mathfrak{I}$ of the entity α. Obviously, inductively, the last expression can be expanded (decomposed), for instance, into

$$
\begin{aligned}
&[2.13]: \\
&\quad (\alpha \models) \Rightarrow \mathfrak{I}(\alpha); \\
&\quad \mathfrak{I}(\alpha) \Rightarrow \mathfrak{I}(\mathfrak{I}\ \ldots\ (\mathfrak{I}(\alpha))\ \ldots\ ); \\
&\quad \mathfrak{I} \in \{\mathfrak{I}_{\models}, \mathfrak{I}_{\VDash}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\nvDash}, \mathfrak{I}_{\nVDash}, \mathfrak{I}_{\nvdash}, \mathfrak{I}_{\nVdash}\}
\end{aligned}
$$

where $\mathfrak{I}_{\models}, \mathfrak{I}_{\VDash}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\nvDash}, \mathfrak{I}_{\nVDash}, \mathfrak{I}_{\nvdash}$, and $\mathfrak{I}_{\nVdash}$ mark the so called general ($\models$), parallel ($\VDash$), cyclic ($\vdash$), and parallel-cyclic case ($\Vdash$) of informing and general ($\nvDash$), parallel ($\nVDash$), cyclic ($\nvdash$), and parallel-cyclic case ($\nVdash$) of non-informing, respectively.

Formulas [2.10] - [2.13] can be repeated for the so-called alternative case of informing concerning operators $\Dashv$, $\DashV$, $\dashv$, $\dashV$, $\not\Dashv$, $\not\DashV$, $\not\dashv$, and $\not\dashV$. These cases can be expressed in a strict symmetric (right-left) form, for instance:

$$
\begin{aligned}
[2.14]: \quad & (\Dashv \alpha) \Leftarrow \alpha; \\
& (\Dashv (\Dashv \alpha)) \Leftarrow (\Dashv \alpha); \\
& (\Dashv (\Dashv (\Dashv \alpha))) \Leftarrow (\Dashv (\Dashv \alpha)); \\
& \ldots\ldots\ldots\ldots\ldots\ldots \\
& \text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}
\end{aligned}
$$

This, by the property of transitivity, yields

$$
\begin{aligned}
[2.15]: \quad & (\Dashv\ \ldots\ (\Dashv (\Dashv \alpha))\ \ldots\ ) \Leftarrow \alpha; \\
& \text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}
\end{aligned}
$$

Analogously to [2.12] the following alternative formula is obtained:

$$
\begin{aligned}
[2.16]: \quad & \mathfrak{I}_{\leftarrow}(\alpha) \Leftarrow (\Dashv \alpha) \text{ or simply} \\
& \mathfrak{I}'(\alpha) \Leftarrow (\Dashv \alpha)
\end{aligned}
$$

where $\mathfrak{I}'$ (or $\mathfrak{I}_{\leftarrow}$) is the implicit alternative operator of informing or non-informing (from the right to the left). $\mathfrak{I}'(\alpha)$ is the alternative functional expression which points out the alternative operational component $\mathfrak{I}'$ of the entity α. Obviously, inductively, the last expression can be expanded (decomposed), for instance, into

$$
\begin{aligned}
&[2.17]: \\
&\quad \mathfrak{I}'(\alpha) \Leftarrow (\Dashv \alpha); \\
&\quad ['(\mathfrak{I}'\ \ldots\ (\mathfrak{I}'(\alpha))\ \ldots\ ) \Leftarrow \mathfrak{I}'(\alpha); \\
&\quad \mathfrak{I}' \in \{\mathfrak{I}'_{\Dashv}, \mathfrak{I}'_{\DashV}, \mathfrak{I}'_{\dashv}, \mathfrak{I}'_{\dashV}, \mathfrak{I}'_{\not\Dashv}, \mathfrak{I}'_{\not\DashV}, \mathfrak{I}'_{\not\dashv}, \mathfrak{I}'_{\not\dashV}\}
\end{aligned}
$$

where $\mathfrak{I}'_{\Dashv}, \mathfrak{I}'_{\DashV}, \mathfrak{I}'_{\dashv}, \mathfrak{I}'_{\dashV}, \mathfrak{I}'_{\not\Dashv}, \mathfrak{I}'_{\not\DashV}, \mathfrak{I}'_{\not\dashv}$, and $\mathfrak{I}'_{\not\dashV}$ mark the so called alternative general ($\Dashv$), parallel ($\DashV$), cyclic ($\dashv$), and parallel-cyclic case ($\dashV$) of informing and alternative general ($\not\Dashv$), parallel ($\not\DashV$), cyclic ($\not\dashv$), and parallel-cyclic case ($\not\dashV$) of non-informing, respectively. In this manner the alternativeness of informing and non-informing in the case "to inform" is preserved also in an informationally implicit way.

The last question which we have to deal with more thoroughly within this section concerns the operational family of non-informing. The "non" in non-informing appears as a symbol of negation ($\neg$) and this operation is a regular unary connective of formal (mathematical) logic. Now, it is possible to show how the "logically" pure meaning of negation can become informationally contestable, questionable, and insufficient.

Let be

$$
\begin{aligned}
[2.18]: \quad & \neg(\alpha \models) \Rightarrow (\alpha \nvDash); \\
& \text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash\}; \\
& \text{"}\nvDash\text{"} \in \{\nvDash, \nVDash, \nvdash, \nVdash\};
\end{aligned}
$$

$(\not\Dashv\ \alpha) \Leftarrow (\neg(\Dashv\ \alpha)$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel\}$;
"$\not\Dashv$" $\in \{\not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

Concerning the last formula in which $\not\models$ is the operator of non-informing, it is possible to develop the following questions:

(1) If α marks an informational entity which informs ($\models$ or $\Dashv$), how does this entity not inform ($\not\models$ or $\not\Dashv$)? Evidently, $\neg$ as an informational operator of negation does not possess a totally negational meaning (operational power).

(2) How does α not inform ($\not\models$ or $\not\Dashv$) and what does this non-informing mean?

(3) If it is said that α does not inform in a certain way, then α either inhibits or is not capable to inform in a certain way. Thus, it is possible to say, for instance, that α informs in an inhibitory manner. This fact yields

[2.19]: $(\alpha \not\models) \Rightarrow (\alpha \models_i)$;
"$\not\models$" $\in \{\not\models, \parallel\!\not\models, \nvdash, \parallel\!\nvdash\}$;
"$\models_i$" $\in \{\models_i, \parallel\!\models_i, \vdash_i, \parallel\!\vdash_i\}$;

$(\Dashv_i\ \alpha) \Leftarrow (\not\Dashv\ \alpha)$;
"$\not\Dashv_i$" $\in \{\not\Dashv_i, \not\Dashv\!\parallel_i, \not\dashv_i, \not\dashv\!\parallel_n\}$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel\}$

The so-called non-informing ($\not\models$ or $\not\Dashv$) is nothing else than inhibitive informing.

(4) The reverse can also be certain. If α informs, then α does not inform in its all embracing informational variety or entirety. It informs only in a certain way and not in all possible (universal) ways. Thus,

[2.20]: $(\alpha \models) \Rightarrow (\alpha \not\models_n)$;
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \parallel\!\vdash\}$;
"$\not\models_n$" $\in \{\not\models_n, \parallel\!\not\models_n, \nvdash_n, \parallel\!\nvdash_u\}$;

$(\not\Dashv_n\ \alpha) \Leftarrow (\Dashv\ \alpha)$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel\}$;
"$\not\Dashv_n$" $\in \{\not\Dashv_n, \not\Dashv\!\parallel_n, \not\dashv_n, \not\dashv\!\parallel_n\}$

where $\not\models_n$ and $\not\Dashv_n$ mark the non-universal informing. This fact can be explained by the intentional nature of informational arising regardless of a certain informational entity. Any informational entity, as a process of its informational existing and arising of information, possesses a certain orientation or intentionality of its informing and only in this manner can inform or can be informed.

(5) If α informs a certain informational entity β, where $\alpha \models \beta$ or $\beta \Dashv \alpha$, and entity β is not "sufficiently" sensitive to the informing of α, then β is not "adequately" informed by α, i.e., $\alpha \not\models \beta$ or $\beta \not\Dashv \alpha$. Because of "specific" β's sensitivity in regard to α's informing, symbol $\models$ or $\Dashv$ or any other informational operator has to be understood as an operator composition of particular operators, i.e. in our case of $\models_\alpha$ and $\models_\beta$ or $\Dashv_\alpha$ and $\Dashv_\beta$, that is as that what α intends to inform and what β intends to perceive or, simply, what β can perceive as α's informing. That is why the operational composition $\models_\alpha \circ \models_\beta$ or $\Dashv_\alpha \circ \Dashv_\beta$ which constitutes operator $\models$ or $\Dashv$ in the relation $\alpha \models \beta$ or $\beta \Dashv \alpha$ can be comprehended also as

[2.21]: $(\alpha \models \beta) \Rightarrow ((\alpha \models_\alpha \circ \models_\beta\ \beta) \vee$
$(\alpha \not\models_\alpha \circ \models_\beta\ \beta) \vee$
$(\alpha \models_\alpha \circ \not\models_\beta\ \beta) \vee$
$(\alpha \not\models_\alpha \circ \not\models_\beta\ \beta))$;
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \parallel\!\vdash\}$;
"$\not\models$" $\in \{\not\models, \parallel\!\not\models, \nvdash, \parallel\!\nvdash\}$;

$((\beta \not\Dashv_\beta \circ \not\Dashv_\alpha\ \alpha) \vee$
$(d \not\Dashv_\beta \circ \Dashv_\alpha\ \alpha) \vee$
$(\beta \Dashv_\beta \circ \not\Dashv_\alpha\ \alpha) \vee$
$(\beta \not\Dashv_\beta \circ \Dashv_\alpha\ \alpha)) \Leftarrow (\beta \Dashv \alpha)$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel\}$;
"$\not\Dashv$" $\in \{\not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

The case $\alpha \models_\alpha \circ \models_\beta\ \beta$ or $\beta \Dashv_\beta \circ \Dashv_\alpha\ \alpha$ can be taken as the most appropriate form of informing from entity α to entity β, where both α and β are acting (informing) as useful informational partners. The informational transmitter α transmits ($\models_\alpha$ or $\Dashv_\alpha$) information which can be conditionally ($\models_\beta$ or $\Dashv_\beta$) accepted by the informational receiver β.

In the case $\alpha \not\models_\alpha \circ \models_\beta\ \beta$ or $\beta \Dashv_\beta \circ \not\Dashv_\alpha\ \alpha$, α is not entirely in the position to inform in such a way to β that β could accept information (intentionally or essentially) mediated from α. It could be said that α does not entirely fulfill the informational expectance or capability of β.

In the case $\alpha \models_\alpha \circ \not\models_\beta\ \beta$ or $\beta \not\Dashv_\beta \circ \Dashv_\alpha\ \alpha$, β is not entirely in the position to be informed in the way in which α informs or mediates information. It is possible to say that β does not entirely fulfill the informational expectance or ability of α.

In the last case $\alpha \not\models_\alpha \circ \not\models_\beta\ \beta$ or $\beta \not\Dashv_\beta \circ \not\Dashv_\alpha\ \alpha$, the informing (processing) $\alpha \models \beta$ or $\beta \Dashv \alpha$ does practically (more exactly, particularly) not exist, for α cannot mediate information which β could be capable to accept. However, it does not mean that another particular process of the form $\alpha \models \beta$ or $\beta \Dashv \alpha$ is not taking place.

This discussion shows how operators $\models$ and $\not\models$ could be understood to be symmetrical to each other. Thus,

[2.22]: $(\alpha \not\models \beta) \Rightarrow ((\alpha \not\models_\alpha \circ \not\models_\beta\ \beta) \vee$
$(\alpha \models_\alpha \circ \not\models_\beta\ \beta) \vee$
$(\alpha \not\models_\alpha \circ \models_\beta\ \beta) \vee$
$(\alpha \models_\alpha \circ \models_\beta\ \beta))$;
"$\not\models$" $\in \{\not\models, \parallel\!\not\models, \nvdash, \parallel\!\nvdash\}$;
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \parallel\!\vdash\}$;

$((\beta \Dashv_\beta \circ \Dashv_\alpha\ \alpha) \vee$
$(d \Dashv_\beta \circ \not\Dashv_\alpha\ \alpha) \vee$
$(\beta \not\Dashv_\beta \circ \Dashv_\alpha\ \alpha) \vee$
$(\beta \not\Dashv_\beta \circ \not\Dashv_\alpha\ \alpha)) \Leftarrow (\beta \not\Dashv \alpha)$;
"$\not\Dashv$" $\in \{\not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel\}$

The conclusion of this discussion is that general informational operators belonging to the classes $\models$, $\nvDash$, $\Dashv$, and $\not\Dashv$ are relative to each other and that it is possible to use them according to the occurring circumstances, appropriateness, and needs.

2.2.2. The Case 'α is informed'

Implicitly, in the case $\alpha \models \beta$, we have learned a bit on the nature of the case 'to be informed'. Let us examine this case analogously to the case 'to inform' into more detail.

The form $\models \alpha$ or $\alpha \Dashv$ says that α is informed. This formula is implicatively open in the following sense:

[2.23]:

$$(\models \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \models \alpha));$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \Dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \Dashv);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\|, \dashv, \dashv\|, \not\Dashv, \not\Dashv\|, \not\dashv, \not\dashv\|\}$$

If α is informed, then there may exist some informational entities ξ, η, ..., ζ, which inform α. The consequence of this implication might be the implication

[2.24]: $$(\models \alpha) \Rightarrow (\exists_\pi\, (\alpha \models \alpha));$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\exists_\pi\, (\alpha \Dashv \alpha)) \Leftarrow (\alpha \Dashv);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\|, \dashv, \dashv\|, \not\Dashv, \not\Dashv\|, \not\dashv, \not\dashv\|\}$$

If α is informed, then it could be informed by itself. Logically, the following inverse implication can be adopted:

[2.25]: $$(\xi, \eta, \ldots, \zeta \models \alpha) \Rightarrow (\models \alpha);$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\alpha \Dashv) \Leftarrow (\alpha \Dashv \xi, \eta, \ldots, \zeta);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\|, \dashv, \dashv\|, \not\Dashv, \not\Dashv\|, \not\dashv, \not\dashv\|\}$$

If α is informed by informational entities ξ, η, ..., ζ, then it is informed in general too. The particular case of this implication is

[2.26]: $$(\alpha \models \alpha) \Rightarrow (\models \alpha);$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\alpha \Dashv) \Leftarrow (\alpha \Dashv \alpha);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\|, \dashv, \dashv\|, \not\Dashv, \not\Dashv\|, \not\dashv, \not\dashv\|\}$$

If α is informed in itself, then it is informed. Now, we can adopt the following complete list of implications proceeding from the previous discussion, which concern general informational operators (the so-called "informing" operators and the so-called "non-informing" ones), which perform (inform) from the left to the right and vice versa, i.e., operators $\models$, $\VDash$, $\vdash$, $\Vdash$, $\nvDash$, $\nVDash$, $\nvdash$, $\nVdash$, $\Dashv$, $\Dashv\|$, $\dashv$, $\dashv\|$, $\not\Dashv$, $\not\Dashv\|$, $\not\dashv$, and $\not\dashv\|$:

[2.27]:

$$(\models \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \models \alpha));$$
$$(\VDash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \VDash \alpha));$$
$$(\vdash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \vdash \alpha));$$
$$(\Vdash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \Vdash \alpha));$$

$$(\nvDash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \nvDash \alpha));$$
$$(\nVDash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \nVDash \alpha));$$
$$(\nvdash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \nvdash \alpha));$$
$$(\nVdash \alpha) \Rightarrow$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \nVdash \alpha));$$

$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \Dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \Dashv);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \Dashv\| \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \Dashv\|);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \dashv);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \dashv\| \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \dashv\|);$$

$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \not\Dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \not\Dashv);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \not\Dashv\| \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \not\Dashv\|);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \not\dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \not\dashv);$$
$$((\exists_\pi\, \xi, \eta, \ldots, \zeta).(\alpha \not\dashv\| \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow (\alpha \not\dashv\|)$$

Again, it becomes evident how it is possible to particularize the general informational operator $\models$ by the so-called general operators (metaoperators) $\models$ and $\nvDash$, general parallel operators $\VDash$ and $\nVDash$, general cyclic operators $\vdash$ and $\nvdash$, and general parallel-cyclic operators $\Vdash$ and $\nVdash$. Thus,

[2.28]: $$(\models \alpha) =_{\text{Df}} ((\VDash \alpha) \vee (\vdash \alpha) \vee (\Vdash \alpha));$$
$$(\nvDash \alpha) =_{\text{Df}} ((\nVDash \alpha) \vee (\nvdash \alpha) \vee (\nVdash \alpha));$$
$$(\models \alpha) \Rightarrow ((\models \alpha) \vee (\nvDash \alpha))$$

This definition says simply that α is informed or not informed in a parallel, cyclic, and/or parallel-cyclic manner. Again, the parallel-cyclic case is to be understood as a parallel and cyclically perplexing complex mode of informing of an informational entity.

As previously, the performance of operator $\Dashv$ in the case "to be informed" can be defined. Again, this operator demon-strates the diversity and alternativeness against the general operator $\models$. It can be showed how in cases of anthropological (linguistic) discourse this explicit informational operator becomes the necessity, delivering the unrevealed informing which lurks or waits in the background of each living informing and non-informing (for instance, as skepticism, unbelief, the Other, or simply counter-informing). Thus, adequately to [2.28] there is

$$[2.29]:\ (\alpha \Dashv) =_{Df} ((\alpha \DashV) \vee (\alpha \dashv) \vee (\alpha \dashV));$$
$$(\alpha \nDashv) =_{Df} ((\alpha \nDashV) \vee (\alpha \ndashv) \vee (\alpha \ndashV));$$
$$(\alpha \Dashv) \Rightarrow ((\alpha \Dashv) \vee (\alpha \nDashv));$$

Again, it is to understand that if operators $\vDash$, $\VDash$, $\vdash$, $\Vdash$, $\nvDash$, $\nVDash$, $\nvdash$, and $\nVdash$ inform in one way, then their counterparts $\Dashv$, $\DashV$, $\dashv$, $\dashV$, $\nDashv$, $\nDashV$, $\ndashv$, and $\ndashV$ inform in another way. This verbal difference between the first and the second case (class) of various informational operators ensures that the alternative horizon of informing in the case "to be informed" comes explicitly (formally) into existence too. Further, it is to understand that $\vDash \alpha$ can have the meaning (or metameaning) of $\alpha \Dashv$ too.

The first two formulas in expressions [2.28] and [2.29] in the case "to be informed" state that in the domain of informational connectedness, which can be at most a cyclic, parallel, parallel-cyclic, parallel-serial, or parallel-sequential structure, general informing or non-informing is nothing else than a type of these kinds of informing. The last formula in [2.28] and [2.29] implicates merely the metarole (metameaning) of operators $\vDash$ and $\Dashv$, respectively. At last, operator $\vDash$ can take over the role to be the only informational metaoperator. Thus, for instance, $\vDash \alpha$ can have the meaning of $\vDash \alpha$ as well as of $\alpha \Dashv$, etc.

Now, it is possible to continue the discourse of unary informational operators concerning formula $\vDash \alpha$ as an operand.

By definition, if α marks an informational entity, then α is informed. Inductively, on the basis of this fact, it is possible to construct an indefinite number of implications, namely,

$$[2.30]:\ \alpha \Rightarrow (\vDash \alpha);$$
$$(\vDash \alpha) \Rightarrow (\vDash (\vDash \alpha));$$
$$(\vDash (\vDash \alpha)) \Rightarrow (\vDash (\vDash (\vDash \alpha)));$$
$$\ldots\ldots\ldots\ldots$$
$$\text{"}\vDash\text{"} \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\}$$

Thus, by the property of transitivity, there is

$$[2.31]:\ \alpha \Rightarrow (\vDash \ldots (\vDash (\vDash \alpha)) \ldots);$$
$$\text{"}\vDash\text{"} \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\}$$

This formula says that informational entity can be informed in all possible ways concerning informational operators $\vDash$, $\VDash$, $\vdash$, $\Vdash$, $\nvDash$, $\nVDash$, $\nvdash$, $\nVdash$. It says again in a formally explicit way that α can be perplexedly complex in respect to parallel, serial, and parallel-serial informing in the sense "to be informed". Thus, informational entity α marks a system or network of informational processes which constitute it informationally. By this, an informational entity becomes a systemic notion or notion of an informational network.

Formula [2.31] is an explicit expression (through the use of explicit informational operators of the type $\vDash$) of the arising nature of informational entity α in the sense "to be informed". Besides of this explicitness of informational arising, there exists, by definition, also the operational implicitness (an implicit form of informational arising) of an informational entity α. This operational implicitness is coming to the surface when, for instance, an informational entity marked by α, is decomposed, and thus explicating its informational components (a composition of informational operators and operands). The origin of this discussion can be the following:

$$[2.32]:\ (\vDash \alpha) \Rightarrow \mathfrak{I}_{\rightarrow}(\alpha) \text{ or simply}$$
$$(\vDash \alpha) \Rightarrow \mathfrak{I}(\alpha)$$

where $\mathfrak{I}$ (or $\mathfrak{I}_{\rightarrow}$) is the implicit operator of informing or non-informing (or informing or non-informing from the left to the right). $\mathfrak{I}(\alpha)$ is a sort of functional expression which points out the operational component $\mathfrak{I}$ of the entity α. Obviously, inductively, the last expression can be expanded (decomposed), for instance, into

$$[2.33]:$$
$$(\vDash \alpha) \Rightarrow \mathfrak{I}(\alpha);$$
$$\mathfrak{I}(\alpha) \Rightarrow \mathfrak{I}(\mathfrak{I} \ldots (\mathfrak{I}(\alpha)) \ldots);$$
$$\mathfrak{I} \in \{\mathfrak{I}_{\vDash}, \mathfrak{I}_{\VDash}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\nvDash}, \mathfrak{I}_{\nVDash}, \mathfrak{I}_{\nvdash}, \mathfrak{I}_{\nVdash}\}$$

where $\mathfrak{I}_{\vDash}$, $\mathfrak{I}_{\VDash}$, $\mathfrak{I}_{\vdash}$, $\mathfrak{I}_{\Vdash}$, $\mathfrak{I}_{\nvDash}$, $\mathfrak{I}_{\nVDash}$, $\mathfrak{I}_{\nvdash}$, and $\mathfrak{I}_{\nVdash}$ mark the so called general ($\vDash$), parallel ($\VDash$), cyclic ($\vdash$), and parallel-cyclic case ($\Vdash$) of informing and general ($\nvDash$), parallel ($\nVDash$), cyclic ($\nvdash$), and parallel-cyclic case ($\nVdash$) of non-informing, respectively.

Formulas [2.30] - [2.33] can be repeated for the so-called alternative case of "to be informed" concerning operators $\Dashv$, $\DashV$, $\dashv$, $\dashV$, $\nDashv$, $\nDashV$, $\ndashv$, and $\ndashV$. Again, these cases can be expressed in a strict symmetric (right-left) form, for instance:

$$[2.34]:\ (\alpha \Dashv) \Leftarrow \alpha;$$
$$((\alpha \Dashv) \Dashv) \Leftarrow (\alpha \Dashv);$$
$$(((\alpha \Dashv) \Dashv) \Dashv) \Leftarrow ((\alpha \Dashv) \Dashv);$$
$$\ldots\ldots\ldots\ldots$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \nDashv, \nDashV, \ndashv, \ndashV\}$$

This, by the property of transitivity, yields

$$[2.35]:\ (\ldots ((\alpha \Dashv) \Dashv) \ldots \Dashv) \Leftarrow \alpha;$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \nDashv, \nDashV, \ndashv, \ndashV\}$$

Analogously to [2.32] the following alternative formula is obtained:

$$[2.36]:\ \mathfrak{I}_{\leftarrow}(\alpha) \Leftarrow (\alpha \Dashv) \text{ or simply}$$
$$\mathfrak{I}'(\alpha) \Leftarrow (\alpha \Dashv)$$

where $\mathfrak{I}'$ (or $\mathfrak{I}_{\leftarrow}$) is the implicit alternative operator of informing or non-informing (from the right to the left). $\mathfrak{I}'(\alpha)$ is the alternative functional expression which points out the alternative operational component $\mathfrak{I}'$ of the entity α in the case "to be informed". Obviously, inductively, the last expression can be expanded (decomposed), for instance, into

$$[2.37]:$$
$$\mathfrak{I}'(\alpha) \Leftarrow (\alpha \Dashv);$$

$['(\mathfrak{I}' \; \ldots \; (\mathfrak{I}'(\alpha)) \; \ldots \;) \Leftarrow \mathfrak{I}'(\alpha);$

$\mathfrak{I}' \in \{\mathfrak{I}'_{\Dashv}, \mathfrak{I}'_{\DashV}, \mathfrak{I}'_{\dashv}, \mathfrak{I}'_{\dashV}, \mathfrak{I}'_{\not\Dashv}, \mathfrak{I}'_{\not\DashV}, \mathfrak{I}'_{\not\dashv}, \mathfrak{I}'_{\not\dashV}\}$

where $\mathfrak{I}'_{\Dashv}$, $\mathfrak{I}'_{\DashV}$, $\mathfrak{I}'_{\dashv}$, $\mathfrak{I}'_{\dashV}$, $\mathfrak{I}'_{\not\Dashv}$, $\mathfrak{I}'_{\not\DashV}$, $\mathfrak{I}'_{\not\dashv}$, and $\mathfrak{I}'_{\not\dashV}$ mark the so called alternative general ($\Dashv$), parallel ($\DashV$), cyclic ($\dashv$), and parallel-cyclic case ($\dashV$) of informing and alternative general ($\not\Dashv$), parallel ($\not\DashV$), cyclic ($\not\dashv$), and parallel-cyclic case ($\not\dashV$) of non-informing, respectively. In this manner the alternativeness of informing and non-informing in the case "to be informed" is preserved also in an informationally implicit way.

Let us see how the "logically" pure meaning of negation can become informationally contestable, questionable, and insufficient in the case of "to be non-informed". Let be

[2.38]:

$$\neg(\models \alpha) \Rightarrow (\not\models \alpha);$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash\};$$
$$\text{"}\not\models\text{"} \in \{\not\models, \nVDash, \nvdash, \nVdash\};$$

$$(\alpha \not\Dashv) \Leftarrow (\neg(\alpha \Dashv);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV\};$$
$$\text{"}\not\Dashv\text{"} \in \{\not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

Concerning the last formula in which $\not\models$ is the operator of non-informing, it is possible to develop the following questions:

(1) If α marks an informational entity which is informed ($\models$ or $\Dashv$), how is this entity not informed ($\not\models$ or $\not\Dashv$)? Again, evidently, $\neg$ as an informational operator of negation does not possess a totally negational meaning (operational power).

(2) How is α not informed ($\not\models$ or $\not\Dashv$) and what does this non-informing mean?

(3) If it is said that α is not informed in a certain way, then α is either inhibited or is not capable to be informed in a certain way. Thus, it is possible to say, for instance, that α is informed in an inhibitory manner. This fact yields

[2.39]:

$$(\not\models \alpha) \Rightarrow (\models_i \alpha);$$
$$\text{"}\not\models\text{"} \in \{\not\models, \nVDash, \nvdash, \nVdash\};$$
$$\text{"}\models_i\text{"} \in \{\models_i, \VDash_i, \vdash_i, \Vdash_i\};$$

$$(\alpha \Dashv_i) \Leftarrow (\alpha \not\Dashv);$$
$$\text{"}\not\Dashv_i\text{"} \in \{\not\Dashv_i, \not\DashV_i, \not\dashv_i, \not\dashV_n\};$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV\}$$

The so-called non-informing ($\not\models$ or $\not\Dashv$) can be understood as inhibitive informing.

(4) The reverse can also be certain. If α is informed, then α is not informed in its all embracing informational variety or entirety. It is informed only in a certain way and not in all possible (universal) ways. Thus,

[2.40]:

$$(\models \alpha) \Rightarrow (\not\models_n \alpha);$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash\};$$
$$\text{"}\not\models_n\text{"} \in \{\not\models_n, \nVDash_n, \nvdash_n, \nVdash_u\};$$

$$(\alpha \not\Dashv_n) \Leftarrow (\alpha \Dashv);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV\};$$
$$\text{"}\not\Dashv_n\text{"} \in \{\not\Dashv_n, \not\DashV_n, \not\dashv_n, \not\dashV_n\}$$

where $\not\models_n$ and $\not\Dashv_n$ mark the non-universal informing. This fact can be explained by the intentional nature of informational arising regardless of a certain informational entity. Any informational entity, as a process of its informational existing and arising of information, possesses a certain orientation or intentionality to be informed and only in this manner can inform or can be informed.

(5) If β is informed by a certain informational entity α, where $\alpha \models \beta$ or $\beta \Dashv \alpha$, and entity β is not "sufficiently" sensitive to the informing of α, then β is not "adequately" informed by α, i.e., $\alpha \not\models \beta$ or $\beta \not\Dashv \alpha$. We have already examined this case by the expressions [2.21] and [2.22].

Again, the conclusion of this discussion is that general informational operators belonging to the classes $\models$, $\not\models$, $\Dashv$, and $\not\Dashv$ are relative to each other and that it is possible to use them according to the occurring circumstances, appropriateness, and needs.

2.3. Implications and Definitions Concerning Binary Informational Operators

Because of informing of an informational entity α, there may exist an informational entity β, which can be reached by the informing of α. In this case we say that α informs β or β is informed by α. It seems that every unary informational operator appears to be at least the binary one and, in general, the multiplex informational operator. In fact, the emphasizing of the unary nature of an informational operator is nothing else than concealing of informational source or sink in regard to the operand, being informationally connected with the unary operator.

The form $\alpha \models \beta$ or $\beta \Dashv \alpha$ says that α informs β or that β is informed by α. But, these formulas are implicatively open in the following sense:

[2.41]:

$$(\alpha \models \beta) \Rightarrow ((\alpha \models \beta) \models);$$
$$((\alpha \models \beta) \models) \; \mathrm{I}$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).((\alpha \models \beta) \models \xi, \eta, \ldots, \zeta));$$
$$(\alpha \models \beta) \Rightarrow (\models (\alpha \models \beta));$$
$$(\models (\alpha \models \beta)) \Rightarrow$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \models (\alpha \models \beta)));$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\};$$

$$(\Dashv (\beta \Dashv \alpha)) \Leftarrow (\beta \Dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).(\xi, \eta, \ldots, \zeta \Dashv (\beta \Dashv \alpha))$$
$$\Leftarrow (\Dashv (\beta \Dashv \alpha));$$
$$(\beta \Dashv \alpha) \Dashv) \Leftarrow (\beta \Dashv \alpha);$$
$$((\exists_\pi \xi, \eta, \ldots, \zeta).((\beta \Dashv \alpha) \Dashv \xi, \eta, \ldots, \zeta))$$
$$\Leftarrow ((\beta \Dashv \alpha) \Dashv);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If α informs β, i.e., $\alpha \models \beta$ or $\beta \Dashv \alpha$ then there may exist some informational entities ξ, η, $\ldots$, ζ, which are informed by the process $\alpha \models \beta$ or $\beta \Dashv \alpha$. The consequence of these implications might be

[2.42]: $(\alpha \models \beta) \Rightarrow (\exists_\pi ((\alpha \models \beta) \models (\alpha \models \beta)))$;
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \Vdash, \not\models, \parallel\!\not\models, \nvdash, \nVdash\}$;

$(\exists_\pi ((\beta \Dashv \alpha) \Dashv (\beta \Dashv \alpha))) \Leftarrow (\beta \Dashv \alpha)$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel, \not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

If α informs β∴ ∉δεδ∴ $\alpha \models \beta$ or $\beta \Dashv \alpha$, then these processes could inform itself.

It becomes evident (similar to the case of unary informational operators) that it is possible to particularize the general informational operator $\models$ by the so-called general operators (metaoperators) $\models$ and $\not\models$, general parallel operators $\parallel\!\models$ and $\parallel\!\not\models$, general cyclic operators $\vdash$ and $\nvdash$, and general parallel-cyclic operators $\Vdash$ and $\nVdash$. Thus,

[2.43]:

$(\alpha \models \beta) =_{Df} ((\alpha \parallel\!\models \beta) \vee (\alpha \vdash \beta) \vee (\alpha \Vdash \beta))$;
$(\alpha \not\models \beta) =_{Df} ((\alpha \parallel\!\not\models \beta) \vee (\alpha \nvdash \beta) \vee (\alpha \nVdash \beta))$;
$(\alpha \models \beta) \Rightarrow ((\alpha \models \beta) \vee (\alpha \not\models \beta))$

This definition says that α informs or does not inform β in a parallel, cyclic, and/or parallel-cyclic manner. The parallel-cyclic case is to be understood as a parallel and cyclically perplexing complex mode of informing of an informational entity.

In the similar way the performance of operator $\Dashv$ can be defined. This operator demon-strates the diversity and alternativeness against the general operator $\models$. Thus, adequately to [2.43] there is

[2.44]:

$(\beta \Dashv \alpha) =_{Df} ((\beta \Dashv\!\parallel \alpha) \vee (\beta \dashv \alpha) \vee (\beta \dashv\!\parallel \alpha))$;
$(\beta \not\Dashv \alpha) =_{Df} ((\beta \not\Dashv\!\parallel \alpha) \vee (\beta \not\dashv \alpha) \vee (\beta \not\dashv\!\parallel \alpha))$;
$(\beta \Dashv \alpha) \Rightarrow ((\beta \Dashv \alpha) \vee (\beta \not\Dashv \alpha))$;

The first two formulas in expressions [2.43] and [2.44] state that in the domain of informational connectedness, which can be at most a cyclic, parallel, parallel-cyclic, parallel-serial, or parallel-sequential structure, general informing or non-informing is nothing else than a type of these kinds of informing. The last formula in [2.43] and [2.44] implicates merely the metarole (metameaning) of operators $\models$ and $\Dashv$, respectively. At last, operator $\models$ can take over the role to be the only informational metaoperator. Thus, for instance, $\alpha \models$ can have the meaning of $\alpha \models$ as well as of $\Dashv \alpha$, etc.

By definition, if $\alpha \models \beta$ or $\beta \Dashv \alpha$ marks an informational process, then α informs β in one or another way. Inductively, on the basis of this fact, it is possible to construct an indefinite number of implications, namely,

[2.45]: $(\alpha \models \beta) \Rightarrow ((\alpha \models \beta) \models)$;
$((\alpha \models \beta) \models) \Rightarrow (((\alpha \models \beta) \models) \models)$;
$(((\alpha \models \beta) \models) \models) \Rightarrow ((((\alpha \models \beta) \models) \models) \models)$;
. . . .
$(\alpha \models \beta) \Rightarrow (\models (\alpha \models \beta))$;
$(\models (\alpha \models \beta)) \Rightarrow (\models (\models (\alpha \models \beta)))$;
$(\models (\models (\alpha \models \beta))) \Rightarrow (\models (\models (\models (\alpha \models \beta))))$;
. . . .
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \Vdash, \not\models, \parallel\!\not\models, \nvdash, \nVdash\}$;

$(\Dashv (\beta \Dashv \alpha)) \Leftarrow (\beta \Dashv \alpha)$;
$(\Dashv (\Dashv (\beta \Dashv \alpha))) \Leftarrow (\Dashv (\beta \Dashv \alpha))$;
$(\Dashv (\Dashv (\Dashv (\beta \Dashv \alpha)))) \Leftarrow (\Dashv (\Dashv (\beta \Dashv \alpha)))$;
. . . .
$((\beta \Dashv \alpha) \Dashv) \Leftarrow (\beta \Dashv \alpha)$;
$(((\beta \Dashv \alpha) \Dashv) \Dashv) \Leftarrow ((\beta \Dashv \alpha) \Dashv)$;
$((((\beta \Dashv \alpha) \Dashv) \Dashv) \Dashv) \Leftarrow (((\beta \Dashv \alpha) \Dashv) \Dashv)$;
. . . .
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel, \not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

Thus, by the property of transitivity, there is

[2.46]: $(\alpha \models \beta) \Rightarrow (\ \ldots (((\alpha \models \beta) \models) \models) \ldots \models)$;
$(\alpha \models \beta) \Rightarrow (\models \ldots (\models (\models (\alpha \models \beta))) \ldots\ )$;
"$\models$" $\in \{\models, \parallel\!\models, \vdash, \Vdash, \not\models, \parallel\!\not\models, \nvdash, \nVdash\}$;

$(\Dashv \ldots (\Dashv (\Dashv (\beta \Dashv \alpha))) \ldots\ ) \Leftarrow (\beta \Dashv \alpha)$;
$(\ \ldots (((\beta \Dashv \alpha) \Dashv) \Dashv) \ldots \Dashv) \Leftarrow (\beta \Dashv \alpha)$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel, \not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

Besides of this explicitness of informational arising, there exists, by definition, also the operational implicitness (an implicit form of informational arising) of an informational process $\alpha \models \beta$ or $\beta \Dashv \alpha$. This operational implicitness is coming to the surface when, for instance, an informational process marked by $\alpha \models \beta$ or $\beta \Dashv \alpha$, is decomposed, and thus explicating its informational components (a composition of informational operators and operands). Again, the origin of this discussion can be the following:

[2.47]: $((\alpha \models \beta) \models) \Rightarrow \mathfrak{I}_{\rightarrow}(\alpha \models \beta)$ or simply
$((\alpha \models \beta) \models) \Rightarrow \mathfrak{I}(\alpha \models \beta)$;
$(\models (\alpha \models \beta)) \Rightarrow \mathfrak{I}_{\rightarrow}(\alpha \models \beta)$ or simply
$(\models \pi\alpha \models \beta)) \Rightarrow \mathfrak{I}(\alpha \models \beta)$;

$\mathfrak{I}_{\leftarrow}(\beta \Dashv \alpha) \Leftarrow (\Dashv \pi\beta \Dashv \alpha))$ or simply
$\mathfrak{I}(\beta \Dashv \alpha) \Leftarrow (\Dashv \pi\beta \Dashv \alpha))$;
$\mathfrak{I}_{\leftarrow}(\beta \Dashv \alpha) \Leftarrow ((\beta \Dashv \alpha) \Dashv)$ or simply
$\mathfrak{I}(\beta \Dashv \alpha) \Leftarrow ((\beta \Dashv \alpha) \Dashv)$;

"$\models$" $\in \{\models, \parallel\!\models, \vdash, \Vdash, \not\models, \parallel\!\not\models, \nvdash, \nVdash\}$;
"$\Dashv$" $\in \{\Dashv, \Dashv\!\parallel, \dashv, \dashv\!\parallel, \not\Dashv, \not\Dashv\!\parallel, \not\dashv, \not\dashv\!\parallel\}$

where $\mathfrak{I}$ (or $\mathfrak{I}_{\rightarrow}$ or $\mathfrak{I}_{\leftarrow}$) is the implicit operator of informing or non-informing (or informing or non-informing from the left to the right or from the right to left). $\mathfrak{I}(\alpha \models \beta)$ or $\mathfrak{I}(\beta \Dashv \alpha)$ is a functional expression which points out the operational component $\mathfrak{I}$ of the process $\alpha \models \beta$ or $\beta \Dashv \alpha$. Obviously, inductively, the last expressions can be expanded (decomposed), for instance, into

[2.48]:
$((\alpha \models \beta) \models) \Rightarrow \mathfrak{I}(\alpha \models \beta)$;
$(\models (\alpha \models \beta)) \Rightarrow \mathfrak{I}(\alpha \models \beta)$;
$\mathfrak{I}(\alpha \models \beta) \Rightarrow \mathfrak{I}(\mathfrak{I} \ldots (\mathfrak{I}(\alpha \models \beta)) \ldots\ )$;
$\mathfrak{I} \in \{\mathfrak{I}_{\models}, \mathfrak{I}_{\parallel\models}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\not\models}, \mathfrak{I}_{\parallel\not\models}, \mathfrak{I}_{\nvdash}, \mathfrak{I}_{\nVdash}\}$;

$\mathfrak{I}(\beta \Dashv \alpha) \Leftarrow (\Dashv (\beta \Dashv \alpha))$;
$\mathfrak{I}(\beta \Dashv \alpha) \Leftarrow ((\beta \Dashv \alpha) \Dashv)$;

$$\mathfrak{I}(\mathfrak{I}\ \dots\ (\mathfrak{I}(\beta \Dashv \alpha))\ \dots\ ) \Leftarrow \mathfrak{I}(\beta \Dashv \alpha);$$
$$\mathfrak{I} \in \{\mathfrak{I}_{\Dashv}, \mathfrak{I}_{\DashV}, \mathfrak{I}_{\dashv}, \mathfrak{I}_{\dashV}, \mathfrak{I}_{\not\Dashv}, \mathfrak{I}_{\not\DashV}, \mathfrak{I}_{\not\dashv}, \mathfrak{I}_{\not\dashV}\}$$

where $\mathfrak{I}_{\models}$, $\mathfrak{I}_{\VDash}$, $\mathfrak{I}_{\vdash}$, $\mathfrak{I}_{\Vdash}$, $\mathfrak{I}_{\nvDash}$, $\mathfrak{I}_{\nVDash}$, $\mathfrak{I}_{\nvdash}$, $\mathfrak{I}_{\nVdash}$ and $\mathfrak{I}_{\Dashv}$, $\mathfrak{I}_{\DashV}$, $\mathfrak{I}_{\dashv}$, $\mathfrak{I}_{\dashV}$, $\mathfrak{I}_{\not\Dashv}$, $\mathfrak{I}_{\not\DashV}$, $\mathfrak{I}_{\not\dashv}$, $\mathfrak{I}_{\not\dashV}$ mark the so called general ($\models$ and $\Dashv$), parallel ($\VDash$ and $\DashV$), cyclic ($\vdash$ and $\dashv$), and parallel-cyclic case ($\Vdash$ and $\dashV$) of informing and general ($\nvDash$ and $\not\Dashv$), parallel ($\nVDash$ and $\not\DashV$), cyclic ($\nvdash$ and $\not\dashv$), and parallel-cyclic case ($\nVdash$ and $\not\dashV$) of non-informing, respectively.

2.4. Implications and Definitions Concerning Multiplex Informational Operators

Inductively, from binary informational operators it is possible to proceed to the case dealing with multiplex informational operators. In principle, by definition, each informational operator can perform as a unary, binary, or multiplex operator. The nature of the multiplex operators has to be explained. In the case of a unary operator, its operativeness remains open in the sense that there exist possibilities of its connection to other, explicitly hidden operands. In the case of a binary operator, the operator's connectivity concerns the left and the right operand, however, the openness in the sense of a unary operator to other, yet unrevealed operands still exists. Only in the case of a multiplex operator, the dilemma of openness can vanish, for multiplex operator, in any case, concerns a multiple of informational operands, however, remains still open to the unrevealed operands.

Because of informing of informational entities (operands), marked by $\alpha, \beta, \dots, \gamma$, there may exist informational entities (operands), marked by $\xi, \eta, \dots, \zeta$, which can be informationally reached by the informing of entities $\alpha, \beta, \dots, \gamma$. In this case we say that $\alpha, \beta, \dots, \gamma$ inform $\xi, \eta, \dots, \zeta$ or that $\xi, \eta, \dots, \zeta$ are informed by $\alpha, \beta, \dots, \gamma$. In this respect it seems that every unary or binary informational operator appears to be also a (hidden, in its entirety unrevealed) multiplex informational operator.

The form $\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta$ or the form $\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma$ says that entities $\alpha, \beta, \dots, \gamma$ perplexedly inform entities $\xi, \eta, \dots, \zeta$ or that entities $\xi, \eta, \dots, \zeta$ are perplexdly informed by entities $\alpha, \beta, \dots, \gamma$. But, these formulas are inductively implicatively open in the following sense:

[2.49]:

$$(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \Rightarrow$$
$$((\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \models);$$

$$((\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \models) \Rightarrow$$
$$((\exists_\pi\ \varphi, \psi, \dots, \tau).$$
$$((\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \models$$
$$\varphi, \psi, \dots, \tau));$$

$$(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \Rightarrow$$
$$(\models (\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta));$$

$$(\models (\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta)) \Rightarrow$$

$$((\exists_\pi\ \varphi, \psi, \dots, \tau).$$
$$(\varphi, \psi, \dots, \tau \models$$
$$(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta)));$$

$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\Dashv (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma))$$
$$\Leftarrow (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma);$$

$$((\exists_\pi\ \varphi, \psi, \dots, \tau).$$
$$(\varphi, \psi, \dots, \tau$$
$$\Dashv (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma))$$
$$\Leftarrow (\Dashv (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma));$$

$$(\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma) \Dashv)$$
$$\Leftarrow (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma);$$

$$((\exists_\pi\ \varphi, \psi, \dots, \tau).$$
$$((\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma)$$
$$\Dashv \varphi, \psi, \dots, \tau))$$
$$\Leftarrow ((\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma) \Dashv);$$

$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If $\alpha, \beta, \dots, \gamma$ inform $\xi, \eta, \dots, \zeta$, i.e., $\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta$ or $\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma$ then there may exist some informational entities $\varphi, \psi, \dots, \tau$, which are informed by the process $\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta$ or $\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma$. The consequence of these implications might be

[2.50]: $(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \Rightarrow$

$$(\exists_\pi\ ((\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) \models$$
$$(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta)));$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$

$$(\exists_\pi\ ((\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma)$$
$$\Dashv (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma)))$$
$$\Leftarrow (\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma);$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

If $\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta$ inform $\xi, \eta, \dots, \zeta$, i.e., $\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta$ or $\xi, \eta, \dots, \zeta \Dashv \alpha, \beta, \dots, \gamma$, then these processes could inform itself.

Again, it becomes evident (similar to the case of unary informational operators) that it is possible to particularize the multiplex general informational operator $\models$ by the so-called multiplex general operators (metaoperators) $\models$ and $\nvDash$, multiplex general parallel operators $\VDash$ and $\nVDash$, multiplex general cyclic operators $\vdash$ and $\nvdash$, and multiplex general parallel-cyclic operators $\Vdash$ and $\nVdash$. Thus,

[2.51]:

$$(\alpha, \beta, \dots, \gamma \models \xi, \eta, \dots, \zeta) =_{Df}$$
$$((\alpha, \beta, \dots, \gamma \VDash \xi, \eta, \dots, \zeta) \lor$$
$$(\alpha, \beta, \dots, \gamma \vdash \xi, \eta, \dots, \zeta) \lor$$
$$(\alpha, \beta, \dots, \gamma \Vdash \xi, \eta, \dots, \zeta));$$

$$
\begin{aligned}
&(\alpha, \beta, \ldots, \gamma \not\models \xi, \eta, \ldots, \zeta) =_{Df} \\
&((\alpha, \beta, \ldots, \gamma \nVDash \xi, \eta, \ldots, \zeta) \vee \\
&\ (\alpha, \beta, \ldots, \gamma \nvdash \xi, \eta, \ldots, \zeta) \vee \\
&\ (\alpha, \beta, \ldots, \gamma \nVdash \xi, \eta, \ldots, \zeta));
\end{aligned}
$$

$$
\begin{aligned}
&(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow \\
&((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \vee \\
&\ (\alpha, \beta, \ldots, \gamma \not\models \xi, \eta, \ldots, \zeta))
\end{aligned}
$$

This definition says that $\alpha, \beta, \ldots, \gamma$ inform or do not inform $\xi, \eta, \ldots, \zeta$ in a parallel, cyclic, and/or parallel-cyclic manner. The parallel-cyclic case is to be understood as a parallel and cyclically perplexing complex mode of informing of an informational entity.

In the similar way the multiplex performance of operator $\Dashv$ can be defined. This operator demon-strates the diversity and alternativeness against the general multiplex operator $\models$. Thus, adequately to [2.51], there is

[2.52]:

$$
\begin{aligned}
&(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) =_{Df} \\
&((\xi, \eta, \ldots, \zeta \DashV \alpha, \beta, \ldots, \gamma) \vee \\
&\ (\xi, \eta, \ldots, \zeta \dashv \alpha, \beta, \ldots, \gamma) \vee \\
&\ (\xi, \eta, \ldots, \zeta \dashV \alpha, \beta, \ldots, \gamma));
\end{aligned}
$$

$$
\begin{aligned}
&(\xi, \eta, \ldots, \zeta \not\Dashv \alpha, \beta, \ldots, \gamma) =_{Df} \\
&((\xi, \eta, \ldots, \zeta \not\DashV \alpha, \beta, \ldots, \gamma) \vee \\
&\ (\xi, \eta, \ldots, \zeta \not\dashv \alpha, \beta, \ldots, \gamma) \vee \\
&\ (\xi, \eta, \ldots, \zeta \not\dashV \alpha, \beta, \ldots, \gamma));
\end{aligned}
$$

$$
\begin{aligned}
&(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Rightarrow \\
&((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \vee \\
&\ (\xi, \eta, \ldots, \zeta \not\Dashv \alpha, \beta, \ldots, \gamma));
\end{aligned}
$$

These cases of formulas concern multiplex informational operators in the similar way as were the cases of unary and binary informational operators.

By definition, if $\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta$ or $\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma$ marks an informational process, then $\alpha, \beta, \ldots, \gamma$ inform $\xi, \eta, \ldots, \zeta$ in one or another way. Inductively, on the basis of this fact, it is possible to construct an indefinite number of implications, namely,

[2.53]:

$$
\begin{aligned}
&(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow \\
&((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models); \\
&((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \Rightarrow \\
&(((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \models); \\
&(((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \models) \Rightarrow \\
&((((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \models) \models); \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
&(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow \\
&(\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)); \\
&(\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)) \Rightarrow \\
&(\models (\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta))); \\
&(\models (\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta))) \Rightarrow \\
&(\models (\models (\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)))); \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
&\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\};
\end{aligned}
$$

$$
\begin{aligned}
&(\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)) \\
\Leftarrow\ &(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma); \\
&(\Dashv (\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma))) \\
\Leftarrow\ &(\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)); \\
&(\Dashv (\Dashv (\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)))) \\
\Leftarrow\ &(\Dashv (\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma))); \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
&((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv) \\
\Leftarrow\ &(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma); \\
&(((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv) \Dashv) \\
\Leftarrow\ &((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv); \\
&((((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv) \Dashv) \Dashv) \\
\Leftarrow\ &(((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv) \Dashv); \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
&\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}
\end{aligned}
$$

Thus, by the property of transitivity, there is

[2.54]:

$$
\begin{aligned}
&(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow \\
&(\ \ldots (((\alpha, \beta, \ldots, \gamma \models \\
&\qquad \xi, \eta, \ldots, \zeta) \models) \models) \ldots \models); \\
&(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow \\
&(\models \ldots (\models (\models (\alpha, \beta, \ldots, \gamma \models \\
&\qquad \xi, \eta, \ldots, \zeta))) \ldots\ ); \\
&\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\};
\end{aligned}
$$

$$
\begin{aligned}
&(\Dashv \ldots (\Dashv (\Dashv (\xi, \eta, \ldots, \zeta \Dashv \\
&\qquad \alpha, \beta, \ldots, \gamma))) \ldots\ ) \\
\Leftarrow\ &(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma); \\
&(\ \ldots (((\xi, \eta, \ldots, \zeta \Dashv \\
&\qquad \alpha, \beta, \ldots, \gamma) \Dashv) \Dashv) \ldots \Dashv) \\
\Leftarrow\ &(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma); \\
&\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}
\end{aligned}
$$

Besides of this explicitness of informational arising, there exists, by definition, also the operational implicitness (an implicit form of informational arising) of an informational process $\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta$ or $\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma$. This operational implicitness is coming to the surface when, for instance, an informational process marked by $\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta$ or $\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma$, is decomposed, and thus explicating its informational components (a composition of informational operators and operands). Again, the origin of this discussion can be the following:

[2.55]:

$$
\begin{aligned}
&((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \Rightarrow \\
&\mathfrak{I}_{\rightarrow}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \text{ or simply} \\
&((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \Rightarrow \\
&\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta); \\
&(\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)) \Rightarrow \\
&\mathfrak{I}_{\rightarrow}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \text{ or simply} \\
&(\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)) \Rightarrow \\
&\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta);
\end{aligned}
$$

$$
\begin{aligned}
&\mathfrak{I}_{\leftarrow}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \\
\Leftarrow\ &(\Dashv \pi\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)) \text{ or simply} \\
&\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \\
\Leftarrow\ &(\Dashv \pi\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma));
\end{aligned}
$$

$$\mathfrak{I}_{\leftarrow}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)$$
$$\Leftarrow ((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv) \text{ or simply}$$
$$\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)$$
$$\Leftarrow ((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv);$$

$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$$
$$\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$$

where $\mathfrak{I}$ (or $\mathfrak{I}_{\rightarrow}$ or $\mathfrak{I}_{\leftarrow}$) is the implicit operator of informing or non-informing (or informing or non-informing from the left to the right or from the right to left). $\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)$ or $\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)$ is a functional expression which points out the operational component $\mathfrak{I}$ of the process $\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta$ or $\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma$. Obviously, inductively, the last expressions can be expanded (decomposed), for instance, into

[2.56]:

$$((\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \models) \Rightarrow$$
$$\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta);$$
$$(\models (\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)) \Rightarrow$$
$$\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta);$$
$$\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta) \Rightarrow$$
$$\mathfrak{I}(\mathfrak{I} \ldots (\mathfrak{I}(\alpha, \beta, \ldots, \gamma \models \xi, \eta, \ldots, \zeta)) \ldots);$$
$$\mathfrak{I} \in \{\mathfrak{I}_{\models}, \mathfrak{I}_{\VDash}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\nvDash}, \mathfrak{I}_{\nVDash}, \mathfrak{I}_{\nvdash}, \mathfrak{I}_{\nVdash}\};$$

$$\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)$$
$$\Leftarrow (\Dashv (\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma));$$
$$\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)$$
$$\Leftarrow ((\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma) \Dashv);$$
$$\mathfrak{I}(\mathfrak{I} \ldots (\mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma)) \ldots)$$
$$\Leftarrow \mathfrak{I}(\xi, \eta, \ldots, \zeta \Dashv \alpha, \beta, \ldots, \gamma);$$
$$\mathfrak{I} \in \{\mathfrak{I}_{\Dashv}, \mathfrak{I}_{\DashV}, \mathfrak{I}_{\dashv}, \mathfrak{I}_{\dashV}, \mathfrak{I}_{\not\Dashv}, \mathfrak{I}_{\not\DashV}, \mathfrak{I}_{\not\dashv}, \mathfrak{I}_{\not\dashV}\}$$

where $\mathfrak{I}_{\models}, \mathfrak{I}_{\VDash}, \mathfrak{I}_{\vdash}, \mathfrak{I}_{\Vdash}, \mathfrak{I}_{\nvDash}, \mathfrak{I}_{\nVDash}, \mathfrak{I}_{\nvdash}, \mathfrak{I}_{\nVdash}$ and $\mathfrak{I}_{\Dashv}, \mathfrak{I}_{\DashV}, \mathfrak{I}_{\dashv}, \mathfrak{I}_{\dashV}, \mathfrak{I}_{\not\Dashv}, \mathfrak{I}_{\not\DashV}, \mathfrak{I}_{\not\dashv}, \mathfrak{I}_{\not\dashV}$ mark the so called general ($\models$ and $\Dashv$), parallel ($\VDash$ and $\DashV$), cyclic ($\vdash$ and $\dashv$), and parallel-cyclic case ($\Vdash$ and $\dashV$) of informing and general ($\nvDash$ and $\not\Dashv$), parallel ($\nVDash$ and $\not\DashV$), cyclic ($\nvdash$ and $\not\dashv$), and parallel-cyclic case ($\nVdash$ and $\not\dashV$) of non-informing, respectively.

3. INFORMATIONAL OPERANDS

3.0. Introduction

Informational algebra organizes the transformation of informational formulas which are formal compositions of informational operands and operators. In formulas as in any formal system, operands are markers of distinct informational processes and as such can be decomposed into formulas in which to the original operand markers new informational compositions, i.e. formulas come into existence. The decomposition (in some cases called also the particularization) principle of operands enables the so-called informational analysis being the basic counter-informational property of the concept of information (in this case on the level of a formula). Thus, informational operands are markers (the simplest form of formulas or elementary formulas) which can be decomposed into informationally compound formulas. Thus, the notion of a concrete informational operand is always a relative one. By decomposition of an operand its operational components and, through these, its implicit operational nature are coming into explicitness (existence).

An informational operand - simple or composed - models an informational process. Formulas as operands are models of processes on the level of informational logic or informational algebra. Thus, logic or algebra becomes a tool for modeling of various informational processes or of processes which can be understood as informational or transformed, for instance, from physical, chemical, physiological, neuropsychological, cosmic processes, etc. into informational ones. On the level of anthropological awareness, informational processes concern the anthropological autopoiesis and, thus, experiencing and understanding of the world is nothing else than informational modeling within the possibilities of the autopoietic shell of a being. Then, informational or informationally modeling limits can concern only informational capabilities of the autopoietic shell. In this way, informing is always modeling and reality, and the awareness about reality of the world can be only informational, i.e., informationally modeled. An informational operand as informational formula is a formal mood of model which can be operated as any other informational entity.

3.1. Elementary informational operands

An elementary informational entity or operand α is elementary only to the extent that it informs and is informed. We shall see later how this property leads to the algebraic non-elementariness of an elementary operand. The consequence of this principle is that each elementary operand can always be algebraically transformed into a non-elementary expression, i.e., into composed (non-elementary) informational formula.

For, in general, informational operand informs and is informed, it is informationally open. The openness of an informational operand means that there may exist other informational operands which are informed by this operand and which can inform it. This fact can be expressed generally by unary informational operators concerning the operand.

Further, an informational operand can be decomposed not only formally in the sense of unary operators, but also by informational analysis of its structure or organization. This process leads to the transformation of an elementary formula (a single operand) into informationally composed expression of operands and operators (formula).

3.2. Composed Informational Operands: the Real Informational Formulas

A single informational operand represents a trivial informational formula, for on the formalistic level it operates as a static or as a pure representational or marking entity. It merely designates an informational process which can possibly be decomposed into a more detailed operator and operand expression. In this way, in principle, the process of possible further decomposition never ends. However, by way of decomposition also processes of substitution, change, and vanishing of informational entities (operands and operators) can occur. We say that the decomposition process de-trivializes the marking nature of an operand.

To some extent, by rules of informational algebra, decomposition processes can be automatized, i.e., formal informational transformations of single operands and composite formulas can be performed by means of the algebraic apparatus. In this way also the reverse processes or rules to decomposition (we can call them universalization, recomposition, reduction, etc.) can be imagined, i.e. expressed in the informationally formal algebraic form. We have already learned some of these rules having universal and particular informational operators, for instance, the informational metaoperator $\models$ and its general, parallel, serial, parallel-serial, and to them alternative forms and their various particularizations (implication, equivalence, and other logical operators).

3.3. Ways of Decomposition and Recomposition (Marking, Symbolizing) of Operands

The rules of informational algebra concern decompositional as well as recompositional processes applied to various informational formulas. The question to state is what is the logic of informational decomposition and recomposition. It is evident that on the level of this decision various, linguistically or discursively structured logical approaches can be applied. The variety of extracting information (in the form of informational formulas) is, for instance, given by the so-called modi informationis [4]. Various operational concepts can be borrowed from the modal logic and from other theories of logic.

In informational algebra there do not exist rules prohibiting in advance the spontaneous processes of operand and operator particularization and universalization within decomposed and recomposed informational formulas.

By decomposition of a variable (informational operand), implicit variables are coming into existence. For example, if informational entity marked by α is decomposed, hidden variables arise or come into existence. By decomposition, the implicitness is made explicit, however, this is only another term for informational arising of the given informational entity α.

Instead of hidden variables it is possible to speak of variables, which do not inform and are non-informed yet. As we understand, the concept of decomposition puts an informational formula to the level of an arising informational entity. Thus, an informational formula itself performs as arising information.

3.4. Substitution within Decomposed Operands

As far as informational operands are merely marked and their decompositions do not exist, the initial process of their decomposing can begin. The process of decomposition is spontaneous to some extent, according to the semantic context of the formula in which operands appear.

Substitution of an operand by a formula is nothing else than a form of radical change or decomposition of the operand in question. It means that this operand transits from its marking-symbolic state into the formal composition which is structured on the level of operands connected via operators.

4. SOME FORMS OF INFORMATIONAL ALGEBRAS

> The principle of all principles comprises the thesis on the priority of the method. This principle decides about that which thing alone can satisfy the method.
>
> Martin Heidegger [11] 70

4.1. Introduction

In which way an informational algebra could be self-sufficient? How it could satisfy the metaprinciple which governs all the informational principles?

An informational algebra can concern several algebraic modes, from the most general to the most convenient, e.g., traditionally logical ones. The algebraic modes, we will deal with, are self-informational, general informational, informational implicative, informational equivalent, and informational modal. The last class of algebras will concern the most complex algebras imaginable today.

4.2. The Self-informational Algebra

The self-informational algebra is the basis of any informational algebra. Written algebraic expressions or formulas can be understood as being composed only of operands and operators. By another informational operation, called informational substitution and marked by the operator $\models_{\rightarrow}$, it is possible to construct recursively the entire system of algebraic rules of self-informational algebra. In the most general form this system becomes

$$[4.1]:\quad \alpha \models_{\rightarrow} (\alpha;\ \models \alpha \models;\ \alpha \models;\ \models \alpha;\ \alpha \models \alpha);$$
$$\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash,$$
$$\Dashv, \DashV, \dashv, \dashV, \nDashv, \nDashV, \ndashv, \ndashV\}$$

etc. where occurring metaoperands α and occurring metaoperators $\models$ can be particularized from case to case, according to the requirements (needs, circumstances). However, in this context one exception has to be mentioned: in $\models \alpha \models$, the case (α) is meant, where $\models_{(} \alpha \models_{)}$ is parenthetically particularized form of $\models \alpha \models$. Similarly, the semicolon in [4.1] can be understood as particularization of the form $\models_{;}$, etc. (For instance, also quotation-marks, $\in$, {, }, and comma in [4.1] are nothing else than particular operators). A sequence of operands can be obtained by recursive use of $\alpha \models \alpha$, where $\models$ can represent any separator, for instance, comma, semicolon, etc.

Formula [4.1] is read in the following way: an informational operand α can be substituted by (operator $\models_{\rightarrow}$) entities listed within the parentheses on the right side of $\models_{\rightarrow}$. Further, the metaoperator $\models$ can be particularized by any other general operator (on the right of $\in$) and certainly (this is not marked explicitly by [4.1]) by any imaginable informational operator.

Let us look at a system of algebraic rules of self-informational algebra proceeding from the formula [4.1]. Let be, for instance:

[4.2]:
[1] $"\models" \in \{\models, \Vdash, \vdash, \Vvdash, \not\models, \nVdash, \nvdash, \nVvdash\}$;
[2] $"\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$;
[3] α; (α); [single operand expressions];
[4] $\alpha \models \alpha;\ \alpha \Dashv \alpha;$
[5] $\alpha \models (\alpha);\ (\alpha) \models \alpha;\ (\alpha) \models (\alpha);$
$(\alpha) \Dashv \alpha;\ \alpha \Dashv (\alpha);\ (\alpha) \Dashv (\alpha);$
[6] $\alpha \models;\ \Dashv \alpha;\ (\alpha) \models;\ \Dashv (\alpha);$
[7] $\models \alpha;\ \alpha \Dashv;\ \models (\alpha);\ (\alpha) \Dashv;$
[8] $\alpha \models (\alpha \models);\ (\Dashv \alpha) \Dashv \alpha;$
[9] $\alpha \models (\models \alpha);\ (\alpha \Dashv) \Dashv \alpha;$
[10] $\alpha \Dashv (\alpha \models);\ (\alpha \models) \Dashv \alpha;$
[11] $\alpha \Dashv (\models \alpha);\ (\models \alpha) \Dashv \alpha;$
[12] $(\alpha \models) \models \alpha;\ \alpha \Dashv (\Dashv \alpha);$
[13] $(\models \alpha) \models \alpha;\ \alpha \Dashv (\alpha \Dashv);$
[14] $(\Dashv \alpha) \models \alpha;\ \alpha \Dashv (\alpha \models);$
[15] $(\alpha \Dashv) \models \alpha;\ \alpha \Dashv (\models \alpha);$
[16] $\alpha \models (\alpha \models \alpha);\ (\alpha \Dashv \alpha) \Dashv \alpha;$
[17] $\alpha \Dashv (\alpha \models \alpha);\ (\alpha \models \alpha) \Dashv \alpha;$
[18] $(\alpha \models \alpha) \models \alpha;\ \alpha \Dashv (\alpha \Dashv \alpha);$
[19] $(\alpha \Dashv \alpha) \models \alpha;\ \alpha \Dashv (\alpha \models \alpha);$
[20] $\alpha \models (\alpha \models (\alpha \models));\ ((\Dashv \alpha) \Dashv \alpha) \Dashv \alpha;$
[21] $\alpha \models (\alpha \models (\models \alpha));\ ((\alpha \Dashv) \Dashv \alpha) \Dashv \alpha;$
[22] $\alpha \models ((\alpha \models) \models \alpha);\ (\alpha \Dashv (\Dashv \alpha)) \Dashv \alpha;$
[23] $\alpha \models ((\models \alpha) \models \alpha);\ (\alpha \Dashv (\alpha \Dashv)) \Dashv \alpha;$
[24] $((\alpha \models) \models \alpha) \models \alpha;\ \alpha \Dashv (\alpha \Dashv (\Dashv \alpha));$
[25] $((\models \alpha) \models \alpha) \models \alpha;\ \alpha \Dashv (\alpha \Dashv (\alpha \Dashv));$
[26] $\alpha \Dashv (\alpha \models (\alpha \models));\ ((\alpha \models) \Dashv \alpha) \models \alpha;$
[27] $\alpha \Dashv (\alpha \models (\models \alpha));\ ((\models \alpha) \Dashv \alpha) \models \alpha;$
[28] $\alpha \Dashv ((\alpha \models) \models \alpha);\ (\alpha \Dashv (\models \alpha)) \models \alpha;$
[29] $\alpha \models (\alpha \Dashv (\alpha \models));\ ((\Dashv \alpha) \models \alpha) \Dashv \alpha;$
[30] $\alpha \models (\alpha \models (\Dashv \alpha));\ ((\Dashv \alpha) \Dashv \alpha) \models \alpha;$
. . . .

etc., ad infinitum. It is evident that arbitrarily complex formula consisting of operands α, operators $\models$ and $\Dashv$, and parentheses '(' and ')' can be generated (automatically).

System [4.1] suggests also generation of systems of informational formulas. Such systems, if marked (similarly as the system [4.1]) can be parenthesized. From [4.1], for instance, system formulas

[4.3]:
[1] $(\alpha);$
[2] $(\alpha;\ \alpha;\ \ldots\ ;\ \alpha);$
[3] $(\alpha;\ (\alpha));\ ((\alpha);\ \alpha);$
[4] $(\alpha;\ (\alpha \models));\ ((\Dashv \alpha);\ \alpha);$
[5] $(\alpha;\ (\models \alpha));\ ((\alpha \Dashv);\ \alpha);$
[6] $(\alpha;\ ((\alpha \models);\ (\models \alpha));\ ((\alpha \Dashv);\ (\Dashv \alpha);\ \alpha);$
[7] $(\alpha;\ (\alpha \models \alpha));\ ((\alpha \Dashv \alpha);\ \alpha);$
[8] $((\alpha \models);\ (\alpha \models \alpha));\ ((\alpha \Dashv \alpha);\ (\Dashv \alpha));$
[9] $((\models \alpha);\ (\alpha \models \alpha));\ ((\alpha \Dashv \alpha);\ (\alpha \Dashv));$
. . . .
$"\models" \in \{\models, \Vdash, \vdash, \Vvdash, \not\models, \nVdash, \nvdash, \nVvdash\}$;
$"\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$

can be generated ad infinitum.

Further, it is worth to stress how the unary metaoperators $\models$ and $\Dashv$ appear dually on the formal level in regard to each other. While, for instance, operator $\models$ is in the function 'to inform', operator $\Dashv$ is in the function 'to be informed'. This duality extends also vice versa: while operator $\Dashv$ is in the function 'to inform', operator $\models$ is in the function 'to be informed'. This is true in the case $\alpha \models$ and $\alpha \Dashv$ and in the case $\models \alpha$ and $\Dashv \alpha$, where always the active and passive function of informing (to inform and to be informed, respectively) stay dually against each other. This fact might entitle the initial introduction of the dual operator $\Dashv$ to the operator $\models$, pointing to deeper consequences which might follow from such initial (intuitive) choice.

4.3. The General Informational Algebra

The step from the self-informational algebra to the general informational algebra roots primarily in the substitution of informational operands α by differently marked informational operands, say $\alpha, \beta, \gamma, \ldots$ in algebraic systems [4.2] and [4.3]. Under these circumstances, markers of informational operands ξ belong to all possible operand markers, for instance to $\alpha, \beta, \gamma, \ldots$. In this case, system [4.2] simply passes over to the system

[4.4]:
[0] $"\xi" \in \{\alpha, \beta, \gamma, \ldots, \xi, \ldots\}$;
[1] $"\models" \in \{\models, \Vdash, \vdash, \Vvdash, \not\models, \nVdash, \nvdash, \nVvdash\}$;
[2] $"\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\}$;
[3] ξ; (ξ); [single operand expressions];
[4] $\xi \models \xi;\ \xi \Dashv \xi;$
[5] $\xi \models (\xi);\ (\xi) \models \xi;\ (\xi) \models (\xi);$
$(\xi) \Dashv \xi;\ \xi \Dashv (\xi);\ (\xi) \Dashv (\xi);$
[6] $\xi \models;\ \Dashv \xi;\ (\xi) \models;\ \Dashv (\xi);$
[7] $\models \xi;\ \xi \Dashv;\ \models (\xi);\ (\xi) \Dashv;$
[8] $\xi \models (\xi \models);\ (\Dashv \xi) \Dashv \xi;$
[9] $\xi \models (\models \xi);\ (\xi \Dashv) \Dashv \xi;$
[10] $\xi \Dashv (\xi \models);\ (\xi \models) \Dashv \xi;$

[11] ξ ⫤ (⊨ ξ); (⊨ ξ) ⫤ ξ;
[12] (ξ ⊨) ⊨ ξ; ξ ⫤ (⫤ ξ);
[13] (⊨ ξ) ⊨ ξ; ξ ⫤ (ξ ⫤);
[14] (⫤ ξ) ⊨ ξ; ξ ⫤ (ξ ⊨);
[15] (ξ ⫤) ⊨ ξ; ξ ⫤ (⊨ ξ);
[16] ξ ⊨ (ξ ⊨ ξ); (ξ ⫤ ξ) ⫤ ξ;
[17] ξ ⫤ (ξ ⊨ ξ); (ξ ⊨ ξ) ⫤ ξ;
[18] (ξ ⊨ ξ) ⊨ ξ; ξ ⫤ (ξ ⫤ ξ);
[19] (ξ ⫤ ξ) ⊨ ξ; ξ ⫤ (ξ ⊨ ξ);
[20] ξ ⊨ (ξ ⊨ (ξ ⊨)); ((⫤ ξ) ⫤ ξ) ⫤ ξ;
[21] ξ ⊨ (ξ ⊨ (⊨ ξ)); ((ξ ⫤) ⫤ ξ) ⫤ ξ;
[22] ξ ⊨ ((ξ ⊨) ⊨ ξ); (ξ ⫤ (⫤ ξ)) ⫤ ξ;
[23] ξ ⊨ ((⊨ ξ) ⊨ ξ); (ξ ⫤ (ξ ⫤)) ⫤ ξ;
[24] ((ξ ⊨) ⊨ ξ) ⊨ ξ; ξ ⫤ (ξ ⫤ (⫤ ξ));
[25] ((⊨ ξ) ⊨ ξ) ⊨ ξ; ξ ⫤ (ξ ⫤ (ξ ⫤));
[26] ξ ⫤ (ξ ⊨ (ξ ⊨)); ((ξ ⊨) ⫤ ξ) ⊨ ξ;
[27] ξ ⫤ (ξ ⊨ (⊨ ξ)); ((⊨ ξ) ⫤ ξ) ⊨ ξ;
[28] ξ ⫤ ((ξ ⊨) ⊨ ξ); (ξ ⫤ (⊨ ξ)) ⊨ ξ;
[29] ξ ⊨ (ξ ⫤ (ξ ⊨)); ((⫤ ξ) ⊨ ξ) ⫤ ξ;
[30] ξ ⊨ (ξ ⊨ (⫤ ξ)); ((⫤ ξ) ⫤ ξ) ⊨ ξ;
. . . .

etc., ad infinitum. It is evident that arbitrarily complex formula consisting of operands α, β, γ, ..., ξ, ..., operators ⊨ and ⫤, and parentheses '(' and ')' can be generated (automatically). For instance, in case [30], there is ω ⊨ (τ ⊨ (⫤ ψ)); ((⫤ φ) ⫤ σ) ⊨ ρ.

Again, system [4.1] suggests also the generation of systems of informational formulas with differently marked operands. Such systems, if marked (similarly as the system [4.1]) can be parenthesized. From [4.3], for instance, system formulas

[4.5]:
[1] (ξ);
[2] (ξ; ξ; ... ; ξ);
[3] (ξ; (ξ)); ((ξ); ξ);
[4] (ξ⊥ (ξ ⊨)); ((⫤ ξ); ξ);
[5] (ξ; (⊨ ξ)); ((ξ ⫤); ξ);
[6] (ξ; ((ξ ⊨); (⊨ ξ)); ((ξ ⫤); (⫤ ξ); ξ);
[7] (ξ; (ξ ⊨ ξ)); ((ξ ⫤ ξ); ξ);
[8] ((ξ ⊨); (ξ ⊨ ξ)); ((ξ ⫤ ξ); (⫤ ξ));
[9] ((⊨ ξ); (ξ ⊨ ξ)); ((ξ ⫤ ξ); (ξ ⫤));
. . . .
"ξ" ∈ {α, β, γ, ... , ξ, ...};
"⊨" ∈ {⊨, ⊫, ⊢, ⊩, ⊭, ⊯, ⊬, ⊮};
"⫤" ∈ {⫤, ⫣, ⊣, ⫞, ⫤̸, ⫣̸, ⊣̸, ⫞̸}

can be generated ad infinitum. Thus, for instance, in case [9], there is ((⊨ α); (β ⊨ γ)); ((δ ⫤ ε); (ζ ⫤)).

4.4. The Implicative Informational Algebra

The implicative informational algebra concentrates on some "logical facts" which may be useful in the context of informational conceptualism, by which informational entities are (partly, not necessarily equivalently) informationally determined. It is evident that informational implications can proceed from the self-informational and general informational algebra, replacing informational metaoperators by implicative ones. However, these replacements cannot be arbitrary to keep the logical conceptualism valid. Partly, by introduction of logical (informational) implication into informational formulas, these formulas enter the realm of convenient logical truth and falsity.

For an informational entity α (an informational operand or a marked informational formula) it was said that it informs and is informed. This determination has also its implicative consequences, namely, α ⇒ (α ⊨) and α ⇒ (⊨ α), etc. Let us gather the most important implications concerning informational principles, although these implications cannot represent the entire possible realm of further, useful implications.

By implicative informational algebra we will enter into the domain of basic understanding of informational phenomenology. This understanding is natural since it proceeds from traditionally logical consequences resting in expressions of natural languages. In this way, the implicative algebra will become a careful searching of the roots belonging to the term 'information'. Thus, it is possible to propose the following initial set of implicative algebraic rules:

[4.6]:
[1] "ξ" ∈ {α, β, γ, ... , ξ, ...};
[2] "⊨" ∈ {⊨, ⊫, ⊢, ⊩, ⊭, ⊯, ⊬, ⊮};
[3] "⫤" ∈ {⫤, ⫣, ⊣, ⫞, ⫤̸, ⫣̸, ⊣̸, ⫞̸}
[4] ξ ⇒ (ξ ⊨); (⫤ ξ) ⇐ ξ;
ξ ⇒ (⊨ ξ); (ξ ⫤) ⇐ ξ;
ξ ⇒ (⫤ ξ); (ξ ⊨) ⇐ ξ;
ξ ⇒ (ξ ⫤); (⊨ ξ) ⇐ ξ;
[5] ξ ⇒ ((ξ ⊨); (⊨ ξ)); ((ξ ⫤); (⫤ ξ)) ⇐ ξ;
ξ ⇒ ((ξ ⊨); (ξ ⫤)); ((⊨ ξ); (⫤ ξ)) ⇐ ξ;
ξ ⇒ ((⫤ ξ); (⊨ ξ)); ((ξ ⫤); (ξ ⊨)) ⇐ ξ;
ξ ⇒ ((ξ ⫤); (⫤ ξ)); ((ξ ⊨); (⊨ ξ)) ⇐ ξ;
[6] ξ ⇒ ((ξ ⊨) ∨ (⊨ ξ)); ((ξ ⫤) ∨ (⫤ ξ)) ⇐ ξ;
ξ ⇒ ((ξ ⊨) ∨ (ξ ⫤)); ((⊨ ξ) ∨ (⫤ ξ)) ⇐ ξ;
ξ ⇒ ((⫤ ξ) ∨ (⊨ ξ)); ((ξ ⫤) ∨ (ξ ⊨)) ⇐ ξ;
ξ ⇒ ((ξ ⫤) ∨ (⫤ ξ)); ((ξ ⊨) ∨ (⊨ ξ)) ⇐ ξ;
[7] ξ ⇒ ((ξ ⊨); (⊨ ξ); (⫤ ξ));
((ξ ⫤); (⫤ ξ); (ξ ⊨)) ⇐ ξ;
ξ ⇒ ((ξ ⊨); (ξ ⫤); (⫤ ξ));
((⊨ ξ); (⫤ ξ); (ξ ⊨)) ⇐ ξ;
. . . .
ξ ⇒ ((ξ ⫤); (⫤ ξ); (⊨ ξ));
((ξ ⊨); (⊨ ξ); (ξ ⫤)) ⇐ ξ;
[8] ξ ⇒ ((ξ ⊨) ∨ (⊨ ξ) ∨ (⫤ ξ));
((ξ ⫤) ∨ (⫤ ξ) ∨ (ξ ⊨)) ⇐ ξ;
. . . .
[9] ξ ⇒ ((ξ ⊨); (⊨ ξ); (⫤ ξ); (ξ ⫤));
((ξ ⫤); (⫤ ξ); (ξ ⊨); (⊨ ξ)) ⇐ ξ;
[10] ξ ⇒ ((ξ ⊨) ∨ (⊨ ξ) ∨ (⫤ ξ) ∨ (ξ ⫤));
((ξ ⫤) ∨ (⫤ ξ) ∨ (ξ ⊨) ∨ (⊨ ξ)) ⇐ ξ;

[11] (ξ ⊨) ⇒ ((ξ ⊨) ⊨); ((⫤ (⫤ ξ) ⇐ (⫤ ξ);
(ξ ⊨) ⇒ (⫤ (ξ ⊨)); ((⫤ ξ) ⊨) ⇐ (⫤ ξ);
. . . .
(⊨ ξ) ⇒ ((⊨ ξ) ⊨); (⫤ (ξ ⫤)) ⇐ (ξ ⫤);
(⊨ ξ) ⇒ (⊨ (⊨ ξ)); ((ξ ⫤) ⫤) ⇐ (ξ ⫤);
[12] (ξ ⇒ (ξ ⊨)) ⇒ ((ξ ⊨) ⊨);
(⫤ (⫤ ξ)) ⇐ ((⫤ ξ) ⇐ ξ);
(ξ ⇒ (⊨ ξ)) ⇒ (⊨ (⊨ ξ));

$((\xi \Dashv) \Dashv) \Leftarrow ((\xi \Dashv) \Leftarrow \xi);$

. . . .

$((\models \xi) \Dashv) \Leftarrow ((\models \xi) \Leftarrow \xi);$

[13] $((\xi \models) \models) \Rightarrow (((\xi \models) \models) \models);$

$(\Dashv (\Dashv (\Dashv \xi))) \Leftarrow (\Dashv (\Dashv \xi));$

. . . .

[14] $\xi \Rightarrow (\xi \models \xi);\ (\xi \Dashv \xi) \Leftarrow \xi;$

$(\xi \models \xi) \Rightarrow \xi;\ \xi \Leftarrow (\xi \Dashv \xi);$

$\xi \Rightarrow (\xi \Dashv \xi);\ (\xi \models \xi) \Leftarrow \xi;$

$(\xi \Dashv \xi) \Rightarrow \xi;\ \xi \Leftarrow (\xi \models \xi);$

[15] $(\xi \models \xi) \Rightarrow (\models \xi);\ (\Dashv \xi) \Leftarrow (\xi \Dashv \xi);$

$(\xi \models \xi) \Rightarrow (\models \xi);\ (\xi \Dashv) \Leftarrow (\xi \Dashv \xi);$

$(\xi \models \xi) \Rightarrow (\xi \Dashv);\ (\xi \models) \Leftarrow (\xi \Dashv \xi);$

$(\xi \models \xi) \Rightarrow (\xi \Dashv);\ (\models \xi) \Leftarrow (\xi \Dashv \xi);$

[16] $\xi \Rightarrow ((\models \xi) \models);\ (\Dashv (\xi \Dashv)) \Leftarrow \xi;$

$\xi \Rightarrow ((\xi \Dashv) \models);\ (\Dashv (\models \xi)) \Leftarrow \xi;$

$\xi \Rightarrow (\Dashv (\models \xi));\ ((\xi \Dashv) \models) \Leftarrow \xi;$

$\xi \Rightarrow (\Dashv (\xi \Dashv));\ ((\models \xi) \models) \Leftarrow \xi;$

[17] $\xi \Rightarrow (\models (\xi \models));\ ((\Dashv \xi) \Dashv) \Leftarrow \xi;$

$\xi \Rightarrow (\models (\Dashv \xi));\ ((\models \xi) \Dashv) \Leftarrow \xi;$

$\xi \Rightarrow ((\xi \models) \Dashv);\ (\models (\Dashv \xi)) \Leftarrow \xi;$

$\xi \Rightarrow ((\Dashv \xi) \Dashv);\ (\models (\xi \models)) \Leftarrow \xi;$

. . . .

It can be imagined how further informational implications can be generated ad infinitum. In these implications, general informational operators can be particularized according to particular needs and requirements. In this sense, implicative informational algebra becomes applicatively flexible and not bounded as a traditional logic could be.

4.5. The Equivalence Informational Algebra

Similarly as the implicative informational algebra, the so-called equivalence informational algebra deals with particular "logical facts" which may be useful in the context of informational determinism, by which informational entities are (equivalently) informationally determined. It is evident that informational equivalences can proceed from the self-informational, general informational, and implicative informational algebra, replacing informational metaoperators and implicative operators by equivalence ones. However, these replacements cannot be arbitrary to keep the logical determinism valid. Partly, by introduction of logical (informational) equivalence into informational formulas, these formulas (partly) enter the realm of convenient logical truth and falsity.

For an arbitrary informational entity α (an informational operand or a marked informational formula) it was said that it informs and is informed. This determination has also its equivalence consequence, namely, $\alpha \Leftrightarrow ((\alpha \models); (\models \alpha))$ or $\alpha \Leftrightarrow ((\alpha \models) \vee (\models \alpha))$ etc. We choose the symbol $\Leftrightarrow$ or $\Rightarrow\!\!\Leftarrow$ for the equivalence instead of symbol $\equiv$ to stress the deductive origin which concerns the implicative algebra. So, let us gather the most important equivalences concerning informational principles, although these equivalences cannot represent the entire possible realm of further, useful equivalences.

By equivalence informational algebra we will enter into the domain of basic understanding of informational notions. This understanding is natural since it proceeds from intuitive logical consequences resting in speech and writing of natural languages. In this way, the equivalence algebra will become a notional searching of the roots belonging to the determination of information. In this way it is possible to propose the following initial set of equivalence algebraic rules:

[4.6]:

[1] $\text{"}\xi\text{"} \in \{\alpha, \beta, \gamma, \ldots, \xi, \ldots\};$

[2] $\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\};$

[3] $\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\!\|, \dashv, \dashv\!\|, \not\Dashv, \not\Dashv\!\|, \not\dashv, \not\dashv\!\|\};$

[4] $\xi \Leftrightarrow ((\xi \models); (\models \xi));$

$((\xi \Dashv); (\Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[5] $\xi \Leftrightarrow ((\xi \models) \vee (\models \xi));$

$((\xi \Dashv) \vee (\Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[6] $\xi \Leftrightarrow ((\xi \models); (\models \xi); (\xi \Dashv); (\Dashv \xi));$

$((\xi \models); (\models \xi); (\xi \Dashv); (\Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[7] $\xi \Leftrightarrow ((\xi \models) \vee (\models \xi) \vee (\xi \Dashv) \vee (\Dashv \xi));$

$((\xi \models) \vee (\models \xi) \vee (\xi \Dashv) \vee (\Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[8] $\xi \Leftrightarrow ((\xi \models \xi); (\xi \Dashv \xi));$

$((\xi \models \xi); (\xi \Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[9] $\xi \Leftrightarrow ((\xi \models \xi) \vee (\xi \Dashv \xi));$

$((\xi \models \xi) \vee (\xi \Dashv \xi)) \Rightarrow\!\!\Leftarrow \xi;$

[10] 'information_as_informational_system' $\Leftrightarrow$
$((\exists \xi).(\xi \in \{\alpha, \beta, \gamma, \ldots, \xi, \ldots\}) \wedge$
$(\exists \models).(\models \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\}) \wedge$
$(\exists \Dashv).(\Dashv \in \{\Dashv, \Dashv\!\|, \dashv, \dashv\!\|, \not\Dashv, \not\Dashv\!\|, \not\dashv, \not\dashv\!\|\})).$
$((\xi \models); (\models \xi); (\xi \Dashv); (\Dashv \xi); (\xi \models \xi);$
$(\xi \Dashv \xi));$

'information as informational system' $\Leftrightarrow$
$((\exists \xi).(\xi \in \{\alpha, \beta, \gamma, \ldots, \xi, \ldots\}) \wedge$
$(\exists \models).(\models \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\}) \wedge$
$(\exists \Dashv).(\Dashv \in \{\Dashv, \Dashv\!\|, \dashv, \dashv\!\|, \not\Dashv, \not\Dashv\!\|, \not\dashv, \not\dashv\!\|\})).$
$((\xi \models) \vee (\models \xi) \vee (\xi \Dashv) \vee (\Dashv \xi) \vee$
$(\xi \models \xi) \vee (\xi \Dashv \xi))$

etc. Formula [10] constitutes information as the most complex informational system in which informational entities (processes) are mutually perplexed in any imaginable form.

4.6. Some Transformation Rules

The class of equivalence rules can be supplemented by some formula transformation rules, which seems to be the subject of their definition. In these cases the equivalence signs $\equiv$ or $\not\equiv$ will be used. Such rules can be as follows:

[4.7]:

[1] $\text{"}\models\text{"} \in \{\models, \VDash, \vdash, \Vdash, \not\models, \nVDash, \nvdash, \nVdash\};$

[2] $\text{"}\Dashv\text{"} \in \{\Dashv, \Dashv\!\|, \dashv, \dashv\!\|, \not\Dashv, \not\Dashv\!\|, \not\dashv, \not\dashv\!\|\};$

[3] $\alpha \equiv (\alpha \models \alpha);\ (\alpha \Dashv \alpha) \equiv \alpha;$

[4] $(\alpha \models \beta) \equiv (\alpha \models \beta;\ \alpha \models \beta;\ \beta \models \beta);$

[5] $(\beta \Dashv \beta;\ \beta \Dashv \alpha;\ \alpha \Dashv \alpha) \equiv (\beta \Dashv \alpha);$

[6] $(\alpha, \beta \models \gamma, \delta) \equiv$
$(\alpha \models \gamma;\ \alpha \models \delta;\ \beta \models \gamma;\ \beta \models \delta);$

[7] $(\delta \Dashv \beta;\ \gamma \Dashv \beta;\ \delta \Dashv \alpha;\ \gamma \Dashv \alpha) \equiv$
$(\delta,\ \gamma \Dashv \beta,\ \alpha);$

. . . .

etc. However, some implicative consequences cannot necessarily lead to an equivalence. Thus, for instance,

[4.8]: $((\alpha \Rightarrow \beta) \wedge (\alpha \Leftarrow \beta)) \Rightarrow (\alpha \not\equiv_{\nu} \beta)$

In this formula, $\not\equiv_{\nu}$ marks the informational operator possessing the meaning "is not necessarily equivalent". The particular symbol ν is used for marking the necessity. Instead of symbol $\not\equiv_{\nu}$, symbol $\equiv_{\pi}$ could be used, where π stands for possibility.

4.7. Possibilities of Modal Informational Algebras

The modal informational algebras will concern the realm of the so-called modus informationis [4]. Traditional logical concepts can be seen as particular (modal-trivial) cases of modal logic.

The origin of modal informational logic roots in the Latin "modus" as information, i.e. in measure, extent, rhythm, way, manner, method of informing, etc. Also, modus informationis is meant to be a way, manner, method, etc. of acquiring, gaining, extracting, or, in the most general way, of arising or coming of information into existence within and through information in question. In this respect, modal informational logic differs from the convenient modal logic, which is limited to the logic of necessity and possibility, of 'must be' and 'may be'.

In [4], several types of modus informationis have been discussed. What can be the algebraic consequence of these modi? It is evident that the way of informational acquiring concerning particular modi cannot be determined in general or in advance, for this acquiring depends, for instance, on the semantic analysis and intuition (meaning) of a particular informational case. Although in [4] we have discussed the most obvious, i.e. historically, culturally, logically accepted informational forms of reasoning, common sense, inference as informational modi (modus ponens, tollens, rectus, obliquus, procendendi, operandi, vivendi, possibilitatis, necessitatis), only the most convenient manners of informational reasoning have been touched. It is to understand that modal informational algebra has in general to do with discovering of certain information within information in question.

Let us list in short only the most important algebraic rules concerning modi informationis.

4.7.1. Informational Modus Ponens

Informational modus ponens originates in some general informational schemes, for instance,

[4.9]:

[1] $\text{"}\xi\text{"}, \text{"}\eta\text{"} \in \{\alpha, \beta, \gamma, \ldots, \xi, \eta, \ldots\};$
[2] $\text{"}\vDash\text{"} \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$
[3] $\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\};$
[4] $(\xi \vDash (\xi \vDash \eta)) \vDash \eta;$
[5] $\eta \Dashv ((\eta \Dashv \xi) \Dashv \xi);$
[6] $(\xi \vDash (\eta \Dashv \xi)) \vDash \eta;$
[7] $\eta \Dashv ((\xi \vDash \eta) \Dashv \xi);$
[8] $((\xi \vDash (\xi \vDash \eta));\ (\xi \vDash (\eta \Dashv \xi))) \vDash \eta;$
[9] $\eta \Dashv (((\xi \vDash \eta) \Dashv \xi);\ ((\eta \Dashv \xi) \Dashv \xi));$
[10] $((\xi \vDash (\xi \vDash \eta)) \vDash (\xi \vDash (\eta \Dashv \xi))) \vDash \eta;$
[11] $\eta \Dashv (((\xi \vDash \eta) \Dashv \xi) \Dashv ((\eta \Dashv \xi) \Dashv \xi));$

etc. Informational modus ponens can use several conjunctively and disjunctively implicative algebraic rules, for instance,

[4.10]:

[1] $\text{"}\xi\text{"}, \text{"}\eta\text{"} \in \{\alpha, \beta, \gamma, \ldots, \xi, \eta, \ldots\};$
[2] $\text{"}\vDash\text{"} \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$
[3] $\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV, \not\Dashv, \not\DashV, \not\dashv, \not\dashV\};$
[4] $(\xi \wedge (\xi \vDash \eta)) \Rightarrow \eta;$
[5] $\eta \Leftarrow (\xi \wedge (\eta \Dashv \xi));$
[6] $(\xi \wedge (\eta \Dashv \xi)) \Rightarrow \eta;$
[7] $\eta \Leftarrow (\xi \wedge (\xi \vDash \eta));$
[8] $(\xi \wedge ((\xi \vDash \eta);\ (\eta \Dashv \xi)) \Rightarrow \eta;$
[9] $\eta \Leftarrow (\xi \wedge ((\eta \Dashv \xi);\ (\xi \vDash \eta));$
[10] $(\xi \wedge ((\xi \vDash \eta) \vee (\eta \Dashv \xi)) \Rightarrow \eta;$
[11] $\eta \Leftarrow (\xi \wedge ((\eta \Dashv \xi) \vee (\xi \vDash \eta))$

etc. Let us read some of the rules belonging to the system [4.7]. Rule [4] $(\xi \wedge (\xi \vDash \eta)) \Rightarrow \eta$ is read in the following way: "if ξ is information and if ξ informs η in one way, then η is information in one way". Rule [5] $\eta \Leftarrow (\xi \wedge (\eta \Dashv \xi))$ can be read in several ways: "if ξ is information and if ξ informs η in another way, then η is information in another way"; or "η is information in another way, if ξ is information and if η is informed by ξ in another way".

4.7.2. Informational Modus Tollens

Similarly as in the case of modus ponens, it is possible to list some general informational schemes for informational modus tollens, for instance,

[4.11]:

[1] $\text{"}\xi\text{"}, \text{"}\eta\text{"} \in \{\alpha, \beta, \gamma, \ldots, \xi, \eta, \ldots\};$
[2] $\text{"}\vDash\text{"} \in \{\vDash, \VDash, \vdash, \Vdash\};\ \text{"}\nvDash\text{"} \in \{\nvDash, \nVDash, \nvdash, \nVdash\};$
[3] $\text{"}\Dashv\text{"} \in \{\Dashv, \DashV, \dashv, \dashV\};\ \text{"}\not\Dashv\text{"} \in \{\not\Dashv, \not\DashV, \not\dashv, \not\dashV\};$
[4] $((\xi \vDash \eta) \vDash (\nvDash \eta)) \vDash (\xi \nvDash);$
[5] $(\not\Dashv \xi) \Dashv ((\eta \not\Dashv) \Dashv (\eta \Dashv \xi));$
[6] $((\eta \Dashv \xi) \vDash (\nvDash \eta)) \vDash (\xi \nvDash);$
[7] $(\not\Dashv \xi) \Dashv ((\eta \not\Dashv) \Dashv (\xi \vDash \eta));$
[8] $((\xi \vDash \eta) \vDash (\eta \not\Dashv)) \vDash (\xi \nvDash);$
[9] $(\not\Dashv \xi) \Dashv ((\nvDash \eta) \Dashv (\eta \Dashv \xi));$
[10] $((\xi \vDash \eta) \vDash (\nvDash \eta)) \vDash (\not\Dashv \xi);$
[11] $(\xi \nvDash) \Dashv ((\eta \not\Dashv) \Dashv (\eta \Dashv \xi));$
[12] $((\nvDash \eta) \Dashv (\xi \vDash \eta)) \vDash (\xi \nvDash);$
[13] $(\not\Dashv \xi) \Dashv ((\eta \Dashv \xi) \vDash (\eta \not\Dashv));$
[14] $(((\xi \vDash \eta) \vDash (\xi \nvDash));$
$((\eta \Dashv \xi) \vDash (\xi \nvDash))) \vDash \eta;$
[15] $\eta \Dashv (((\not\Dashv \xi) \Dashv (\xi \vDash \eta));$
$((\not\Dashv \xi) \Dashv (\eta \Dashv \xi)));$

[16] $(((\xi \models \eta) \models (\xi \nvDash)) \models$
$((\eta \Dashv \xi) \models (\xi \nvDash))) \models \eta;$
[17] $\eta \Dashv (((\nDashv \xi) \Dashv (\xi \models \eta)) \Dashv$
$((\nDashv \xi) \Dashv (\eta \Dashv \xi)));$

etc. Informational modus tollens can use several conjunctively and disjunctively implicative algebraic rules, for instance,

[4.12]:

[1] $"\xi", "\eta" \in \{\alpha, \beta, \gamma, \ldots, \xi, \eta, \ldots\};$
[2] $"\models" \in \{\models, \VDash, \vdash, \Vdash\}; "\nvDash" \in \{\nvDash, \nVDash, \nvdash, \nVdash\};$
[3] $"\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV\}; "\nDashv" \in \{\nDashv, \nDashV, \ndashv, \ndashV\};$
[4] $((\xi \models \eta) \wedge (\nvDash \eta)) \Rightarrow (\xi \nvDash);$
[5] $(\nDashv \xi) \Leftarrow ((\eta \nDashv) \wedge (\eta \Dashv \xi));$
[6] $((\eta \Dashv \xi) \wedge (\nvDash \eta)) \Rightarrow (\xi \nvDash);$
[7] $(\nDashv \xi) \Leftarrow ((\eta \nDashv) \wedge (\xi \models \eta));$
[8] $((\xi \models \eta) \wedge (\eta \nDashv)) \Rightarrow (\xi \nvDash);$
[9] $(\nDashv \xi) \Leftarrow ((\nvDash \eta) \wedge (\eta \Dashv \xi));$
[10] $((\xi \models \eta) \wedge (\nvDash \eta)) \Rightarrow (\nDashv \xi);$
[11] $(\xi \nvDash) \Leftarrow ((\eta \nDashv) \wedge (\eta \Dashv \xi));$
[12] $((\nvDash \eta) \wedge (\xi \models \eta)) \Rightarrow (\xi \nvDash);$
[13] $(\nDashv \xi) \Leftarrow ((\eta \Dashv \xi) \wedge (\eta \nDashv));$
[14] $(((\xi \models \eta) \wedge (\xi \nvDash));$
$((\eta \Dashv \xi) \wedge (\xi \nvDash))) \Rightarrow \eta;$
[15] $\eta \Leftarrow (((\nDashv \xi) \wedge (\xi \models \eta));$
$((\nDashv \xi) \wedge (\eta \Dashv \xi)));$
[16] $(((\xi \models \eta) \wedge (\xi \nvDash)) \vee$
$((\eta \Dashv \xi) \wedge (\xi \nvDash))) \Rightarrow \eta;$
[17] $\eta \Leftarrow (((\nDashv \xi) \wedge (\xi \models \eta)) \vee$
$((\nDashv \xi) \wedge (\eta \Dashv \xi)));$

Let us read some of the rules belonging to the system [4.10]. Rule, marked by [4], $((\xi \models \eta) \wedge (\nvDash \eta)) \Rightarrow (\xi \nvDash)$, is read in the following way: "if ξ informs η and if η is not informed in one way, then ξ does not inform in one way". Rule [5], $(\nDashv \xi) \Leftarrow ((\eta \nDashv) \wedge (\eta \Dashv \xi))$, can be read in several ways: "if ξ informs η in another way and if η is not informed in another way, then ξ does not inform in another way"; or "ξ does not inform in another way, if η is informed by ξ in another way and if η is not informed". Etc.

4.7.3. Informational Modus Rectus

One of the aims of modus rectus is to detach or to extract intentional information, which informs intentionally within (as a part of) information in question. Thus, the intention of information images in informing of information, in that how information in question informs itself and other information and how it is informed by itself and by other information. If $\mathfrak{I}$ or $\mathfrak{I}(\beta)$ marks the implicit intentional informing of information β, then the following implicative informational rules, determining the intentional information α can be senseful:

[4.13]:

[1] $"\models_{\mathfrak{I}}" \in \{\models_{\mathfrak{I}}, \VDash_{\mathfrak{I}}, \vdash_{\mathfrak{I}}, \Vdash_{\mathfrak{I}}, \nvDash_{\mathfrak{I}}, \nVDash_{\mathfrak{I}}, \nvdash_{\mathfrak{I}}, \nVdash_{\mathfrak{I}}\};$
[2] $"\Dashv_{\mathfrak{I}}" \in \{\Dashv_{\mathfrak{I}}, \DashV_{\mathfrak{I}}, \dashv_{\mathfrak{I}}, \dashV_{\mathfrak{I}}, \nDashv_{\mathfrak{I}}, \nDashV_{\mathfrak{I}}, \ndashv_{\mathfrak{I}}, \ndashV_{\mathfrak{I}}\};$
[3] $\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}}); (\models_{\mathfrak{I}} \alpha));$
[4] $((\alpha \Dashv_{\mathfrak{I}}); (\Dashv_{\mathfrak{I}} \alpha)) \Leftarrow \alpha;$
[5] $\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}}) \vee (\models_{\mathfrak{I}} \alpha));$
[6] $((\alpha \Dashv_{\mathfrak{I}}) \vee (\Dashv_{\mathfrak{I}} \alpha)) \Leftarrow \alpha;$
[7] $\alpha \Rightarrow ((\Dashv_{\mathfrak{I}} \alpha); (\models_{\mathfrak{I}} \alpha));$
[8] $((\alpha \Dashv_{\mathfrak{I}}); (\alpha \models_{\mathfrak{I}})) \Leftarrow \alpha;$
[9] $\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}}); (\alpha \Dashv_{\mathfrak{I}}));$
[10] $((\models_{\mathfrak{I}} \alpha); (\Dashv_{\mathfrak{I}} \alpha)) \Leftarrow \alpha;$
[11] $\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}}); (\models_{\mathfrak{I}} \alpha); (\alpha \Dashv_{\mathfrak{I}}); (\Dashv_{\mathfrak{I}} \alpha));$
[12] $((\alpha \models_{\mathfrak{I}}); (\models_{\mathfrak{I}} \alpha); (\alpha \Dashv_{\mathfrak{I}}); (\Dashv_{\mathfrak{I}} \alpha)) \Leftarrow \alpha;$
. . . .

In the last formulas, α marks the so-called intentional information of information β and operators $\models_{\mathfrak{I}}$ and $\Dashv_{\mathfrak{I}}$ are intentional informing or intentional non-informing of information β. Now, the informational modus rectus can be expressed in the following way: let α or $\alpha(\beta)$ be the intentional information of information β in question and let the implicit intentional informing of β be marked by $\mathfrak{I}$ or $\mathfrak{I}(\beta)$. Further, let β inform information γ. Let the task of informational modus rectus be to detach or extract the implicit intentional informing $\mathfrak{I}$ or $\mathfrak{I}(\beta)$ out of the processes of informing $\beta \models \gamma$, $\gamma \Dashv \beta$, etc. Thus, the following cases of informational modus rectus can be constructed:

[4.14]:

[1] $"\models_{\mathfrak{I}}" \in \{\models_{\mathfrak{I}}, \VDash_{\mathfrak{I}}, \vdash_{\mathfrak{I}}, \Vdash_{\mathfrak{I}}, \nvDash_{\mathfrak{I}}, \nVDash_{\mathfrak{I}}, \nvdash_{\mathfrak{I}}, \nVdash_{\mathfrak{I}}\};$
[2] $"\Dashv_{\mathfrak{I}}" \in \{\Dashv_{\mathfrak{I}}, \DashV_{\mathfrak{I}}, \dashv_{\mathfrak{I}}, \dashV_{\mathfrak{I}}, \nDashv_{\mathfrak{I}}, \nDashV_{\mathfrak{I}}, \ndashv_{\mathfrak{I}}, \ndashV_{\mathfrak{I}}\};$
[3] $((\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}(\beta)}); (\models_{\mathfrak{I}(\beta)} \alpha)));$
$(\beta \models_{\mathfrak{I}(\beta)} \gamma)) \Rightarrow \mathfrak{I}(\beta);$
[4] $\mathfrak{I}(\beta) \Leftarrow ((\gamma \Dashv_{\mathfrak{I}(\beta)} \beta);$
$(((\alpha \Dashv_{\mathfrak{I}(\beta)}); (\Dashv_{\mathfrak{I}(\beta)} \alpha)) \Leftarrow \alpha));$
[5] $((\alpha \Rightarrow ((\alpha \models_{\mathfrak{I}(\beta)}); (\models_{\mathfrak{I}(\beta)} \alpha))) \wedge$
$(\beta \models_{\mathfrak{I}(\beta)} \gamma)) \Rightarrow \mathfrak{I}(\beta);$
[6] $\mathfrak{I}(\beta) \Leftarrow ((\gamma \Dashv_{\mathfrak{I}(\beta)} \beta) \wedge$
$(((\alpha \Dashv_{\mathfrak{I}(\beta)}); (\Dashv_{\mathfrak{I}(\beta)} \alpha)) \Leftarrow \alpha));$
[7] $(\beta; (\beta \models \gamma)) \Rightarrow \mathfrak{I}(\beta);$
[8] $\mathfrak{I}(\beta) \Leftarrow ((\gamma \Dashv \beta); \beta);$
[9] $(\beta \wedge (\beta \models \gamma)) \Rightarrow \mathfrak{I}(\beta);$
[10] $\mathfrak{I}(\beta) \Leftarrow ((\gamma \Dashv \beta) \wedge \beta);$
. . . .

etc. Formulas [3] - [6] can be read in the following way: if α is intentional information of information β and if β intentionally informs information γ, then $\mathfrak{I}(\beta)$ is intentional informing, which can be detached out of the process $\beta \models_{\mathfrak{I}(\beta)} \gamma$, etc. by the informational modus rectus. Formulas [7] - [10] are generalizations which can be read: if β is information (and for any information some intentionality is supposed) and if information β informs information γ, then the intentionality of β can be detached out of this informing by the informational modus rectus.

4.7.4. The Informational Modus Obliquus

What could be the aim of informational modus obliquus? What kind of information could it extract from the information in question? Does it concern information of unawareness, doubt, indirectness, and absurdity? Informational modus obliquus deviates from intentional line of discourse, not going straight to the point, so it may enter into the domain of contradiction, by which the intention is not openly shown.

Let β be information in question, being investigated by informational modus obliquus against information of absurdity, α, with an implicit absurd informing $\mathfrak{A}$. If possible, informational modus obliquus may deliver α through the absurd informing of information β, when β informs γ. First, for information of absurdity α there is

[4.15]:

[1] $"\vDash_{\mathfrak{A}}" \in \{\vDash_{\mathfrak{A}}, \VDash_{\mathfrak{A}}, \vdash_{\mathfrak{A}}, \Vdash_{\mathfrak{A}}, \nvDash_{\mathfrak{A}}, \nVDash_{\mathfrak{A}}, \nvdash_{\mathfrak{A}}, \nVdash_{\mathfrak{A}}\};$

[2] $"\Dashv_{\mathfrak{A}}" \in \{\Dashv_{\mathfrak{A}}, \DashV_{\mathfrak{A}}, \dashv_{\mathfrak{A}}, \dashV_{\mathfrak{A}}, \nDashv_{\mathfrak{A}}, \nDashV_{\mathfrak{A}}, \ndashv_{\mathfrak{A}}, \ndashV_{\mathfrak{A}}\};$

[3] $\alpha \Rightarrow ((\alpha \vDash_{\mathfrak{A}}); (\vDash_{\mathfrak{A}} \alpha));$

[4] $((\alpha \Dashv_{\mathfrak{A}}); (\Dashv_{\mathfrak{A}} \alpha)) \Leftarrow \alpha;$

[5] $\alpha \Rightarrow ((\alpha \vDash_{\mathfrak{A}}) \vee (\vDash_{\mathfrak{A}} \alpha));$

[6] $((\alpha \Dashv_{\mathfrak{A}}) \vee (\Dashv_{\mathfrak{A}} \alpha)) \Leftarrow \alpha;$

[7] $\alpha \Rightarrow ((\Dashv_{\mathfrak{A}} \alpha); (\vDash_{\mathfrak{A}} \alpha));$

[8] $((\alpha \Dashv_{\mathfrak{A}}); (\alpha \vDash_{\mathfrak{A}})) \Leftarrow \alpha;$

[9] $\alpha \Rightarrow ((\alpha \vDash_{\mathfrak{A}}); (\alpha \Dashv_{\mathfrak{A}}));$

[10] $((\vDash_{\mathfrak{A}} \alpha); (\Dashv_{\mathfrak{A}} \alpha)) \Leftarrow \alpha;$

[11] $\alpha \Rightarrow ((\alpha \vDash_{\mathfrak{A}}); (\vDash_{\mathfrak{A}} \alpha); (\alpha \Dashv_{\mathfrak{A}}); (\Dashv_{\mathfrak{A}} \alpha));$

[12] $((\alpha \vDash_{\mathfrak{A}}); (\vDash_{\mathfrak{A}} \alpha); (\alpha \Dashv_{\mathfrak{A}}); (\Dashv_{\mathfrak{A}} \alpha)) \Leftarrow \alpha;$

. . . .

Let us show how information of absurdity α and its implicit informing $\mathfrak{A}$ can be detached out of information in question β, when $\beta \vDash \gamma$, $\gamma \Dashv \beta$, etc. There can exist the following informational modi obliquus:

[4.16]:

[1] $"\vDash_{\mathfrak{A}}" \in \{\vDash_{\mathfrak{A}}, \VDash_{\mathfrak{A}}, \vdash_{\mathfrak{A}}, \Vdash_{\mathfrak{A}}, \nvDash_{\mathfrak{A}}, \nVDash_{\mathfrak{A}}, \nvdash_{\mathfrak{A}}, \nVdash_{\mathfrak{A}}\};$

[2] $"\Dashv_{\mathfrak{A}}" \in \{\Dashv_{\mathfrak{A}}, \DashV_{\mathfrak{A}}, \dashv_{\mathfrak{A}}, \dashV_{\mathfrak{A}}, \nDashv_{\mathfrak{A}}, \nDashV_{\mathfrak{A}}, \ndashv_{\mathfrak{A}}, \ndashV_{\mathfrak{A}}\};$

[3] $"\vDash" \in \{\vDash, \VDash, \vdash, \Vdash, \nvDash, \nVDash, \nvdash, \nVdash\};$

[4] $"\Dashv" \in \{\Dashv, \DashV, \dashv, \dashV, \nDashv, \nDashV, \ndashv, \ndashV\};$

[5] $((\beta \vDash_{\mathfrak{A}} \alpha); (\beta \vDash \gamma)) \Rightarrow (\alpha \vDash_{\mathfrak{A}} \gamma);$

[6] $(\gamma \Dashv_{\mathfrak{A}} \alpha) \Leftarrow ((\gamma \Dashv \beta); (\alpha \Dashv_{\mathfrak{A}} \beta));$

[7] $(((\alpha \subset_{\mathfrak{A}} \beta); (\mathfrak{I}_{\mathfrak{A}} \subset \mathfrak{I}(\beta))); (\beta \vDash \gamma)) \Rightarrow$
$(\alpha, \mathfrak{I}_{\mathfrak{A}}(\alpha) \vDash_{\mathfrak{A}} \gamma);$

[8] $(\gamma \Dashv_{\mathfrak{A}} \mathfrak{I}_{\mathfrak{A}}(\alpha), \alpha)$
$\Leftarrow ((\gamma \Dashv \beta); ((\alpha \subset_{\mathfrak{A}} \beta); (\mathfrak{I}_{\mathfrak{A}} \subset \mathfrak{I}(\beta))));$

[9] $(((\alpha \subset_{\mathfrak{A}} \beta); (\alpha \vDash_{\mathfrak{A}} \mathfrak{I}(\beta))); (\beta \vDash \gamma)) \Rightarrow$
$([_{\mathfrak{A}}(\beta) \llcorner_{\mathfrak{A}} \mathfrak{I}_{\mathfrak{A}}(\gamma));$

[10] $(\mathfrak{I}_{\mathfrak{A}}(\gamma) \dashv_{\mathfrak{A}} \mathfrak{I}_{\mathfrak{A}}(\beta))$
$\Leftarrow ((\gamma \Dashv \beta); ((\mathfrak{I}(\beta) \Dashv_{\mathfrak{A}} \alpha); (\alpha \subset_{\mathfrak{A}} \beta)));$

. . . .

To these formulas some exlpanations are necessary. We introduced additional operators: $\subset$ marks informational inclusion and $\subset_{\mathfrak{A}}$ the so-called absurd informational inclusion; $\mathfrak{I}_{\mathfrak{A}}$ is an informationally non-identified absurd informing and $\mathfrak{I}(\xi)$ and $\mathfrak{I}_{\mathfrak{A}}(\xi)$ the so-called ξ-identified implicit informing and implicit absurd informing. Within this context, formulas of [4.16] can be read as follows:

[5]: if β absurdly (obliquely) informs α in one way and if β informs γ in one way, then α absurdly informs γ in one way.

[6]: if β absurdly (obliquely) informs α in another way and if β informs γ in another way, then α absurdly informs γ in another way.

[7]: if α absurdly exists (informs) within β in one way, if absurd (oblique) informing $\mathfrak{I}_{\mathfrak{A}}$ exists (informs) within the informing of β in one way, i.e. $\mathfrak{I}(\beta)$, and if β informs γ in one way, then absurd (oblique) information α and its informing absurdly inform γ in one way.

[10]: if α absurdly exists (informs) within β in another way, if α absurdly informs the informing $\mathfrak{I}(\beta)$ in another way, and if β informs γ in another way, then the absurd informing $\mathfrak{I}_{\mathfrak{A}}(\beta)$ causes the appearance of the absurd informing $\mathfrak{I}_{\mathfrak{A}}(\gamma)$ in another way. In common sense it would mean that γ begins to observe the absurd informing of β, which was caused by α.

In this sense, informational modus obliquus is by itself information, which is capable to reveal oblique informing of informational entities. Informational midi are nothing else than informational means by which informational entities observe and conclude in particular, modi-characteristic ways on information in question.

4.7.5. The Informational Modus Procedendi, Modus Operandi, Modus Vivendi, Modus Possibilitatis, and Modus Necessitatis

Modi informationis in the above title can be discussed in a similar way as have been modus ponens, modus tollens, modus rectus, and modus obliquus, considering their beginning (or original) presuppositions as determined in [4]. Hopefully, the reader will be capable to construct adequate formulas according to cases listed in [4] and certainly to his/her own imagination. Since, modi informationis belong to the most provoking informational constructs through the history of human informational evolution. As said, modi informationis belong to certain types of informational arising and concern primarily the observational and concluding (inferential) nature of information.

5. CONCLUSION

To offer a satisfactory answer to the question of possible informational algebras, a sufficiently exhaustive overview of regular and diversified logical and algebraic approaches of sciences and philosophies would be necessary. Such overview could be the basis for a more systematic treatment of a general informational algebra and its particularizations. Nowadays, it seems quite possible that any particular algebra, irrespective of its scientific or philosophical nature, can be universalized onto the level of the proposed self-informational or general informational algebra. On this basis, an adequate informational language could be proposed, covering also the more and more actualizing field of information-oriented technology.

On the other side, the represented instrumentalism of formal approach (say, informational algebra) could become a way to the analysis, synthesis, intuition, and formalization in the field of sciences as well as philosophies, for they, in the last consequence, can be understood to be nothing less than sufficiently complex disciplines of their own information.

Informational algebra seems to be extremely flexible and remains open to any further informational imagination. Its language can be easily conformed to fit the needs, applications, and concepts which may arise additionally during the process of formalization. It means that the impact on already achieved formalism or determined formal system remains open for further development. In this respect, informational algebra performs as regular, live information. In this direction it is possible to search for a new language, accentuated in [12].

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