Conscious Informational Entities

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This paper deals with the constitution and organization of a conscious entity. Informon, as an ordered and named conscious entity, informs in its equally named and informationally disordered (chaotic, irregular) environment, called entropon. Both informon and entropon overlap informationally more or less with other informons and entropons constituting a local or global informational space.

A conscious system, as known from the naturalistic point of view, is necessarily a cognitive-emotional system together with other components concerning sensuality, attention, motivation. homeostasis, behavior, motorics, etc., all of them possessing a specific intention (orientation, goal-directedness, decision-making specificity) within the conscious informing. Concrete cognitive, emotional, and otherwise meaningly organized entities come into the conscious foreground.

Artificial conscious systems can differ substantially from the natural ones in the functional domain, regarding the future complexity, memory, global interconnection, and informational search possibilities. Artificial entropons can serve as absolute memories for experiences (components, parts of components) and, in this way, can enable informons to use the entire precisely, regularly, and disorderly structured previous experience and their lumps.

1 Intercomplex and interconscious organization of informational entities

Components of a conscious system are informationally fused in nature. In addition, a circular metaview of causation comes fore, in which stimulus and response take the role to be both cause and effect. Rotation of operands in a circular formula scheme is the consequence of this fact [19, 20, 21]. Circular organization of informational entities reflects in informational metaphysicalism [21], being the condition sine qua non in the organization of conscious components (see, for instance, R. S. Lazarus [15]).

Complexity [4] and metaphysicalism [19, 20], determining conscious entities, can be explained through an enormous degree of informational interrelationship. In a conscious system, conscious entities (components) are

interactive, interassociative, intercausal, intercircular, interconnected, interconscious, intercommunicational, interdependent, interdistributed, intereffective, interemergent, interferential, interintentional, interreflective, interrelational, interspontaneous, interweaved, that is, *interinforming* and *interinformational.*

This kinds of interselfness constitute the intercomplexness of entities, that is, the distributed complexity of entities and their (entroponic) environments, in which each of entities can inform consciously.

The consequence of these properties is that a conscious system is organized intercomponetially, or naturally, artificially, pragmatically, and spontaneously, in an intercognitive, interemotional, intermotivational, interattentional, interbehavioral, interhomeostatical emergent way, and the like. Circularity in the form of metaphysicalism remains the main ability of the conscious informational phenomenon. Informational betweenness or interness (interism) is the consequence of connectedness and distributiveness of conscious components fused informationally in the system. In this context, metaphysicalism is the metaphor for a basic organization of conscious entities, for instance, in the form of informons in informonic environments [19, 20], and in this way being cognitive, emotional, motivational, attentional, homeostatic, behavioral, etc.

Within conscious systems, informational complexness of components reaches the extreme forms in number and interism, causing the possibility for emergence of informons, coming into the conscious attention. In such an environment, any component emerged, can immediately appropriate to it corresponding conscious property or concrete functional organization, for it has the access to the subconsciously complex domain of informational lumps in which conscious abilities are memorized, associatively conditioned (interrelated), and being experientially on disposal.

Artificial conscious systems can hardly ignore the so-called cognitive-emotional paradigm, constituting the con-

cept of consciousness as a natural system of awareness, self-awareness, and behavior of living creatures. The artificial aspires to imitate the natural consciousness with the aim, to make artificial conscious systems adopted to the human culture and the way of understanding. In this respect, cogniton-driven and emotion-driven robots are sine qua non in the field of sociable robots, designed to be spiritual friends and practical helpers in the environment of human everyday life.

2 Complexity and metaphysicalism as general principles of conscious informing

Complexity in number, structure, and organization of informational components is one of the conditions necessary for the emerging of conscious systems [4, 19, 20]. Human brain is an example of the large number of neurons, synapses and other ingredients connected perplexedly in an informational way, in which the conscious mind can emerge and develop as the complexity of thinking, its informational coherence, and decoherence (see decoherence in quantum computing in Kurzweil [14], pp. 110–118 and informational gestalt decoherence in Železnikar [21], Subsect. 8.9). Thus, the mind for itself becomes the complexity, in which mind can emerge and become more complex. That what in mind is accumulated are individual experiences, a sort of conscious and subconscious result of success and failure, within an intention of the individual living or artificial conscious system.

Metaphysicalism is a metaphor for a specific organization of informing of entities in the domain of consciousness [19, 20, 21]. It concerns intentional informing, intentional counterinforming and intentional informational embedding in a complex circular informational organization. Metaphysicalism always concerns an object, a certain informational entity, to which it is intentionally directed. We always speak about entity's metaphysicalism, with a specific sort of meaning rooting in entity's intention, that is, in its simple or complex name, that is, name's meaning, being a complex formula system. Name performs as an impulse for the emergence of the complex organization, preserving and generating the meaning of the name, as it happens in the case of informon, developing in the emerging informational space.

3 Entropon and informon

Entropon $\overline{\alpha}$ is the α-named informational background of informon $\underline{\alpha}$, its subconscious or unconscious domain, from which the informon emerges as a conscious component at the very moment. Entropon is the entropic, informationally disordered state within informational space, concerning a named informational entity, including both well-formed and irregular informational items, that is, formulas

and formula systems, as well as parts of the both.

At the very beginning, the informon, as an instantaneous event of experience, emerges through its name or name phrase α out of informon's entropic (entroponic) background, fitting informationally each new situation in the ongoing moment. For example, a flow of consciousness in people's speech means the occurrence of events as informons, which follow one another spontaneously, unpredictably in details, and depending on inner (conscious, subconscious, intentional) and outer (sensory) impulses, events, states of experience, circumstances, situations, emotions, attitudes, associations, perceptions, cognition, attentions, motivations, etc.

Entropon is an informational potential of informon[1]. It is an environment, from which an informon emerges, being structured consciously by decomposition, that is, shaped regularly in an informational way. In this respect, as an informational component, informon has its fore-having, foresight, and fore-conception (Heidegger [11] p. 195)[2], just in informon's decomposition in the area of its entropon. In this view, entropon is the available unordered informational domain for the informational (informonic) decomposition out of the disorder of entropon, into the reasonable order of informon.

In the way informons overlap each other, their entropons overlap too in the informational superspace. Both constitute the so-called informational substance of consciousness, being modulated intentionally. In them, the individual consciousness is captured, possessing specific intentions. The quality of consciousness roots in the complexity of entroponic diversity and extensiveness, and in the rational and intuitive orderliness of informonic intentionalities. Reflexive consciousness is just an informonic intervening into the entropic history, is a circular and sufficiently complex memorizing and understanding of the happening of the present and the past, with the view to the future and, in this respect, is a circular decomposition of informons within occurring situations and moments. Consciousness is an informonic happening out of entroponic background — informational disorder of subconsciousness or the individually unconscious background.

The pair of informon and entropon, $(\underline{\alpha}; \overline{\alpha})$, is a correlative and informationally coherent system. Entropon $\overline{\alpha}$ is the broadest non-orderly emerging complex informational environment, background, or domain being named by α. Operand α represents a simple operand (a simple word or word phrase name), a formula (sentence), or a formula system (a group of meaningly interrelated sentences). Entropon consists of informational lumps concerning the name α. In a moment, the name α comes to the conscious foreground, informon $\underline{\alpha}$ begins to emerge out of the entropon $\overline{\alpha}$. In these circumstances, informon as informational entity with metaphysicalistic organization, becomes a part, in

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[1]Entropons can be compared with the contents of a quantum-understood black hole from which new matter can come to existence.

[2]In German (Heidegger [12] p. 153), these words are *Vorhabe, Vorsicht* and *Vorgriff.*

fact, an element of entropon $\overline{\alpha}$. Thus, according to the topological organization of the informational [18], where a system of formulas is equivalent to a set of meaningly (informationally, intentionally) interrelated elements,

$$\underline{\alpha} \in \overline{\alpha}$$

This relation can hold permanently only for artificial conscious systems, while in natural conscious systems, the emerging informon $\underline{\alpha}$ is liable to a gradual, time dependent decay.

In a natural conscious system, after the informon's actualization as a conscious experience, the absolute organization of informon $\underline{\alpha}$, entering into its entropon $\overline{\alpha}$, disintegrates gradually, according with the function of the working memory, into substantial, intentionally relevant parts, that is, becomes informational lumps straying in the subconscious substrate of entropon. This means that in the whole of the informon, some common operands disappear and the connection to the corresponding informons is disrupted, so it must be restored anew, when the informon as such is coming into the conscious foreground. On contrary, in an artificial conscious system, the absolute organization of informon $\underline{\alpha}$ can remain preserved within entropon $\overline{\alpha}$.

To the basic relation $\underline{\alpha} \in \overline{\alpha}$, the following formulas can be introduced:

$$(\underline{\alpha}; \overline{\alpha}) \Longrightarrow (\underline{\alpha} \models \overline{\alpha}; \overline{\alpha} \models \underline{\alpha});$$
$$\overline{\underline{\alpha}} \rightleftharpoons (\underline{\alpha}; \overline{\alpha});$$
$$\underline{\alpha}, \overline{\alpha} \in \overline{\underline{\alpha}};$$
$$(\Box \models \underline{\alpha}) \Longrightarrow (\overline{\alpha} \models \underline{\alpha})$$

The first formula is an implication considering the circular organization (the right side of $\Longrightarrow$) of the informon-entropon pair. By the second formula, a new denotation is introduced, called *informational space* of the name denotation α, that is, $\overline{\underline{\alpha}}$. Such a structure is reasonable because the informonic part $\underline{\alpha}$ can be memorized on a storage medium from where the artificial conscious system can observe it or pick it up as an original informonic whole. In the complex structure of entropon $\overline{\alpha}$, informon emerges into the conscious entity, having on informational disposal all other entropons, connected informationally by common operands occurring in existing entropons. Here, the so-called interism, discussed in Sect. 1, functions throughout the conscious system of entropons.

The third formula states that an informon $\underline{\alpha}$ and its entropon $\overline{\alpha}$ are members of informational space $\overline{\underline{\alpha}}$. The fourth formula of the array, $(\Box \models \underline{\alpha}) \Longrightarrow (\overline{\alpha} \models \underline{\alpha})$, brings the so-called informational nothingness (the unknown, marked by $\Box$) into the discourse. Usually, informational nothingness is the metaphor for anything possible and $\Box \models \underline{\alpha}$ means that by informing of $\Box$, $\underline{\alpha}$ can come into existence. However, such a presumption implies (operator $\Longrightarrow$) that, in fact, informon $\underline{\alpha}$ emerges out of entropon $\overline{\alpha}$.

In a natural conscious system, we clearly experience that informon $\underline{\alpha}$, if not stored on a medium, disintegrates after the emerging within a conscious state, that is,

$$\underline{\alpha} \models_{\text{disintegrate\_within}} \overline{\alpha}$$

Let α_j be a synonym (an alternative definitions) of α, where $\alpha \models_{\text{synonymously}} \alpha_1, \alpha_2, \ldots, \alpha_j, \ldots$ and $\alpha_1, \alpha_2, \ldots, \alpha_j, \ldots \models_{\text{synonymously}} \alpha$. Entropon $\overline{\alpha}$ can be structured as

$$\underline{\alpha}, \underline{\alpha_1}, \underline{\alpha_2}, \ldots, \underline{\alpha_j}, \ldots \in \overline{\alpha}$$

From the name α, synonymous names $\alpha_1, \alpha_2, \ldots, \alpha_j, \ldots$ come in, which can be understood as alternatives of α and, vice versa, alternative names impact informationally the initial name α. This interplay can be understood as a consequence of synonymous emerging of informons $\underline{\alpha}, \underline{\alpha_1}, \underline{\alpha_2}, \ldots, \underline{\alpha_j}, \ldots$ and their entroponic counterparts $\overline{\alpha}, \overline{\alpha_1}, \overline{\alpha_2}, \ldots, \overline{\alpha_j}, \ldots$. In an informational space $\overline{\underline{\alpha}}$ and $\overline{\underline{\alpha_j}}$, names of informons are not all for ever meaningly stable entities and, in a conscious environment, they can be informationally fine-tuned, specifically (culturally) modulated and, lastly, meaningly modified through the interinforming of informons and entropons.

In natural systems, entropons $\overline{\alpha}$ and $\overline{\alpha_j}$ become the history of decayed informons $\underline{\alpha}$ and $\underline{\alpha_j}$, where informational lumps (parts 'wandering' around) concerning former informons are gathered. In general, for informons $\underline{\alpha}$ and $\underline{\alpha_j}$,

$$\underline{\alpha} \models_{\text{disintegrate\_in}} \mathfrak{p}_{\text{part},1} \lceil \underline{\alpha} \rceil, \ldots, \mathfrak{p}_{\text{part},i} \lceil \underline{\alpha} \rceil, \ldots;$$
$$\underline{\alpha_j} \models_{\text{disintegrate\_in}} \mathfrak{p}_{\text{part},j1} \lceil \underline{\alpha_j} \rceil, \ldots, \mathfrak{p}_{\text{part},jk_j} \lceil \underline{\alpha_j} \rceil, \ldots$$

Informon $\underline{\alpha}$ is a complex system of formulas φ_i and the corresponding subformulas are $\psi_{ij_i} \Subset \varphi_i$. Thus, for ψ_{ij_i}, as well-formed parts of φ_i, $i = 1, 2, \ldots, \mathbb{L}_{\varphi_i}$,

$$\psi_{ij_i} \in \overline{\alpha}, \text{ where } \psi_{ij_i} \Subset \varphi_i \text{ and } \varphi_i \in \underline{\alpha}.$$

$\mathbb{L}_{\varphi_i}$ is the number of all subformulas ψ_{ij_i} in formula φ_i [21]. Evidently, concrete informons as parenthesized formula systems do not enter in a natural entropon. They cannot be memorized precisely because of their complexity in a human conscious system. As we believe, their memorizing is approximate and superficial along some key words and phrases. Even more, the decay of informon formulas in an entropon can progress to a total destruction and, thus, the basic constituents of formulas like differently subscribed, however, to the informon adequate operands and operators, enter in the entropon. In this way, in entropons $\overline{\alpha}$ and $\overline{\alpha_j}$, there are meaningly suitable operators in regard to the meaning structures of informons $\underline{\alpha}$ and $\underline{\alpha_j}$, respectively, that is,

$$\models_{\text{particularized},m_{j_i}} \in \overline{\alpha_j}, \overline{\alpha}; \ i, m_{j_i} = 0, 1, 2, \ldots$$

where $\alpha \rightleftharpoons \alpha_0$. So, entropon $\overline{\alpha}$ keeps a large number of constituents concerning different informons $\underline{\alpha_j}$ named α_j being deduced synonymously from the initial intention or name α_0, giving rise to the emergence of the informons particular intentions.

In an artificial conscious environment, informon $\underline{\alpha}$ can remain preserved in entropon $\overline{\alpha}$ as a specific formula system, as it has emerged during its conscious cycle (e.g. being written, stored on a medium). In general, it has the

system form

$$\underline{\alpha} \rightleftharpoons \begin{pmatrix} \varphi_1; \\ \varphi_2; \\ \vdots \\ \varphi_i; \\ \vdots \end{pmatrix}, \text{ where, } \underline{\alpha} \in \overline{\alpha}$$

and is connected with other informons and entropons via the common operands $\alpha_{i1}, \alpha_{i2}, \ldots, \alpha_{ij_i}, \ldots, \alpha_{in_{\varphi_i}}$ of formulas $\varphi_i \lfloor \alpha_{i1}, \alpha_{i2}, \ldots, \alpha_{ij_i}, \ldots, \alpha_{in_{\varphi_i}} \rfloor$.

4 Defining informon and entropon philosophically and formally

The definition of a complex and metaphysically organized informational entity—conscious informational entity—and its direct environment is important for understanding and formal implementation of both informon and entropon. The entity definition means that a concrete implementation may follow in an individual mind and computer net environment. In this context we are speaking specifically and concisely in a formal way about *informational informon* and *informational entropon*, distinguishing them from other concepts using the same basic names, for instance, in quantum mechanics (quantum informon and quantum entropon)[3]. While the quantum informon and entropon are defined as simple information carrying particles, informational informon and entropon are named as the most complex distributed formula systems within a conscious system.

The first published definition of the (informational) informon was in German, obtained from [21] by improvement in verbal and formal sense. According to the definition in German [19][4],

Informon is a new concept for the complexity of a conscious entity. Each informon as an informational entity is provided with its own consciousness. An individual consciousness consists of informons. An informon is in a given consciousness distributed informationally and, in this way, more or less, existent in other informons. Consciousness is nothing other than an informational overlapping of informons, and being an informon by itself.

The artificial informon, named α, can be defined precisely, for instance, as

$$\underline{\alpha} \rightleftharpoons_{\mathsf{def}} \underline{\mathfrak{M}}_{\triangleright}^{\circlearrowright \|} \lceil \alpha \rceil, \text{ where } \triangleright \in \{\rightarrow, \leftarrow, \rightleftarrows, (\rightarrow, \leftarrow)\}$$

$\mathfrak{M}_{\triangleright}^{\circlearrowright \|} \lceil \alpha \rceil$, as a pre-informonic entity, denotes the metaphysicalistic decomposition of name α, according to the subscript $\triangleright$. It delivers the basic metaphysicalistic organization to α (intentional, counter-intentional, and embedding-intentional informing), from which through complexity, that is, complex connectivism in the conscious system, informon as a conscious component can emerge. Informon's connectivism concerns all available operands in the system, concerning informon's name directly and indirectly, associatively, and otherwise possibly. This situation can be captured graphically in Fig. 1. Probably, informon $\underline{\alpha} \rightleftharpoons \mathfrak{M}_{\triangleright}^{\circlearrowright \|} \lceil \alpha \rceil$ is connected with other informons via common operands and via operands appearing in common operand formulas, to a recursive depth, dimension, and circular perplexity.

An artificial entropon can be structured much more orderly, including a great number of well-structured formulas and formula systems, than a natural entropon which is mainly characterized by forgetting the well-formedness and particularities of formulas and formula systems. The artificial entropon can include a substantial number of already emerged informons, being "memorized" absolutely, that is, without loss of organization and meaning of informons, in the form they appeared concretely in certain situations. Within informational understanding, "memory" as a memorizing property means the circular structure of formulas and formula systems, representing a circular dynamic sort of memory, where the circular informing of entities (operands) is understood as an emerging process of memorizing in causal formula loops[5]. In contrast to informon, entropon is in general not absolutely or regularly structured in any way.

Similarly as for the terminology of informon in [20], Table 2, the additional terms for entropon can be introduced, to make the discussion concerning entropon transparent. By entropon, several words as the adjective *entroponic,* the adverb *entoponically,* the verb *entroponize,* and the participle *entroponizing* can be used.

An explicit verbal definition of entropon can be the following[6]:

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[3]The quantum definitions of informon and entropon can be found on Internet in Cyrillic, for instance, in Елкин, С.В. и Д.А. Гаврилов. 1998. Информоны и энтропоны. At the web site ⟨http://www.aha.ru/~latypov/informon.htm⟩. Other and the same Russian authors can be searched in English under Koulikov V. V., Yolkin S. V., Hariponov A. S., Gavrilov D. A., etc.

[4]Das Informon ist ein neuer Begriff für die Komplexität eines bewußten Seienden. Jedes Informon ist als eine informationelle Entität mit eigenem Bewußtsein beschafft. Ein individuelles Bewußtsein ist aus Informonen zusammengesetzt. Ein Informon ist im gegebenen Bewußtsein informationell verteilt und damit auch mehr oder weniger in anderen Informonen anwesend. Das Bewußtsein ist nichts anderes als ein informationelles Überlappen der Informonen und selbst ein Informon.

[5]This sort of dynamic memory conceptualism could come close to the quantum-mechanical phenomenology (informational dynamics) in brain, or at least support the concept theoretically.

[6]In German, the definition is: Das Entropon ist ein neuer Begriff für die Komplexität der Umgebung eines bewußten Seienden. Jedes Entropon ist als eine ungeordnete informationelle Entität aus gut-strukturierten und iregulären Teilen zusammengesetzt, entstehend durch das Informieren des Buwußtseinssystems. Ein individuelles Bewußtsein besteht aus Informonen und Entroponen als genannten Entitäten. Ein Entropon ist im Bewußtseinssystem informationell verteilt und damit mehr oder weniger in anderen Informonen und Entroponen anwesend. Ein System des Bewußtsens ist nichts anderes als ein informationelles Überlappen von Informonen und Entroponen und selbst ein Informon mit dem zugehörigen Entropon.
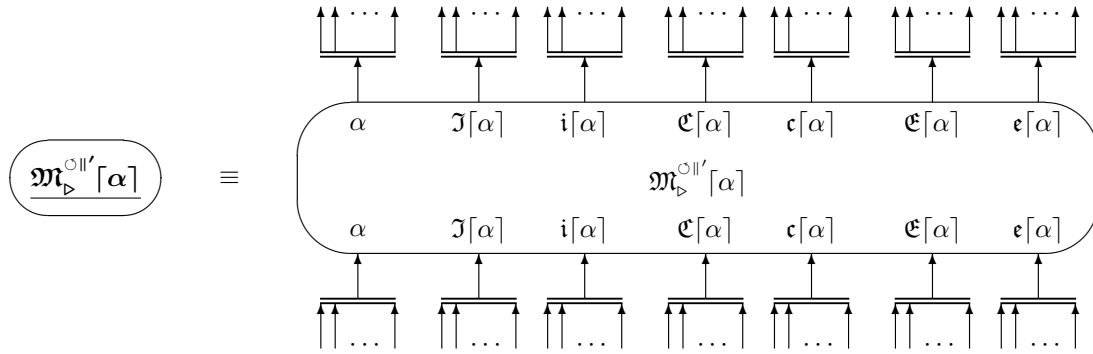
Figure 1: *The complexity of informon's primitive system* $\mathfrak{M}_{\triangleright}^{\circ\|'}\lceil\alpha\rceil$ *is granted by parallel and serial connections to operands in the system around the primitive shell* $\mathfrak{M}_{\triangleright}^{\circ\|'}\lceil\alpha\rceil$, *via the inner operands of name* α, *informing components* $\mathfrak{I}\lceil\alpha\rceil$ *and* $\mathfrak{i}\lceil\alpha\rceil$, *counterinforming components* $\mathfrak{C}\lceil\alpha\rceil$ *and* $\mathfrak{c}\lceil\alpha\rceil$, *and informational-embedding components* $\mathfrak{E}\lceil\alpha\rceil$ *and* $\mathfrak{e}\lceil\alpha\rceil$.

Entropon is a new concept for the complexity and disorder of a named conscious entity environment of an informon. Each entropon, as a disordered informational entity, constituted by well-formed as well as irregular informational items (in fact, parts of well-formed entities), is a consequence, arising by informing of a conscious system, consisting of informons and entropons. An individual consciousness consists of both informons and entropons as named entities. An entropon, in a given conscious system, is distributed informationally and, in this way, more or less, existent in other informons and entropons. A conscious system is nothing other than an informational overlapping of informons and entropons, and being an informon with the corresponding entropon by itself.

The question is, how the entropon can be defined formally, graphically, comparatively, and transparently to the concept of informon. The artificial entropon named α can be defined formally, for instance, as

$$\overline{\alpha} \rightleftharpoons_{\mathsf{def}} \overline{\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil}, \text{ where } \triangleright \in \{\rightarrow, \leftarrow, \rightleftarrows, (\rightarrow, \leftarrow)\}$$

Here, $\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil$ denotes the informonic shell in the form of metaphysicalistic decomposition of the name α, according to the subscript $\triangleright$. Because in the artificial informational environment,

$$\underline{\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil} \in \overline{\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil},$$

entropon $\overline{\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil}$, where $\triangleright \in \{\rightarrow, \leftarrow, \rightleftarrows, (\rightarrow, \leftarrow)\}$, can be divided in the sense of the set-theoretical view, in two areas, being separated by the metaphysicalistic shell $\mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil$, in fact, its longest loop. This loop can be grasped as the informonic envelope for which

$$\varphi_{\triangleright}^{\circ}\lfloor\alpha, \mathfrak{I}\lceil\alpha\rceil, \mathfrak{i}\lceil\alpha\rceil, \mathfrak{C}\lceil\alpha\rceil, \mathfrak{c}\lceil\alpha\rceil, \mathfrak{E}\lceil\alpha\rceil, \mathfrak{e}\lceil\alpha\rceil\rfloor \in \mathfrak{M}_{\triangleright}^{\circ\|}\lceil\alpha\rceil$$

The situation is presented in Fig. 2. The envelope is a formula of the metaphysicalistic shell — the initial inner conscious structure of the informon. Inside the envelope, the entire texture of the informon is meant to be located.
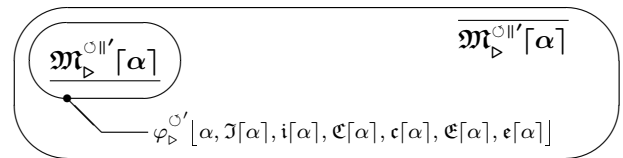

Figure 2: *In entropon's primitive system,* $\overline{\mathfrak{M}_{\triangleright}^{\circ\|'}\lceil\alpha\rceil}$, *informon's primitive system* $\underline{\mathfrak{M}_{\triangleright}^{\circ\|'}\lceil\alpha\rceil}$ *is informationally embedded. Envelope's primitive system* $\varphi_{\triangleright}^{\circ'}\lfloor\alpha, \mathfrak{I}\lceil\alpha\rceil, \mathfrak{i}\lceil\alpha\rceil,$ $\mathfrak{C}\lceil\alpha\rceil, \mathfrak{c}\lceil\alpha\rceil, \mathfrak{E}\lceil\alpha\rceil, \mathfrak{e}\lceil\alpha\rceil\rfloor$ *separates both and the contents of informon is meant to be encircled by the envelope.*

The shell delivers the basic metaphysicalistic organization to α (intentional, counter-intentional, and embedding-intentional informing), from which through complexity, that is, complex connectivism in the conscious system, informon as a conscious component can emerge. Informon's connectivism concerns all available operands in the system concerning informon's name directly and indirectly, associatively, and otherwise possibly. This situation is captured explicitly by Fig. 2.

One must not forget the correspondence between the formula φ, the formula scheme $\mathfrak{S}\lceil\varphi\rceil$, and the primitive system of the formula φ'. There is, $\varphi' \rightleftharpoons \mathfrak{S}\lceil\varphi\rceil$, where $\mathfrak{G}$ denotes the graph. For a formula system Φ, the correspondence becomes

$$\Phi \longrightarrow \mathfrak{S}\lceil\Phi\rceil \longrightarrow \mathfrak{G}\lceil\Phi\rceil, \text{ with}$$
$$\Phi \rightleftharpoons (\varphi_1; \varphi_2; \ldots; \varphi_{n_\Phi}),$$
$$\mathfrak{S}\lceil\Phi\rceil \rightleftharpoons (\mathfrak{S}\lceil\varphi_1\rceil; \mathfrak{S}\lceil\varphi_2\rceil; \ldots; \mathfrak{S}\lceil\varphi_{n_\Phi}\rceil), \text{ and}$$
$$\Phi' \rightleftharpoons (\varphi_1'; \varphi_2'; \ldots; \varphi_{n_\Phi}')$$

This correspondence is irreversible. From a primitive formula system Φ', the schematized system $\mathfrak{S}\lceil\Phi\rceil$ cannot be identified. And from a schematized system, the original formula system Φ cannot be identified. It seems that a natural conscious system operates schematically, however, an artificial conscious system can operate formula-likely,

schematically, and primitively, that is, graphically.

5   Cognitive-emotional nature of consciousness

The cognitive-emotional concept of consciousness has to be understood merely as one of the important views in the philosophy of consciousness. Besides the cognitive-emotional paradigm, other explicit components distributed in a conscious system cooperate in the system orchestration, for instance, attention, sensibility, motivation, homeostasis, behavior, and the like. Cognition and emotion are fields researched extensively in the framework of informational phenomenalism, cognitive science, psychology, psychiatry, clinical research, biological systems, and so on.

5.1   Cognition and emotions

Cognition-driven emotional and emotion-driven cognitive systems exist within the natural and artificial consciousness. The aspect we discuss in this paper roots in the informational phenomenalism, where conscious components (like informons [19, 20]) interact in complex and interactive ways. Emotion-driven robots, like sociable and working robots, are examples of this sort of philosophy. Cognition-emotion perspective concerns different fields of research and clinical practice, that is, philosophy, psychology, psychiatry, cognitive science and the informational theory. The cognitive-emotional interconnection can be efficiently projected on the informational formalism, describing the most complex phenomena, and serving as an outlook for the informational consciousness implementation. The reader must not forget that the discussion in this paper is the subject of the aim dealing with the question, how to design a conscious system artificially in the future.

In nature, cognition and emotion are two of the key concepts in the constitution of conscious and subconscious (unconscious) domain, informing to and being informed by other subsystems. In the everyday language, reason and affect seem to support the main phenomenology of human consciousness. Scientifically, together with other significant components of the conscious system, cognitive-emotional perspective is dominating in complexity, interactivity, and specific (metaphysicalistic) organization of informing components. The following perspective, however not the complete one, is being worth to be considered, for instance, in robotics:

cognition	attention	homeostasis	behavior
emotions	motivation	sensorics	motorics

As the reader can guess, this list of conscious components can be used by the nowadays design possibilities of sociable robots, possessing only a not-yet complex constitution of each of the components.

5.2   Basic emotions

The question of basic emotions has its practical value in the design of emotion-driven and sociable robots. The criteria for basic emotions certainly can be set from different research points of view. Ekman ([8] pp. 55–56) lists 11 rules for distinguishing basic emotions from one another and from other affective phenomena. There are 15 distinguishable basic emotions:

> *amusement, anger, contempt, contentment, disgust, embarrassment, excitement, fear, guilt, pride in achievement, relief, sadness/distress, satisfaction, sensory pleasure,* and *shame.*

Each of these words denotes a family of related emotions, where some affective phenomena are omitted. Guilt may be not a basic emotion when considering its affective components. Interest may not be an emotion but rather a cognitive state.

According to Ekman's classification of basic emotions, romantic love, parental love, and hate are clearly affective, as is grief, and jealousy. They should belong to the so-called *emotional plots,* in which a number of basic emotions can be expected. Emotional plots inform in a more enduring and specific ways than basic emotions, and they can occur in specific affective contexts. The moods are another affective phenomena having different causes, lasting much longer, and being saturated with emotions. Affective personality traits, such as hostility, are another set of affective phenomena.[7]

It is hard to say how many emotions there are, however, linguistically many words naming emotions in different languages and cultures exist. The meaning of these words can be understood as features of eliciting situations and of different responses to reality and phenomenal happening. The name of an emotion, its linguistic denotation, and its meaning is language-conditioned and depends on the development and spreading of the language. Highly developed languages distinguish a high number of different emotions, e.g. in English some 2,500.

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[7]A transparent historical phenomenon of emotional plots is the so-called class hate and class hostility, elapsing in crime upon humanity and class genocide, in totalitarian systems of communism. On the other side of such a hate, the love to the totalitarian political party is demonstrated, and experienced in the highest possible affective state of excitement, pride, and satisfaction. For instance, a communist youngster confessed that she was extremely excited, with tears in her eyes, when being accepted as a member of communist party. Today, as an old philosopher, she is still active in the leftist action and organization, provoking the normally emerging democratic public. This situation may prove how her emotional plot is enduring and lasting over the real possibilities of life. In this sense, a totalitarian ideology is one of the best examples of affective revolutionary conspiracy—a totalitarian plot.

In this respect it can be useful to remind the usual meaning of the word *plot.* Plot is a secret plan for accomplishing an evil or unlawful end, synonymous with intrigue, machination, cabal, conspiracy, scheme. It is a design, plan, trick, contraption, maneuver, stratagem and the like.

5.3 Basic components of cognitive-emotional complex

Because of their informational perplexedness, it is not possible to separate and distinguish strictly cognitive and emotional components. Cognition is triggered by a kind of affective component and, then, being cognitively coupled with it. A first-step approximative approach to the design of cognitive-emotional system can be realized via the following list of characteristic signifiers (names):

ability	affect	affection	anger
anticipation	antipathy	anxiety	apathy
appeal	attention	aversion	avoiding
awareness	believing	bravery	conviction
convincing	courage	delight	desire
despair	disability	disliking	distress
disturbance	emotion	emotionalizing	empathy
empathizing	enjoyment	ethics	evading
excitement	fear	feeling	frightening
grief	hate	hope	horror
impression	inclination	instinctiveness	intention
intuitiveness	joy	liking	love
lust	motivation	opinion	pain
passion	perceiving	pity	pleasure
($\acute{\eta}\delta o\nu\acute{\eta}$)	presentiment	propaganda	provocation
rage	recognition	repugnance	sadness
seeming	sense	sensation	sensing
sensitivity	sentiment	sorrow	($\lambda\upsilon\pi\eta$)
subjectivism	susceptibility	suspicion	sympathy
tending to	touching	trusting	truthfulness
turgidness	turmoil	twitting	understanding

This list of affect and cognition components, that is, of cognitive-emotional signifiers, can serve as possibilities to the initial impulse of design using the principles of consciousness (informonic) decomposition. Each of the components can be differently decomposed according to the available knowledge, information, and data archives including signifier definitions, being connected with other components via common operands.

Corresponding lists of signifiers can be completed for other domains of consciousness components, for the fields of reason, understanding, language, and other domains of consciousness informational activity. For the decomposition of reason, different signifiers can be useful, for instance:

argument	awareness	cause	comprehension
concluding	grasping	ground	intellect
intelligence	legitimacy	judgment	justice
logic	mind	motif	perception
proof	reason	reasoning	right
theme	thinking	tolerance	understanding

Further, for the decomposition of understanding, still additional signifiers come into the foreground:

being conscious	conceiving	conceptualizing	interpreting
perceiving	reasoning	sensing	understanding

Sensuality, attention, motivation, cognition, emotions, homeostasis, behavior, and additional components can be added to a conscious system, performing in the informational and physical reality. In designing the artificial conscious system, an exhaustive list of components, constituting the cognitive-emotional complex, can be helpful, as presented in Table 1. All this could represent a rough approximation of the nature of components entering into the context of conscious systems.

Homeostasis or *homeostatic informational equilibrium* of a conscious entity informing is the relative stability (perseverance of intention), for instance, of the internal organization of informon, by circular (feedback, loop) mechanisms, despite the presence of inner and outer impulses (e.g., ideological, dogmatic, prejudiced disturbances), capable of causing profound changes. Let us analyze and show some possibilities of the attention organization in the next section.

6 The problem of conscious and unconscious attention

Attention belongs to the basic concerning a conscious system. Thus, attention is a component, which together with cognition, emotions, motivation, homeostasis, arousal, behavior, etc., constitutes the conscious system, as imagined today in the research of natural consciousness [6, 16], and being actual at the design of artificial conscious devices, like robots and informational systems dealing with phenomenal organization of systems. Informational formulas, informational schemes, and informational graphs are important tools of design in natural and artificial systems possessing the conscious function. Especially, graphs offer a general overview of a situation concerning a conscious system, putting into the foreground the circular system or subsystem organization, and the informational perplexedness in the graph. In this sense, a complex graph can represent the most advanced field for informational experiments [21]. From a graph, new schemes can be constructed when moving along the graph paths. Thus, the irreversibility of a graph to the original schemes, which originated its perplexed structure, is the condition for a new design within a complex conscious system.

Let us present in more detail the interinforming of *attention,* $\mathfrak{a}_{\text{attention}}$, with other entities (cognition, emotions, etc.), as an informonic-entroponic organized system $\left(\mathfrak{a}_{\text{attention}}; \overline{\mathfrak{a}}_{\text{attention}}\right)$. One of the main problems is, how to organize the complex function of *attention* in a conscious system. There is more or less evident that the attention to a certain contents (object) will be triggered by intrinsic and outer impulses, originating in informational happening. The inner sensuality and the events happening in the system environment will deliver the triggering information to the *system of attention.*

Attention, $\mathfrak{a}_{\text{attention}}$, regulates the extent, to which a conscious system $\left(\mathfrak{z}; \overline{\mathfrak{z}}\right)$ is distracted from aversive stimuli, with the aim, to replace the unwanted emotions. Entropon $\overline{\mathfrak{z}}$ has the role of subconscious or unconscious sys-

| A daptation as problem | F acial expressions | Problem solving | historical, |
| solver | Fear, formal object of, | R age | significance of, |

A daptation as problem
solver
Adaptedness, evolutionary,
 environment
Anger
 concept of,
 formal objects of,
 responses to,
 versus rage
 versus sadness
Anger–disgust–contempt
 triad
Anxiety
 controversial states
 versus fear
Apperception
Attention
Avoidance
B ehavior
 planning of,
 affect infusion in,
 problem solving
Behaviorism
Belief systems
C ivilization
 emotional expression and,
Closure, law of,
Cognition
 as base of emotions
 emotion and,
 versus emotions
 nature of,
Cognitive construction
Cognitive processes
 elicitors
 emergence of,
 emotion classification and,
 emotional experiences and,
Cognitive scenarios
Communication
Concepts, cognitive,
 emotional
Constructs, cognitive
Curiosity, cognitive
D ecision making
Desire, cognition and,
Discourse, cognition as,
E mbarrassment, cognitive-
 attributional
Emotion
 adaptation
 awareness of,
 cognitive aspects
 communicative function
 observable criteria
 versus reason
 topology of,
 understanding

F acial expressions
Fear, formal object of,
G edanken experiments
Goal appraisal
 blocking
 orientation
I dentity
Inference
Intentionality
Interpretation
Irrationality
J oy–sadness pattern
L anguage
 emotion and cognition in,
Learning, mood and,
Lexical models
M asking, backward,
Meaning, acts of,
 situational, law of,
Memory, biased of,
 content of,
 narrative,
 thinking and,
Meta-emotions
Metaphor
 emotion and cognition as,
 emotional effect of,
Moods: effects of,
 versus emotions
 learning and,
 recall dependent on,
Moral sentiments
Motivation
 emotional events and,
 emotions in,
N arrative memory
Negotiation
 positive effect and,
P anic
 expectations in control of,
 stimuli for,
Passion
Perception
 emotional intelligence and,
 emotions in organiz. of,
Planning, role of imagery
 and emotion in,
Play/joy system
Positive affect
 cognitive,
 conclusions
 decision making and,
 memory and,
 motivation and,
Powerlessness
 depression and,

Problem solving
R age
 hierarchical control of,
Rage–anger system
Rationality
 emotional,
 cognitive,
 global and local,
Reason versus emotion
Recall
 associative,
 mood-congruent,
 mood-dependent,
Reflexivity
Relationships, emotional
 knowledge about,
Religion, love as ideal of,
Revenge, universality of,
Reverse design
 metaphysicalistic,
Risk, positive effect and,
Ritual chains, interaction
Rumination
 definition and function
S adness
 aggression and,
 depression and,
 versus anger
 versus guilt
Sadness–joy pattern
Self
Self-awareness
 development of,
Self-conscious emotions
 cognitive,
 conclusive,
 elicitation of,
 neglect of,
 role of self in,
Self-constructs
Self-esteem
Self-evaluation
Semantic differential
Sentiments versus emotions
Shame–anger spiral
Significance evaluation
Situational meaning
Social behavior
 empathy and,
Social/cognitive
 construction
Social competence
Social construction
 conclusions
 cognitive evaluations
 culture in,
Social constructivism
Social context
 emotional,

historical,
 significance of,
 versus temperament
Social groups
 emotion decoding and,
 emotion encoding and,
 emotion expression in,
Social identity
 emotion discourse and,
Social judgment/reasoning
 affect infusion in,
 mood and,
Socialization
 cognitive, emotional,
Speech
 cognitive, emotional,
Standards, rules, goals
Stress response
Subjective well-being
Surprise, emergence of,
Symbolic interaction
Sympathy
 as derivation process
 versus empathy
 negative moral outcomes
  and,
T abula rasa concepts
Temperament
 concepts of,
 emotional construct of,
 conclusion, empathy and,
Thinking
 cognitive and emotional,
Thoughts
 memories, and feelings
Threat
 detection of,
 discovering of,
 perceived,
Trauma
 cognitively identified,
 fear, anxiety and,
 linguistic expression of,
U nconscious
 Freudian,
 in anxiety and fear
Understanding
 cognitive,
 emotional,
Universality
 of cognition and emotion
 versus cultural specificity
V erstehen, philosophy of,
Vulnerability
 concept of,
 depression and,
W ell-being, subjective
We-self versus I-self

Table 1: *A short ad-hoc catalog of perplexed cognition and emotion concerning components (more in [21], Subsubsect. 27.4.1, Tab. 17).*

tem within $\left(\mathfrak{z}; \bar{\mathfrak{z}}\right)$. The part of attention is, in a circular way, a regulatory informing of emotional behavior, $\mathfrak{I}\lceil\tau_{regulation}\lceil\mathfrak{b}_{behavior}\lceil\mathfrak{e}_{emotions}\rceil\rceil\rceil$. In human, the affect-relevant *attentional informing*, $\mathfrak{I}\lceil\mathfrak{a}_{attention}\lceil\mathfrak{a}_{affect\_relevant}\rceil\rceil$,

is under control of prefrontal cortex [7]. This situation can be expressed transparently by the formal language of informational schemes, in the form of the scheme,

$$\mathfrak{p}_{prefrontal\_cortex} \models_{control} \mathfrak{I}\lceil\mathfrak{a}_{attention}\lceil\mathfrak{a}_{affect\_relevant}\rceil\rceil$$
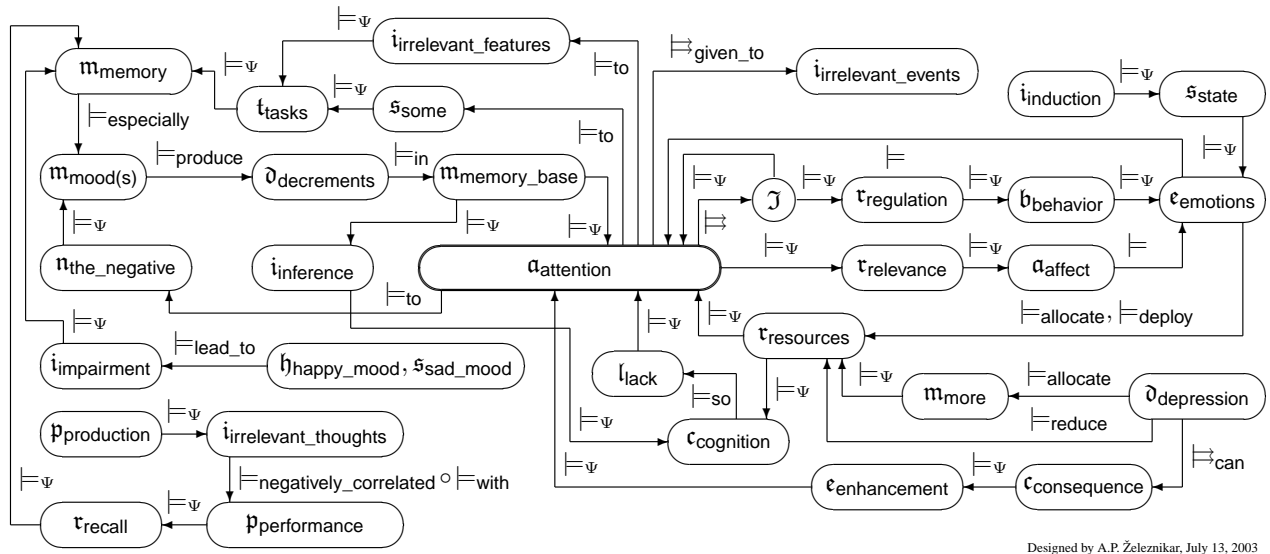
Designed by A.P. Železnikar, July 13, 2003

Figure 3: *The informationally modified Ellis and Moore subsystem of attention [9], concerning mood, memory, depression, irrelevant events, thoughts, and features. Also,* $\mathfrak{a}_{\text{attention}} \Mapsto \mathfrak{I}\lceil\tau_{\text{regulation}}\lceil\mathfrak{b}_{\text{behavior}}\lceil\mathfrak{e}_{\text{emotions}}\rceil\rceil\rceil \models \mathfrak{a}_{\text{attention}}.$

The expression $\mathfrak{I}\lceil\mathfrak{a}_{\text{attention}}\lceil\mathfrak{a}_{\text{affect\_relevant}}\rceil\rceil$ on the right side of operator $\models_{\text{control}}$ can be read as (1) the affect-relevant attentional informing, (2) informing of attention being affect-relevant, (3) informing concerning attention of the affect relevant domain, etc.

Mood produces decrements in memory base concerning attention and cognitive inference, schematically,

$$\mathfrak{m}_{\text{mood}} \models_{\text{produce}} \mathfrak{d}_{\text{decrements}} \models_{\text{in}}$$
$$\mathfrak{m}_{\text{memory\_base}}\lceil\mathfrak{a}_{\text{attention}}, \mathfrak{i}_{\text{inference}}\lceil\mathfrak{c}_{\text{cognition}}\rceil\rceil$$

Induction of an emotional state will allocate or deploy *attentional resources* to some memory task,

$$\left(\mathfrak{i}_{\text{induction}}\lceil\mathfrak{s}_{\text{state}}\lceil\mathfrak{e}_{\text{emotion}}\rceil\rceil\right) \left(\begin{matrix}\models_{\text{allocate}}\\\models_{\text{deploy}}\end{matrix}\right)$$
$$\tau_{\text{resources}}\lceil\mathfrak{a}_{\text{attention}}\rceil\bigg) \models_{\text{to}} \mathfrak{s}_{\text{some}}\lceil\mathfrak{t}_{\text{tasks}}\lceil\mathfrak{m}_{\text{memory}}\rceil\rceil$$

Depression allocates more attentional resources to irrelevant features of the memory task, especially moods, and reduces the cognitive resources, so the lack of attention is given to relevant events. Schematically,

$$\left(\begin{matrix}\mathfrak{d}_{\text{depression}} \models_{\text{allocate}} \mathfrak{m}_{\text{more}}\lceil\tau_{\text{resources}}\lceil\mathfrak{a}_{\text{attention}}\rceil\rceil \models_{\text{to}}\\ \mathfrak{i}_{\text{irrelevant\_features}}\lceil\mathfrak{t}_{\text{tasks}}\lceil\mathfrak{m}_{\text{memory}}\rceil\rceil \models_{\text{especially}} \mathfrak{m}_{\text{moods}};\\ \mathfrak{d}_{\text{depression}} \models_{\text{reduce}} \tau_{\text{resources}}\lceil\mathfrak{c}_{\text{cognition}}\rceil \models_{\text{so}}\\ \mathfrak{l}_{\text{lack}}\lceil\mathfrak{a}_{\text{attention}}\rceil \Mapsto_{\text{given\_to}} \tau_{\text{relevant\_events}}\end{matrix}\right)$$

Both happy and sad moods lead to *memory impairment,* that is,

$$\mathfrak{h}_{\text{happy\_mood}}, \mathfrak{s}_{\text{sad\_mood}} \models_{\text{lead\_to}} \mathfrak{i}_{\text{impairment}}\lceil\mathfrak{m}_{\text{memory}}\rceil$$

Depression can be a consequence of enhanced attention to negative moods, that is, schematically,

$$\mathfrak{d}_{\text{depression}} \Mapsto_{\text{can}} \mathfrak{c}_{\text{consequence}}\lceil\mathfrak{e}_{\text{enhancement}}\lceil\mathfrak{a}_{\text{attention}}\rceil\rceil \models_{\text{to}}$$
$$\mathfrak{n}_{\text{the\_negative}}\lceil\mathfrak{m}_{\text{moods}}\rceil$$

Production of irrelevant thoughts is negatively correlated with recall performance, that is,

$$\mathfrak{p}_{\text{production}}\lceil\mathfrak{i}_{\text{irrelevant\_thoughts}}\rceil \Mapsto_{\text{negatively\_correlated}}{}^{\circ}\models_{\text{with}}$$
$$\mathfrak{p}_{\text{performance}}\lceil\tau_{\text{recall}}\lceil\mathfrak{m}_{\text{memory}}\rceil\rceil$$

This completes the concepts given by Ellis and Moore [9], presented by the informational graph in Fig. 3.

The graph in Fig. 3 needs a commentary. The path $\alpha \models_{\Psi} \beta$ is read α *concerns* β or, colloquially, α *of* β, or, in the adjectival style, α-*like* β or β-*like* α, e.g., cognitive inference instead of inference concerning cognition or, in adjectively used noun β, $\beta\alpha$, e.g., memory base for base of memory. Instead of irrelevant thoughts, thoughts of the irrelevant (domain) could be chosen. In the text discussed, formula schemes are lost in the graph being a union of different schemes and bringing to the surface a scheme-transitive circular organization. Isolated circularly, terminal entities in Fig. 3 are *production of irrelevant thoughts,* $\mathfrak{p}_{\text{production}}\lceil\mathfrak{i}_{\text{irrelevant\_thoughts}}\rceil$, *depression,* $\mathfrak{d}_{\text{depression}}$, and the *happy* and *sad mood,* $\mathfrak{h}_{\text{happy\_mood}}$ and $\mathfrak{s}_{\text{sad\_mood}}$, respectively.

A distinction in *attention informing* between the automatic and conscious, or automatic and controlled, can be introduced. *Attention* as an informational entity is organized in a flexible way and distributed across stimuli and tasks. *Automatic attention* is concurrent and without mutual interference (an informon $\mathfrak{a}_{\text{automatic\_attention}}$). *Conscious attention* is controlled by time-sharing of tasks. *Awareness* of automatic informing is low and high for controlled informing. *Attentional system* is related to unconscious and conscious informing. The modern concept of *working memory* is related to conscious informing. *Noticing* refers to the introspective awareness of perceiving (acknowledging, recognizing, observing). *Selective attention* is a component in the transformation of a perception into
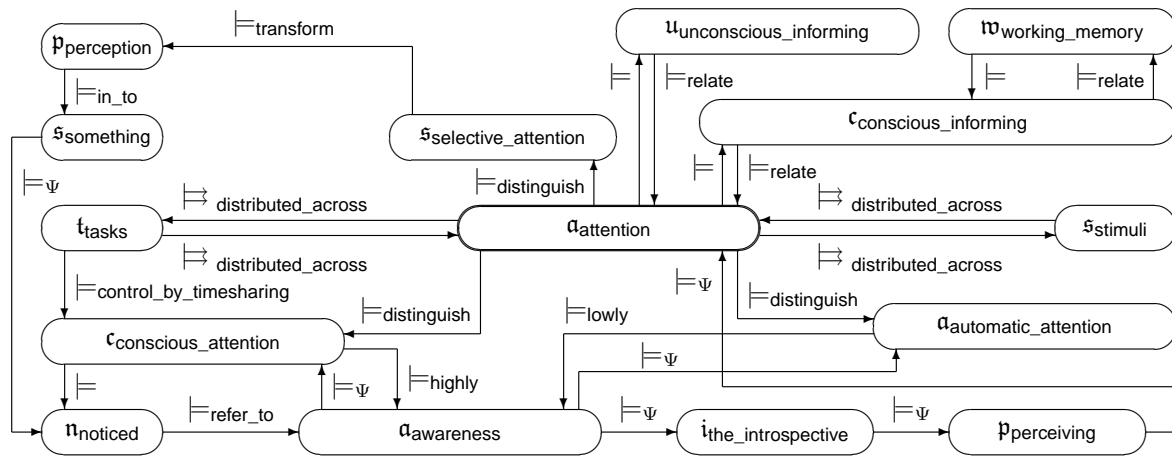
Figure 4: *Informationally modified Öhman's subsystem of attention [17] within a perceptive-emotional organization of a conscious system.*

something noticed. All this, extracted through Öhman's diction [17], can be summarized by the system graph in Fig. 4.

We see how a short text (paragraph) in the natural language generates the graph in Fig. 4 being informationally complemented, delivering a relatively complex and circularly structured subsystem graph concerning $\mathfrak{a}_{attention}$. Together with the initial metaphysicalistic subsystem given by $\mathfrak{M}_{\triangleright}^{\circlearrowright\parallel}\lceil\mathfrak{a}_{attention}\rceil$ and the informonic extension into the informational space, informon $\mathfrak{a}_{attention}$ can emerge and come to a temporary existence. It emerges within and out of its entropon $\overline{\mathfrak{a}_{attention}}$.

On the way to a complete frame definition of attention, several items from the cognitive-emotional domain of research can be added [6, 16] and formalized by informational schemes and graphs. Problems of *attention* and *memory* are highly distractible and play a specific role in manic and paranoid communication. Cognitive informing involved in mania, like that involved in paranoia, has the same informational ground with that implicated in depression. Mania is an extreme state of depression and performs as an extreme defense against depression. Manic episodes (communication) progress through euphoria, anger, irritability and, lastly, through depression, panic and delirium [3].

Attention effects appear to be more easily obtained in anxiety disorders, while depressive states seem to influence memory rather than attention [10]. Forgetting of essential history, trauma and experience seems to be a depressive phenomenon.

Emotional arousal directs *attentional* informing to features which are central to the arousal, at the expense of peripheral details, e.g., in case of eyewitness. Differential attentional informing can occur in response to the negative features of the event [1].

Attention to the environment is the very beginning property of conscious system. Through stimuli, basic emotions emerge and are learned from the environment. The organi-

zation of attention, informing on the path from perceptual systems to the contents of high-level reasoning, is interrelated with emotional and cognitive states of the system, where positive emotions can broaden attentional focus. In fear, shifts in perception and attention appear, goals and motivational weightings change, attentional informing is redirected, conceptual frames change in the direction "dangerous" or "safe", memory informing steps to new retrieval tasks, communication processes change, special inference and learning systems are activated, physiology changes, and behavioral decision rules are activated [5].

Attention can be *selectively dependent on interest,* so it does not stray randomly through the vast domain of stimuli impinging on the senses. Interest focuses attention on a particular object, and as an emotion provides the motivation, interaction, constructive and creative endeavor, and the development of intelligence [13].

It seems that sadness impairs *attention* to tasks. Sadness is associated with *lowering of attention,* where sadness is not being caused by another agent, and so attention is focused inward [2].

The discussed organization and interweavement of attention with other components can now be considered with the aim to make the graph in Fig. 4 more complex and, at last, construct the attention informon, and identifying the existent attention entropon, including the meaningly, associatively and otherwise related words, word phrases, nouns, verbs, formulas, schemes, graphs, etc., which will impact the instantaneous emergence of the attention informon.

7 Implementation of informational phenomenalism

Informational phenomenalism is the metaphor for the conscious system, emerging dynamically, in the live and the artificial. Within this texture, informonic and entroponic entities function as conscious and subconscious (unconscious)

components per se, respectively, in the complex informational space concerning the individual and global conscious system. The condition sine qua non of a component *to be conscious* is the complexity of already existing conscious environment, found in a conscious system, and component's initial metaphysicalistic organization, enabling the emergent development of conscious and self-conscious (metaphysicalistically phenomenal) abilities. Such components' organization and components' environment guarantee the conscious performance of informational entities. Informons together with entropons constitute the conscious system on the conscious and subconscious level, respectively, in local and global circumstances.

Implementing informational phenomenalism means to begin with the initial organization of a couple of informons, realizing the informonic *interism* in the sense pointed out in Sect. 1. In the initial state, a component can gain the property of being conscious through other already conscious components, by which it is linked through common operands. In this manner, the mechanism of the socalled conscious bootstrapping can perform at once, after a short developmental period, or by endurance, developing isolated from the environment in the original initial way of conceptualization. This sort of development is the consequence of system's decompositions concerning the initial entities, including the metaphysicalistic and other sorts of informational decomposition. Decompositions by themselves are conscious entities with their own informonic and entroponic structure and organization within the conscious system.

At last, let us point to the possibilities, how to use an informational graph for construction of sentences in English, when moving along the linked graph paths. Let us take the scheme from the graph in Fig. 4,

$$\mathfrak{s}_{selective\_attention} \models_{transform} \mathfrak{p}_{perception} \models_{in\_to} \mathfrak{s}_{something} \models_\Psi$$
$$\mathfrak{n}_{noticed} \models_{refer\_to} \mathfrak{a}_{awareness} \models_\Psi \mathfrak{i}_{the\_introspective} \models_\Psi$$
$$\mathfrak{p}_{perceiving} \models_\Psi \mathfrak{a}_{attention}$$

The possible parenthesizing of the scheme is, for instance, the well-formed formula,

$$\Big(\big((\mathfrak{s}_{selective\_attention} \models_{transform} \mathfrak{p}_{perception}\big) \models_{in\_to}$$
$$\big(\mathfrak{s}_{something} \models_\Psi \mathfrak{n}_{noticed}\big)\big) \models_{refer\_to}$$
$$\big((\mathfrak{a}_{awareness} \models_\Psi \mathfrak{i}_{the\_introspective}\big) \models_\Psi$$
$$\mathfrak{p}_{perceiving}\big)\Big) \models_\Psi \mathfrak{a}_{attention}$$

One of the possible readings of this formula could be the following: *Concerning attention, selective attention transforms a perception, into something noticed, referring to the introspective awareness of perceiving.* An exact miming of the formula parenthesizing in a natural language is in many cases impossible. Thus, a sentence remains a compromise between an informational scheme and an informational formula (see informational experiments in [21]).

8 Conclusion

The informon-entropon debate can now be made more transparent through the case of attention, discussed in Sect. 6. In the beginning, the name *attention* as operand $\mathfrak{a}_{attention}$ comes fore, for which the meaning is searched, for instance, in the professional literature. In fact, the fragments of possible meaning for the concept named *attention* are gathered within an entity. In the formalized form, this emergent entity of found concepts can be understood as entropon $\overline{\mathfrak{a}_{attention}}$. One of the concepts being included in $\overline{\mathfrak{a}_{attention}}$ has the graph, according to Ellis and Moore [9], presented in Fig. 3. The searching for possible concepts continues with loading of formalized results to entropon $\overline{\mathfrak{a}_{attention}}$. One of such cases is presented, according to Öhman [17], by the graph in Fig. 4. From the text of Sect. 6, which was not exhausted entirely, further formalized concepts concerning attention can be mined. Further concepts for attention, as a function within the conscious system, can be found elsewhere (in [6, 16], and the references herein, for instance). In this way, entropon $\overline{\mathfrak{a}_{attention}}$ can be gradually constituted to an enormous extent of complexity. Many new operands appear and serve simultaneously as common operands within different concepts of attention.

The constitutive step in emerging of informon $\underline{\mathfrak{a}_{attention}}$ can now begin through the initial metaphysicalistic decomposition of the name $\mathfrak{a}_{attention}$, that is, $\mathfrak{M}_\triangleright^{\circlearrowleft\parallel}\lceil\mathfrak{a}_{attention}\rceil$. The common operand to the entities of entropon $\overline{\mathfrak{a}_{attention}}$ is certainly $\mathfrak{a}_{attention}$. In general, by its subsystems, decomposition $\mathfrak{M}_\triangleright^{\circlearrowleft\parallel}\lceil\mathfrak{a}_{attention}\rceil$ means attentional informing, attentional counterinforming, and attentional informational embedding, as known from the general metaphysicalistic organization of entities [18]–[21]. Then, decomposition $\mathfrak{M}_\triangleright^{\circlearrowleft\parallel}\lceil\mathfrak{a}_{attention}\rceil$ can be connected with items residing in entropon $\overline{\mathfrak{a}_{attention}}$, as shown in Fig. 1, in a meaningly reasonable way. It has to be analyzed, which entities fit the meaning of attentional informing and where the connection from and to $\mathfrak{I}\lceil\mathfrak{a}_{attention}\rceil$ and $\mathfrak{i}\lceil\mathfrak{a}_{attention}\rceil$ of $\mathfrak{M}_\triangleright^{\circlearrowleft\parallel}\lceil\mathfrak{a}_{attention}\rceil$ can lead. Meaningly reasonable connection can be realized for metaphysicalistic operands of attentional counterinforming, $\mathfrak{C}\lceil\mathfrak{a}_{attention}\rceil$ and $\mathfrak{c}\lceil\mathfrak{a}_{attention}\rceil$, and attentional informational embedding, $\mathfrak{E}\lceil\mathfrak{a}_{attention}\rceil$ and $\mathfrak{e}\lceil\mathfrak{a}_{attention}\rceil$, leading to and from the entities of the entroponic environment.

In the sketched way, the informon $\underline{\mathfrak{a}_{attention}}$ emerges through the initial step of complexity given by decomposition $\mathfrak{M}_\triangleright^{\circlearrowleft\parallel}\lceil\mathfrak{a}_{attention}\rceil$, and through that, to what it can be connected in entropon $\overline{\mathfrak{a}_{attention}}$. Through more and more connections and informational perplexity, considering the interinformonic and interentroponic connections, the complexity becomes enormous and, by this, the informon $\underline{\mathfrak{a}_{attention}}$ performs, from the step of sufficient complexity on, as a conscious (and self-conscious) informational entity, within a certain conscious subject, the natural or the artificial one. Metaphysicalism and complex connectivity lead to the property of conscious informing of entity within a conscious informational system. In this manner, emotions, cognition, motivations, goals, decisions, and so

on, emerge to conscious entities.

Throughout this paper, the reader is confronted with the natural and formal-informational language — the transformation from the natural language to the so-called ʒ-language[8] [21] and vice versa. Using the natural language, we know of what we speak about, become aware of the object, through the informing of word sequences, describing and interpreting it. In this view, the consciousness concerning something is language dependent, inclusive the cognitive-emotional perspective by itself; it is a constitutive part of the language and nothing more. Thus, consciousness, cognitions, emotions, motivations, attentions, behaviors, etc. depend, emerge, and come to consciousness strongly and substantially through language, its informational development, emergence, fitting, and by producing meaning to the occurring conscious situation.

The name α of informon $\underline{\alpha}$ and entropon $\overline{\alpha}$, in the named informational space $\overline{\underline{\alpha}}$, is functioning like the intention, supervising and forcing the production (informational emerging) of meaning, closely and distantly concerning α. Through α-intentional informing, α-counterinforming, and α-informational embedding, a possible, sufficiently exhaustive, reasonable, and complex interpretation of α can emerge, ending in the interaction with other informons and entropons of the conscious system, in the conscious and subconscious (unconscious) property of the α-informon and α-entropon, respectively. At different informational situation, new informons and entropons can emerge, carrying a different meaning, fitting best the new informational situation. This sort of chaotic informing, concerning a definite name α, happens in everyday informing in a live, individual conscious system. In an artificial conscious system, the emerging of α's meaning may be more precise, disciplined and stable, and certain in this way. Artificial consciousness, through its informons and entropons, can emerge to a certain and disciplined mind, being dedicated to specific problems and themes of informational actuality.

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[8]Symbol ʒ stands for the consciousness informing within the metaphysicalistic decomposition $\mathfrak{M}_{\triangleright}^{\circlearrowleft\|}\lceil \mathfrak{z}\rceil$, where $\mathfrak{z}$ is the designator for ᶜconsciousness.

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[9]In PDF, at <www.artifico.org>.