The Carnapian Aufbau model: epistemology of the sense-data

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7 May 2011

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Abstract

This paper proposes an interpretation theoretical model of the *Aufbau* of Rudolf Carnap, this interpretation contributes to upgrade the project original carnapian, in the sense of conferring to the constitutional program of construction logical, less committed analytic equipment with an ontology or clearly defined epistemology. The setting in phenomenal logical reconstruction practice is elaborated for the visual field as a model whose potential user is a fellow ideal percipient, and, a subject epistemic that operates in the same way that a scheduled computer when he has been given basic phenomenal information and some algorithms logical.

Introduction

About the proposing statistical inference problems, Carnap was the same level as Keynes and Ramsey. The method for addressing the problems of the economy during the first half of the twentieth century was different from the issues that generally affect the empirical sciences. The influence of the logic of Frege and Russell and the phenomenology of Mach and the Vienna Circle were propagated as fields of controversy in all areas of

science. Carnap occupied the center of attention with *Logische Der Aufbau der Welt*, 1928 (*The Logical Construction of the World*).

The logical construction of the world (Carnap, *Aufbau*, 1967) the first creative work of Carnap (1992), was usually subordinate to that aesthetic unity that emerged in different fields at the time were considered carefully separated and soon began looking for a unit: the arts in general, and first of the so-called fine arts (architecture, painting, sculpture), science (Mathematics, Physics, Chemistry, Physiology, etc.). This search for unity is an expression defined in the preface to the first edition.

> We feel the relationship which they have the attitude on which our philosophical work; with the mindset that today affects the most diverse fields of life. We feel this attitude in the currents of art, especially in architecture and in those currents that strive for new ways for human life to be meaningful, both personally and collectively, new ways for education and for the external organization in general. Sorry everywhere the same basic attitude, the same style in thinking and doing. It is a mindset that requires clarity in all things, but, however, recognizes that the interweaving of human life will never be completely transparent. It is a mindset that wants to care both in detail and the structure of the whole, the harmony between people and in the free development of the individual (Carnap, *Aufbau*, 1967, p. VIII).

Philosophical strokes get the analytic attitude of Carnap in the *Aufbau*, display a delicacy in the detail that can only be compared for his fluency with the theme of a Bach fugue or a geometric line in a building *Bahuaus* (Wittgenstein, 1992, p. 71)

Viewed from a distance, this work of Carnap is an Opus of art in every sense of the word, an example of meta-theoretical discipline that is exposed as a sign of rigor, study and critical application.

The second reason to the paper is awarded by the relationship that I think is the *Aufbau* with a central aspect of Kant. It is to be more specific, what is designated by the term "architectural". The idea of building an architecture or, say, a meta-theory to scientific knowledge described by the author of the *Critique of Pure Reason* as follows:

> I understand the art of architectural systems such as the systematic unity is what makes the ordinary knowledge in science, ie, transforms a mere aggregate of knowledge in the system, the architecture is the doctrine of the scientific in our knowledge, and thus belongs so necessary to the doctrine of the method.

Carnap in the *Aufbau* is rigorously faithful to this ideal systematic philosophy; his theoretical model is to draw synthetically an architectural overview of the factors structured empirical knowledge. The user of an ideal observer model that builds progressively and through a complex method the types of entities that occupy the world, or rather the types of entities that occupy their knowledge of the world (*Aufbau*, §§ 125- 128).

Obviously, the project is not strictly Kantian because the notion of form or structure in the *Aufbau* is purely logical; it is understood only in terms of logical form. For Kant, the purely formal logic is inadequate for the constitution of objectivity requires to be supplemented by referring to a transcendental logic of intuition: the "pure intuitions of space and time". Carnap identifies its architectural conception through strong formal logic inherited from Frege and Russell (*Aufbau*, VI, p. x). In other words, what Carnap retains the architectural Kant, the notion of form or structure requires no a "priori synthetic judgments".

In short, the reconstruction project logical / phenomenological is supported by the methodological rules implemented in the *Aufbau*; these rules suggest a consistency ideal formal theoretical economics, two conditions of set-theoretic logical architecture of the constitution. To this is added an aesthetic that is reflected in the syntactic-semantic elegance of the whole work and that is only discovered when the reader has had the patience to enter their details (Goodman, 1963; Suppes, 1988).

Interpretations

To the problem that developed the idea and the kind of hypothesis that says the author, we have synthesized some of the interpretations of the Aufbau recognized according to certain concepts that are proper.

a) *The classic interpretation*: The *Aufbau* is proposed to establish a formal proof of the theory of knowledge of English classical empiricism, especially in its Lockean version. This purpose has not only failed in the representation of Carnap, but in principle it is impossible to achieve (Kambartel, 1978).

b) *The standard interpretation*. The *Aufbau* is identified primarily with the philosophical ideal of logical positivism or logical empiricism, in particular, is the clearest presentation of the methodological principles of reductionism and verification (Quine, 1953).

c) *The logic interpretation*. The *Aufbau* has its greatest merit in being the first systematic application of modern logic in the Frege-Russell tradition,

to a different domain of pure mathematics: the domain of sensory experience (Villemin, 1971).

d) *The integrationist interpretation*: The *Aufbau* is indeed the starting point of logical empiricism. Phenomenalism of Mach represents the criterion of significance of Wittgenstein and the thesis of extensionality Russell (Malherbe, 1979).

e) *The phenomenological interpretation*: The *Aufbau* is the first rigorous representation of a phenomenal system, i.e., a set of rules to a minimum but adequate conceptual foundation for rebuilding the entire course percipient knowledge (Goodman, 1966; Moulines, 1973).

As we see, these interpretations are not entirely mutually exclusive their differences consist in the kind of emphasis on any of the various themes of the work.

The structuralism reconstruction

The special feature of this work with respect to the interpretations above, depends on the phenomenological interpretation (Moulines, 1982), but to discover novel way from the metatheoretical structuralism program Balzer / Moulines / Sneed perspective *Aufbau* theoretical model (Balzer, Moulines, Sneed, 1987). Supports the hypothesis that holds the logical construction of the world of Carnap is ideally a theoretical model from a wide and extensive range of potential models that are part of the same theory. Those who share these models are so to speak, the same structure.

An interpretation of the *Aufbau* theoretical model helps to update the original project of Carnap, in the sense of conferring a constitutional program of logical construction phenomenological an analytical instruments less committed to a clearly defined ontology or epistemology (Moulines, 1991). The implementation of reconstruction is made great sense as a potential user model that is an ideal subject perceiving (*Aufbau* §§ 57-63), i.e., an epistemic subject who operated a computer programmed so that when has provided basic information and some great software algorithms conjunctiva (*Aufbau*, p. 186; Neumann, 1980, Russell 1919, Kambartel, 1978).

The task is to be built-in stages, from level to level, the basic perceptual entities conform their knowledge of the world (Goodman, 1993, p. 2-3). It is the work of a cartographer's knowledge and carefully designed detail by detail, a map to recognize the logical structure of phenomenal domain immediately perceived (Hempel, 1988).

The definitions to condense the central goal of *Aufbau*, which are detailed in the central section of the work (IV.A *objects own psyche* §§ 106-122) are not interpreted in this work as "reductive links" or eliminative definitions, but as rules of operation of a level of abstraction that uses the computer to go by relating the statements of empirical science with a particular type of construction experience, this process should be responsible establishing a phenomenon restricted domain (Hiram Caton, 1974 , 1975, pp. 623-659).

In our view, this reinterpretation of the definitional principles allows a more liberal version of the complete system, without limiting the logical principles to the formal conditions of eliminative bi-sections as with

empirical reductionist interpretations of the *Aufbau* (Moulines, 1991). By the way, are cushioned the scope of the criticisms that have been made to the construction of objects in the physical world, in the sense of judging as irrelevant, from a logical point of view, the definitions appear there. These definitions merely set out the scope heuristic will have the so-called "rules of correspondence".

Therefore, this paper emphasizes the limits within which Carnap conceives of his work, these limits are determined exhaustively by constructive phenomenal domain in which it operates a subject. Carnap was confident that the progress of his method will allow the formalization of the basic concepts of physics, psychology and cultural studies, however, it's like any other program phenomenological exposed to two serious problems, which, apparently, in principle can not be solved within this approach. The first, related to the theoretical terms and the second related to the semantic of observation.

Based on the foregoing, this paper will attempt to differentiate the systematic requirements, extra requirements / systemic to be taken into account when developing a model such as we find described in the *Aufbau*, in our case, only examines the model taking into account the general description of the structural components or logical joint epistemic subject needs a rebuild and deductively represent entities of their immediate perceptual world.

Three methodological values are invoked to the constitutional system Carnapian, first as a formal model, the rigorous management of the entities could not engage in any formal contradiction. Second, the properties of constructed objects may not be incompatible with empirical theories in which these were based and third, the entire system had to observe strictly speaking, a relation of epistemic warrant. It is noteworthy that in the *Aufbau* epistemology are not clearly defined. Carnapian general discipline in this regard is instructive and exemplary, constitutional theory is completely neutral with respect to the metaphysical or ontological issues, illustrates that neutrality Carnap systematic effort to recognize the contributions made by other models prior to his (*Aufbau* , §§ 1,2,6). The phenomenal system developed was outlined by the E. Mach on the analysis of sensations, or the more descriptive B. Russell in *Our Knowledge of the external world.* With the theoretical model developed in the *Aufbau* is met before work started by Mach and Russell, in the sense of having shown the right direction with proper instruments, we have here a model that manages to unify the architectural ideal of knowledge, namely rigorous concatenation of form and content (Russell, 1973, pp. 1067-1264).

The visual field model

The model can represent axiomatically Carnap, which means that it is possible to identify the primitive concepts and their transformation rules (*Aufbau* § 12-15). The base model will be restricted in order to derive (deduct) the principles for formulating deductive chains. This logical device a whole has to adapt to the conditions mentioned above phenomenal.

Axiomatic representation in the *Aufbau* is limited strictly to the visual field

(*Aufbau*, § 86). Indeed, this is a simplified version of the domain forma empirical observation. The conceptual framework is required to deduce the phenomenal conditions has to do with the appearance of the color spectrum in certain parts of the visual field, this requires a system of quality time, an order of places and finally, an order of the colors the spectrum. These are, so to speak axioms or primitive concepts of the system include a list of theorems further analytical and synthetic satisfy these axioms.

The historical origin of the systematic model dates back to the theory of "sense-data" of Mach and Russell, only the author of the *Aufbau*, the starting point of the previous phenomenal system, was limited in several respects. For example, for Carnap it is unlikely that an epistemic subject was able to order an indefinite number of heterogeneous sensations, as we assume the work of Mach and Russell (Russell, pp.75-146). Carnapian idea (inspired by *Gestalt theory*, but formally independent of their empirical results) was that the primitives of the theory should be seen as global experiences through which the phenomenal entities referred to a chromatic order in a specific visual field will be constructed progressively from level to level through a method of extensive abstraction. This method of setting up what Carnap called the *quasi-analysis* (*Aufbau*, §§ 67-74, 75).

The *quasi-analysis* was an innovative strategy that was formally deduced what we sense as part of a whole, based on the totality itself as indivisible units. This complex procedure allowed reinterpreting the concept Carnap "atomistic" of experience. Offering this as a class structure whose relations guide the axiomatic construction of the empirical material phenomena. Inspired by the work of Frege and Russell, our author formally define each class of objects in the system according to the dyadic relationship between a global experience and a class of equivalent classes (*Aufbau* § 40, §§ 70-

73). Then you define a specific class of experiences shaped by the intersection of the circles of similarity which is itself an attribute.

Similar to the construction of real numbers from natural numbers by successive definitions of equivalence relations in the development of Frege and Russell, the theoretical model of the structure much more ambitiously *Aufbau* parts of the visual field and color as qualitative classes (*Aufbau* § 81). However, between the construction of relations equivalent number as Frege/ Russell/ and Carnap phenomenal building there is a difference, for where these authors showed a relationship of equivalence between the abstract objects of its analysis, see Carnap technical difficulties when it comes the phenomenal world here the condition of reflexivity and symmetry formal, but not transitive! . Expressed in the language of realism, if an experience similar to *x* appears and *y* experience to an experience similar to *z*, this can not be phenomenally infer the relationship of similarity between *x* and *z*.

In the *Aufbau*, however, Carnap we describe the representation of similarity relations from a previous relationship which he called "memory of resemblance". This is the only primitive non-interpreted system from which will be built in due order: The similarity phenomenal qualities, visual field locations and order of colors in the spectrum.

RM early formal relationship "memory of resemblance" (Ähnlichkeit serinnerung, *Aufbau*, § 108, § 119) states that "an experience *x* is remembered as partially similar to another experience and relationship, as stated previously is asymmetrical but not transitive. Intuitively RM comprises a qualitative temporal order between experiences. The condition of P (partial resemblance) is fulfilled in three cases: *RM*; *yRMx; x= y*, the latter case, the similarity between total or equivalent experience is possible only in ideal conditions.

Among the two ratios derived from the *RS,* namely, the partial resemblance (*PR*) and the temporal precedence (*PT*) give no analytic relationship. The first refers to a qualitative relationship between experiences, while the second corresponds to a temporal order between them. PT is an asymmetric dyadic relationship, connected and transitive on the domain of experience, while SP is a reflexive and symmetric relation "is not transitive" (Aufbau §§ 153-155).

In empirical terms the relation of partial similarity between qualities can mean:

a) The same spectrum of colors displayed on the experiences *x* and *y*.

b) That two chromatic aspects that differ only slightly in hue (different perception) appear in place of the visual field.

c) That two color spectra of the same hue, appear in neighboring areas of the visual field.

d) That two color spectra that differ only in their hue, appear in neighboring areas of the visual field.

Carnap did not draw formal distinctions between cases (b) - (d), but defined the first case (a) as partial equality between qualitative experiences.

Intuitively, two objects can appear identical with the passage of time, but each experience is unique in front of them (*Aufbau* §§ 76-77).

Visual field

With these basics we can move on to describe the visual field model Carnap.

Denote by *E* the set of basic experiences of a subject perceiving

[Fig 1]

Implicitly between the set E, we find the relation RM-called "memory of resemblance". This relationship in turn contains primitive order of temporal precedence between PT experiences, remember, this relation is reflexive, anti-symmetric and transitive. We then Carnap model was (*E, PT, RM*) in which:

E: is the set of elementary experiences

PT: is the relation of temporal precedence

RM: I remember is the relationship of similarity between experiences.

Thus, the theoretical model triple (*E, RM, PT*) forms the primitive axiomatic system, missing model definitions.

It first defines the field of similarity as follows. Is a subset of experiences ($A \in E$), we say that A is a field of similarity if $x \in A$ implies that x TP y and for all and $\in A$ (if x is partly similar to everything and $\in A$). The set *CS* of all fields of similarity is inductive ordered by inclusion. Circles of similarity then becomes maximal sets of *CS*. Intuitively, this definition is best expressed by stating that "Like a circle consists of a maximal set of experiences that are related to each other by partial resemblance."

Like the circles we move to the definition of qualities. It is said that a quality is a non-empty set of experiences that satisfies the following axioms (*Aufbau* §§ 115, 122, 180):

(1) *A* is a field of similarity

(2) If *CS* is a circle like a quality q is such that / / *q CS* / /> (*q* covers more than half of C ") then $q \in CS$.

(3) If x is an experience, is an attribute q and $x \notin q$, then there is a circle of like CS such that $x \in C \, q \, C$

In short, a quality is a subset of at least one set of CS, since CS displayed intercepted.

We say that an attribute is a subset consisting of two circles that intersect like, subset, in turn, can not be divided by the intersection. In Axiom (2) the factor ½ is included to exclude cases of accidental intersection between qualities, ie similarity circles fail to form a quality.

[Fig 2]

The formal logical definition of the qualities can be described intuitively by the operational rules that searching a computer for calculating the phenomenal construction as follows: in order to structure the qualities, the computer selected in principle a large number of circles of similarity , then collect all the experiences that have a relation of SP. So is giving input pairs to the similarity circles c, c ′ already have a common domain intersections (over half). Then a third circle c ″ will contain more than half ′ DC, to build c'', the computer will be processed $cc \, '' \, ' \, c$ ... until a maximal circle C which is the field of a specific quality.

In the next higher level of constructive steps are represented structurally visual field locations. This requires pre-define the relationship "others" among qualities. Two qualities are alien if $q\,q' = \phi$. Exclusion circles define as follows: Let C be the set of all qualities. A circle is a subset exclusion $\propto$ C such that $q,\, q' \in \propto'$ implies that $q\,q' = \phi$. This means that a circle of exclusion is a kind of qualities beyond (non-overlapping). Empirically ajenación a circle is a kind of qualities such that none of its elements is part of the same experience. This is because the two qualities of the same circle of exclusion can occupy the same place in different experiences. The visual field locations are just as indivisible nuclei exclusion circles, as well as the core qualities are indivisible from the circles of similarity.

[Fig 3]

Thus, the instrumental set-theoretic sense and the minimum criteria for phenomenological model Carnap in the Aufbau, is axiomatic structure the various parts to build the entire system, ie the construction of the qualities based on the experiences global units, followed by the development quasi-analytical classes that correspond to our intuitive notion of the color spectrum. Then the process restarts again but this time the indivisible units

being compared belong to the same order of colors and the relationship of the circles of exclusion between visual field locations.

The general then is: from the primitive relation of similarity remember, it is the relationship of similarity between experiences, the field of similarity, circles of resemblance and qualities. This is a great first step. With the qualities and attributes the similarities between the senses are constructed as topological dimensions. The direction which has dimension five is the most important: The vision. Within two fundamental structures are constructed and to some extent parallel: the visual field, consisting of more ordered and the spectrum, consisting of colors arranged.

[Fig 4]

The outline axiomatic model is developed with all the formal rigor at the lower level of incorporation based on the psyche itself, that is, until now we realize the basic components that requires an observer to reconstruct the structure of their visual field. What the *Aufbau* not illustrate with equal detail, the method is quasi-analytical successively higher levels to trace the route that takes the phenomenal world, the world's perception of

physiological and subsequently to the objects that make up the physical world.

Conclusions

The target goal was to provide a reconstruction of the visual field in the *Aufbau* Carnap. The theoretical model underlying our reading is Carnapian phenomenalism inherited by the logic work of Bertrand Russell and E. Mach. The *Aufbau* is moving towards a more all-encompassing on the reconstruction of the physical, psychological world and the abstract world of theory. The review from the psyche itself excludes an ontological foundation or realistic, shows the importance of the same model suggested by Carnap.

In the reconstruction of the model have worked other authors: Goodman, 1963, Villemin, 1971, Kambartel, 1978 Moulines, 1991) so that this article extends their contributions. Carnap's fundamental contribution is to have identified your model with the empirical possibilities of building an epistemic subject can be accomplished with basic elements of the material world. The model sets out the framework within which an observer analyzing and processing experimental data in the form of global experiences.

The model describes the *Aufbau* Carnap's logical structure does not expose a genuine and independent, but a collection of such achievements logical / semantic that once were essential between members of the Vienna Circle.

The debate opened by Carnap still relevant to complementary disciplines. From neuropsychology to experimental work on the brain, the model of the visual field is narrow enough, certainly, but the way they work and the language used in the Aufbau is still a challenge.

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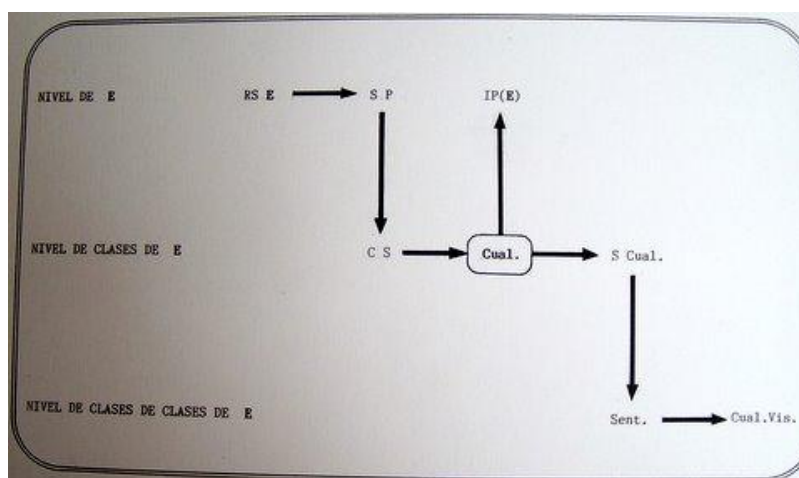
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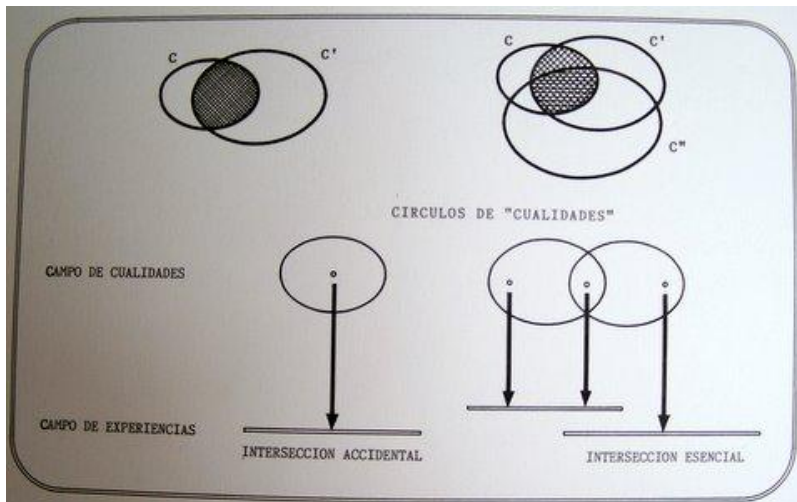
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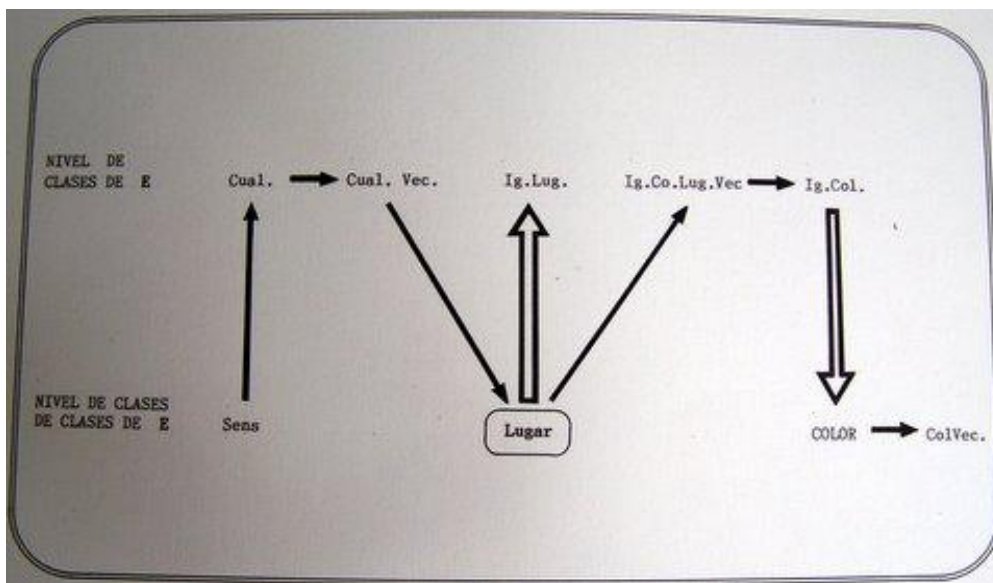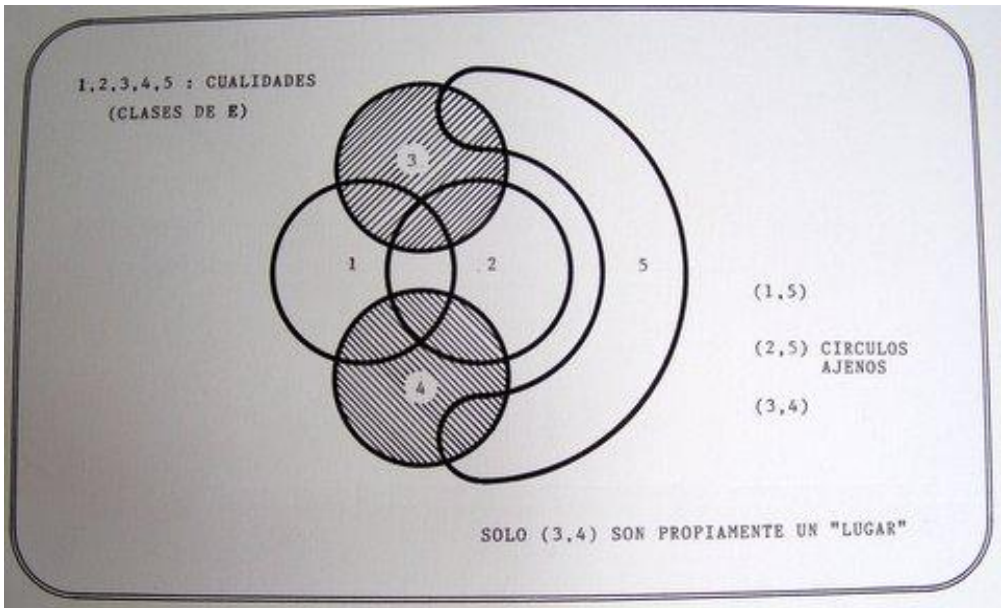
FIGURES

[Fig. 1]

CIRCULOS DE "CUALIDADES"

CAMPO DE CUALIDADES

CAMPO DE EXPERIENCIAS

INTERSECCION ACCIDENTAL   INTERSECCION ESENCIAL

[Fig. 2]

NIVEL DE
CLASES DE E   Cual. → Cual. Vec.   Ig.Lug.   Ig.Co.Lug.Vec → Ig.Col.

NIVEL DE CLASES
DE CLASES DE E   Sens   Lugar   COLOR → ColVec.

[Fig. 3]

[Fig. 4]