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Analogy and the Square of Opposition

ABSTRACT. In this paper I propose a way to express analogy by means of the traditional square of opposition. Medieval thinkers expressed contingency as a conjunction of subcontraries (possible to be and possible not to be), which suggests a new corner in the lower part of the square. Its contradictory gives us the sixth corner to form a hexagon. We begin with the traditional modal square and its expansion into a hexagon following a proposal of Jean-Yves Béziau, who presents a hexagon for similarity, difference, opposition and identity. Then I propose a hexagon for terms proper to analogy and finally I show a hexagon that quantifies over similarity.

KEY WORDS: traditional square, hexagon, analogy, quantification

> Analogy is the kingdom of the word as a verbal bridge that, without suppressing differences and oppositions, reconciles them.[1]
>
> Octavio Paz, *Los hijos del limo*

1. Introduction

Analogy is everywhere, so to speak; it is difficult to exaggerate its significance. I do not remember who said that it is the mark of the wise man to find resemblances where nobody else sees them. Actually, there are many resemblances in the world. Analogy is basic in several kinds of discourse, such as in philosophy and the anthropology of religion. When Thales of Miletus said that the world is full of gods he spoke analogically. In translating, there is always at least one difference, either syntactic or

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[1] *La analogía es el reino de la palabra como, ese puente verbal que, sin suprimirlas, reconcilia las diferencias y las oposiciones* [Paz, 1985, p. 102].

semantic, between the source text and the target text, which aims at full similarity, at least at the level of meaning. In hermeneutics, comprehension and interpretation often resort to analogical processes. In everyday language, resemblances have much to do with context and with the speakers' intentions, as pragmatics has shown.

In this paper I want to propose a way of using logic to understand analogy.[2] The logical treatment of analogy is difficult; it has been done by some philosophers like J.M. Bocheński, James Ross, Walter Redmond and others.[3] My treatment is modest. I wish to establish some points relating analogy to the square of opposition, or rather, to schemata that result in an expansion of the traditional square. We begin with the Medieval Modal Square presented by several thirteenth-century logicians.

The relationship between modality and analogy is not obvious since analogy is predicated of terms – according to the Aristotelian classification of univocal, analogous and equivocal terms as they appear in sentences. Modality refers to modes of being (possible, necessary, contingent and their negations) and also to modes of truth, the so-called "alethic modality", where the modes are predicated of propositions. We will try to find a relationship between modality and analogy. Once the relationship is established, we will examine some hexagons applied to terms and relations proper to analogy. I begin with a modal square using the expressions of thirteenth-century authors who do not use propositions properly speaking, since analogy has been understood as an analogy of being. Of course, to express alethic propositions we use a square with modal operators and a propositional metavariable.

2. The Modal Square and the Modal Hexagon

The Modal Square is shown in (Fig. 1) below where the corners are expressions indicating modes of being, each one with its equivalent forms

[2] This paper reflects and amends some mistakes of "Analogía y el cuadrado de oposición", in *Analogía filosófica*, vol. 28, (2014), pp. 99-111.

[3] [Bocheński, 1948; Ross, 1971; Redmond, 2014].

(“it is necessary to be” is equivalent to “it is impossible not to be,” “it is necessary not to be” is equivalent to “it is not possible to be,” “it is possible to be” is equivalent to “it is not necessary not to be,” “it is possible not to be” is equivalent to “it is not necessary to be”). The usual relationships are maintained. The upper corners (A and E) are contraries, the lower corners (I and O) are subcontraries, and the lower corners are subalterns of the upper corners. Contraries cannot both be true, the upper corners imply the lower corners, diagonal corners contradict each other and inferior corners can be both true.

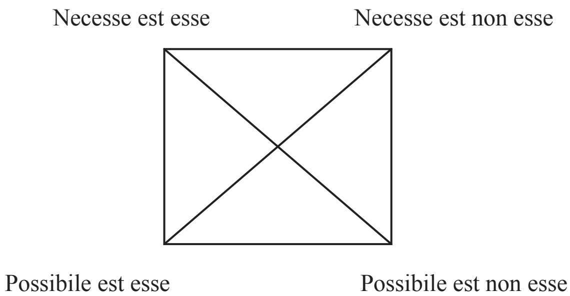

Fig.1.

We notice that contingency (“it is possible to be” and “it is possible not to be”) is not explicitly stated but can be expressed at the subcontrary level, as the conjunction of the lower corners of the square. Now, if something is contingent, its contradictory would be either necessary or impossible; this can be expressed as the disjunction of the upper corners, which results in the following Modal Hexagon[4] where the arrows express implication and the line joining the new corners express contradiction:

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[4] For more information on the Modal and other Hexagons, see [Béziau, 2012]. He uses Y for the new lower corner (the conjunction of subcontraries) and U for the new upper corner (the disjunction of contraries). Béziau has organized international congresses on the Square of Opposition which shed much light on this subject and its developments.

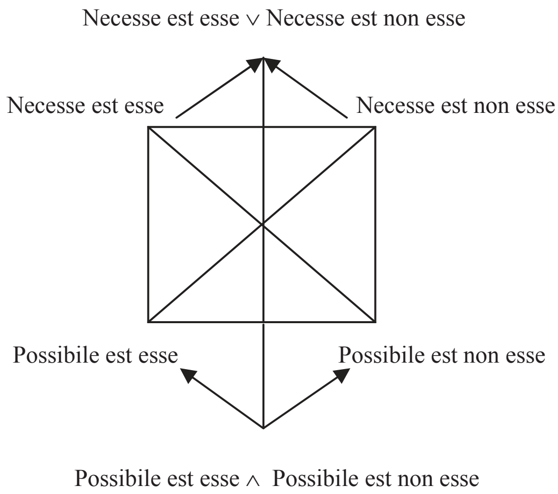

Fig. 2.

At first sight, we may call this square "ontological" since it is about being and its modes.[5] Analogy is the analogy of being, but the classification of terms (analogous, equivocal and univocal) is linguistic. Speaking about the analogy of being requires a language to express the analogy, and that language may contain rules to express the analogical relationships.[6] Some features of analogy can be captured by means of logic, especially through the Square of Opposition and its expansions.

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[5] "At first sight" because the corners may also be regarded as schemes to be filled either using a sentence letter ("it is necessary that p" for instance) or a singular term and a property ("Peter necessarily runs" for instance); these are the *de dicto* and the *de re* interpretation of modal operators. Talking about beings may admit further qualification, since a quantifier cannot be same when referring to a finite being as when referred to an infinite being [Redmond, 2014, p. 78].

[6] James F. Ross proposed the same thing: "St. Thomas Aquinas actually formulated four distinct but complementary analogy rules. In this essay I am concerned to analyze the two most important of these, although the other two rules are stated in the list of definitions given below". See [Ross, 1971, p. 36].

Here is the hexagon with the usual alethic modal symbolism (□: necessary, ◊: possible):

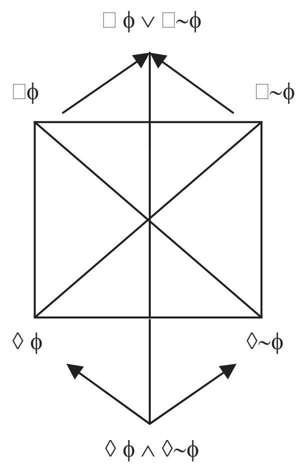

Fig. 3.

3. Analogy

Béziau proposes this Identity Hexagon (Fig. 4) for identity and difference and says:

> This hexagon is constructed by considering that opposition implies difference, which seems quite natural. Similarity is defined as the contradictory of opposition and things can be at the same time similar and different, that's what we have called *analogous*, the label for the Y-corner.[7]

[7] [Béziau, 2012, pp. 27]. I have traded places, Béziau puts Opposition at the A corner, Identity at the E corner and their respective subalterns below. Opposition suggests some kind of negation, and this is the reason why I have placed it at the E corner.

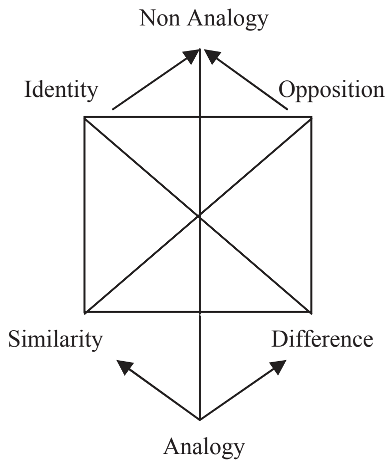

Fig. 4.

We find the basic elements of analogy in this figure precisely forming a Square of Opposition: Identity, Difference, Opposition, and Similarity. Analogy and contingency naturally admit expression at the new Y corner, since both of them express the conjunction of subcontraries. I think, however, that this is too general and that we could get closer to analogy. We can ask what items the corners of the hexagon apply to: What do they qualify?

Put in other words: which sentences could we use to fill the schemata of the square.[8] We could first note that we are talking about relationships, since each corner admits two elements and sentences may be formed. Identity: α is identical to β; Difference: α is different from β; Opposition: α is opposed to β; Similarity: α is similar to β. But there are also properties involved which are asserted of two or more things by a term. This is a famous example: healthy may be predicated of such things as different as an

[8] I would like to thank here Colin James III and Walter Redmond for their valuable suggestions on this point during *The First World Congress on Analogy*.

animal, its urine, its food, its bark (or whinny).[9] Based on this we can come closer to analogy by introducing the traditional terms: equivocal and univocal, and analogy as an intermediary between the two.

We now have the elements we require, but first we should add that by introducing these terms we introduce a linguistic distinction, since we are speaking of terms, i.e. words. But our starting point is the analogy of being, not of language.[10]

4. A Square for terms

We can form a hexagon for analogy with univocal, equivocal and analogous terms.

Univocal terms imply similarity, either in meaning or in definition of the thing named by the term. Equivocal terms have no likeness, and could be homonyms, i.e. the same name for different things, something that is common in natural languages and which is a perhaps inevitable "accident" of language, given the economy of words; we usually understand each other from the context. Analogy is in the "middle", so to speak. It shares some similarity and some difference, though its "location" may be not easy to state, as we shall see.

Let us consider some implications: if there is identity in the application of a term, then there is similarity (this leads to the hexagon´s A and I corners). If there is a distinction in its application, then there is a difference (corners E and O). There is no analogy if there is either identity or distinction: i.e. the corners A and E involve no analogy (the U corner), but if there is analogy (the Y corner), then there is similarity and there is difference. If the application of a term corresponds to univocal terms and distinction to

[9] For instance, Ross comments on this sentence "My dog´s bark is healthy" in this way: "My dog´s bark has those qualities which are signs to me that the dog is ´healthy', that is, has the organic state characterized by a, b, c,…n." [Ross, 1971, p. 50].

[10] [Bocheński, 1948, p. 427] captures this relationship between being and language in his analysis of analogy as an eight argument relationship between terms, language, properties and things. But in [1967, p. 159] he simplifies them into six.

equivocal terms, we can now establish another hexagon. Corners U and Y are expressions linked by disjunction and conjunction respectively. We can establish that if a term is univocal, then it is univocal or it is equivocal, in other words it is not analogous. If there is analogy, then there is similarity and there is difference, i.e. the corner Y includes the subcontraries I and O.

(A digression)

This may not be the right place for this comment, but it may have some pragmatic relevance since analogy is closely related to the uses of terms by speakers. The inference from Y to I, on one hand, and from Y to O on the other, shows some loss of information, because we started with two conjuncts and we obtain a single one by eliminating the connective (this corresponds to the Logical Rule of Simplification where we move from a molecular component toward an atomic one) The inference from A to U (or from E to U), i.e. if A is true so is A v E, also shows some loss of information because when we state A v E we know that at least one of them is true, but we do not know which one, even though we added one connective (this corresponds to the Logical Rule of Disjunctive Addition). The passage from universal to particular sentences (A to I and E to O) also suggests some loss of information, because if I know that an A-sentence is true, but I state an I-sentence, I am not telling the whole truth. Note a certain symmetry: if Y implies I, we "lose" one connective and information is reduced, and if A implies U, information is also reduced, although we "gain" one connective.

I propose these examples: if someone, let us call him Peter, knows that both John Doe and Jane Doe committed the crime, and based on this, when asked, he states "John Doe committed the crime", he speaks the truth but he is hiding something else, that Jane Doe also committed the crime. But if Peter knows that Jane Doe did not commit the crime but John did, and when asked says "John Doe committed the crime or Jane Doe committed the crime", that which he is saying follows from what he knows, but he is not reporting anything, because the listener will not know who committed the crime, although the speaker does. If someone knows that all swans are white and based on this says "Some swans are white", what he says is true, and is implied by "All swans are white", but it seems as if he is not telling the whole truth. The same occurs when someone knows that α is identical to β, then he says that they are similar; besides we need rules to validate this inference. These cases suggest that logical rules do not always jibe with the verbal behaviour of the speakers. This may have some relevance to our understanding of analogy.

Let us go back to our hexagon, where the corner U (Not-analogy) can also be (Equivocal ∨ Univocal), and Y (Analogy) can also be (Similarity ∧ Difference):

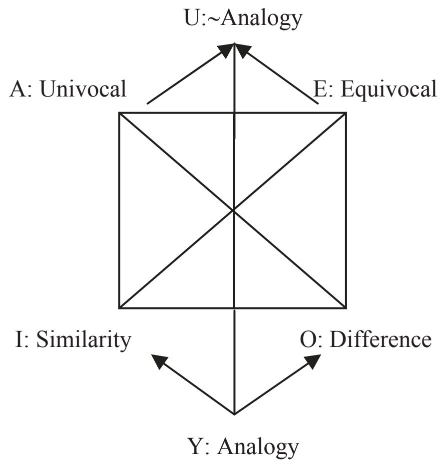

Fig. 5.

Before continuing, we should note that we have already found a similarity, an analogy with modality. The logical structure of contingency, in the context of the Square of Opposition, is formally the same; it can be expressed by means of the same hexagon. Contingency and analogy are at the same corner (Y) and produce the same implications and oppositions. To keep this analogy we have resorted to the Hexagon of Opposition, although it introduces something that is not in the other corners, namely, conjunctive and disjunctive connectives when we consider the implications of Y and those of A and E respectively.

Moreover, the application of univocal and equivocal terms involves total similarity and the absence of similarity respectively; analogy implies some similarity and some non-similarity, at the subcontraries level. Denying that a term is equivocal is to assert some similarity. Indeed, to deny the E-corner of the Square of Opposition is to affirm the I-corner. To deny that a term is univocal is to assert that there is some difference in its application; the negation of the A-corner implies the affirmation of the O-corner.

5. Quantifying the Corners

We have spoken of "some similarity" and "some non-similarity". This tells us that we can express these things in terms of quantification. The application of univocal terms indicates total similarity, i.e. *all* similarity and the application of equivocal terms indicates total difference, i.e. *no* similarity. The application of analogous terms implies a partial similarity, i.e. *some* similarity and a partial difference i.e., *some non*-similarity. We can express this in the following figure.

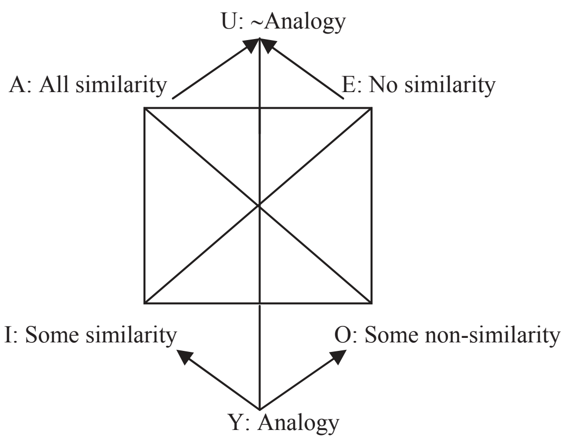

Fig. 6.

This brings us closer to quantification and to the ordinary square. It seems to have also an advantage, that modal operators and quantifiers are definable in terms of each other with the help of negation. Saying that something is necessary, amounts to denying the possibility of its negation; for example*,* if is not possible for something to be, then it is necessary for it not to be. To say that everything is F, is equal to saying that it is not the case that there is something which is not F. But it is not easy to find the equivalents of the corners A and E in (Fig. 5). Indeed, what does it mean to say that univocal is equivalent to a "non-similarity to no" or equivocal amounts to "no difference from no".[11] These "sentences" do not make sense. A clear statement of all this may exist, or perhaps the Figure was ill conceived. It combines different kind of things, for A and E corners refer to terms although I and O corners refer to things, not terms. Nevertheless, the implications listed make some sense. In (Fig. 6) we can say that "all similarity" is equivalent to "there is no non-similarity" and even "it is not the case that there is some dissimilarity". If there is analogy then there is some similarity and there is some dissimilarity, so we could change the word "analogy" for the conjunction of subcontraries and the same holds for the upper extreme U.

A square of terms would be something like this

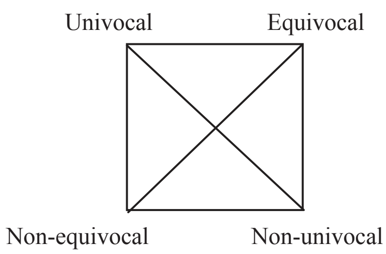

Fig. 7.

[11] Take a modal operator, "Necessary" f.i., its subaltern is "Possible". Adding negations makes them equivalent: "necessary is equivalent to not possible no". Take "every", it is equivalent to "not every no". These moves cannot be applied to "similarity" and "difference".

Which can be extended into a hexagon, as we have seen. Analogy is out of the square, at the bottom, and implies the "particular" corners; its contradictory is to be placed at the upper place, as a disjunction of the univocal and equivocal corners. Universal corners imply the contradictory of analogy, at the top of the square.

Notice that we have two term-negations in these squares, "non-equivocal" and "non-univocal" (and one in (Fig. 6), the O-corner, non-similarity) and this could bring about some problems, for we could have two negative corners where there should be only one negative corner and two affirmative corners where there should be only one affirmative corner at the A and E corners.

6. Some considerations

Two things may be totally or partially similar to each other regarding *some* property, which means we need another quantifier for this property. Let us take the sentence "A and B are completely similar regarding to C", and explain it in a very informal way like, for instance: "Men and Women are completely similar to each other regarding to their being a Human". "Human being" here is a term applied to men and women "by the same reason", in the same way and constitutes a univocal term. "Similar to each other" constitutes a symmetrical relationship. The sentence "A and B are completely different" may be understood as "There is no similarity between A and B", in which case we need no further properties. For instance the word "well" in this compounded sentence "Something is well and something is a well" is equivocal since it shows no similarity, it refers to completely different things in each case.

It should be noted that quantification over similarities requires a more complex logical apparatus, for similarity, when quantified, will probably lead us to establish different degrees of truth values. We may need to say that the similarity tends to zero, but there will always be a degree, however minimal, for there to be analogy. It would be a problem to express this in a square where analogy would be “in the middle” but graphically be farthest from similarity, when approaching zero.

There is another possibility. In (Fig. 6) we have contrary extremes, A and E, and they do not touch each other because they cannot both be true, but we may also have squares where there is some connection. Suppose that the contrary extremes are the colours white and black.[12] We would have these corners: A: White, E: Black, I: Non-black, O: Non-white, since the subcontrary corners are the contradictory of the upper corners, the contraries. The corner that corresponds to the analogy, the corner Y, would be Non-white and Non-black, which involves the subcontraries; the corner corresponding to U, the non-analogy would be White or Black, which is implied by the contrary extremes. This gives us (Fig. 8).

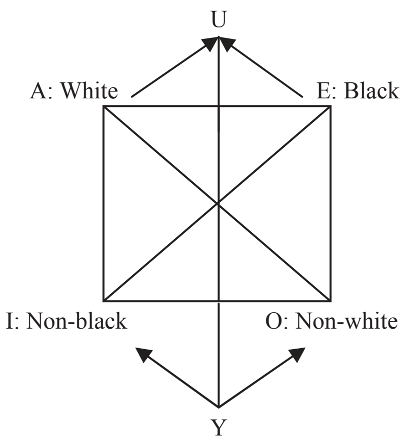

Fig. 8.

In this case the contrary extremes “touch each other" in some way, since it is possible to establish a spectrum of colours where gradation can be seen and passes (through the gradations) from one to another. Here we

[12] Learned of this in some talks at the meetings on the Square of Opposition.

can see that truth values can be multiplied, requiring a more evident application of a multi-valued logic.

We could even have a case where the corners were theories or philosophical doctrines. Indeed, Mauricio Beuchot [2009, p. 35] has pointed out that univocism (which could be our A extreme) in hermeneutics can be exemplified with positivist doctrines, and equivocism (our E extreme) with romantic hermeneutics. Now although these theories are incompatible, some of the consequences (which would be exemplified at the level of the weak operators, the subcontraries) may be consistent, and in this sense shared by both theories, this makes philosophical dialogue fruitful, something which Beuchot has stressed.

Beuchot also noted something about equivocism, which tends to relativism. Relativism obviously must be "relative" [Beuchot, 2009, p. 38]. The same is true of analogy: analogy is analogical. Bocheński understands this considering the level of language, where analogy in the object-language is isomorphic with the analogy expressed in the meta-language [Bocheński, 1948, p. 434]. We can also understand this in relation to logic (which interestingly shares this etymology): analogy makes modal logics, with its many variations, possible.

I do not exaggerate when I say that the analogy of proportionality gains importance in the isomorphism that produces the variety of logics. I have tried to express some of this isomorphism by using the Square of Opposition and its expansion into hexagons.

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