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Alethic Modal Logic and Quine's Responses: An Analysis

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Abstract:

Alethic modal logic deals with the formal validity of alethic modal propositions and arguments. Alethic modal logic is developed by adding alethic modalities, i.e., 'It is necessary that', 'It is possible that' as modal operators either to truth functional propositions or first ordered quantified propositions. The symbols '□' or 'L' and '◊' or 'M' are used for 'Necessarily' and 'Possibly' respectively. Modal operators 'Necessarily' (or '□') and 'Possibly' (or '◊') are interdefinable. A proposition is necessarily true if and only if it is true in all possible worlds. A proposition is possibly true if and only if it is true in at least one possible world. The notion of possible world originates from the idea that any actual situation might have been otherwise. Leibniz uses the notion of possible world to explain the modal notion, i. e., the notion of necessity. Kripke also explains the notion of possible world as a possible state of the world. Possible worlds are defined as relative to the actual world since they are the descriptions of how the world could have been.

Quine holds that alethic modal logic concerns the notion of necessity in two different ways: (a) the notion of logical necessity, (b) the use of the word 'necessarily' as a modal operator. He is of the opinion that none of these two notions can be explained satisfactorily.

In this paper I have tried to analyse, firstly, the nature of alethic modal logic by explaining the notions like alethic modalities, the notion of possible world, and secondly, Quine's responses against alethic modal logic.

Keywords: Modal operator, It is necessary that, It is possible that, The notion of possible world, semantical predicate, statement operator, sentence operator

Modal logic is concerned with the formal validity[1] of modal propositions and arguments. An argument which contains at least one modal proposition is called a modal argument.

A proposition which contains at least one modal operator is called a modal proposition. For example, the proposition

'It is necessary that all men are rational',

Contains the modal operator

[1] The word 'valid' is generally used to characterized deductive arguments. But this word is also used by some logicians to characterized logically true propositions.

'It is necessary that',

So it is a modal proposition.

There are different types of modal logic, namely, deontic modal logic, epistemic modal logic, alethic modal logic, etc.

Deontic modal logic is concerned with the formal validity of deontic modal propositions and arguments. A modal proposition containing at least one deontic modal operator like 'x ought to' is called a deontic modal proposition.

Epistemic modal logic is concerned with the formal validity of epistemic modal propositions and arguments. A modal proposition containing at least one epistemic modal operator like 'x knows that', 'x believes that' is called an epistemic modal proposition.

Alethic modal logic deals with the formal validity of alethic modal propositions and arguments. A modal proposition containing at least one alethic modal operator like 'It is necessary that', 'It is possible that' is called an alethic modal proposition.

Alethic modal logic is developed by adding alethic modalities, i.e., 'It is necessary that', 'It is possible that' as modal operators either to truth functional propositions or first ordered quantified propositions. Thus, there are two types of alethic modal logic, namely, propositional modal logic and quantified modal logic.

Alethic Modalities: The word 'alethic' is originated from the Greek word 'aletheia', that means 'truth'. The word 'alethic' in the expression 'alethic modalities' is used in the sense of 'having to do with truth'.[2] Accordingly, when alethic modalities, namely, 'It is necessary that' and 'It is possible that' are added to truth functional propositions or first ordered quantified propositions as modal operators to express different modes of their truth. The notions 'necessity' and 'possibility' are used as modal operators in logical (metaphysical) sense. Some true propositions, e.g., 'All green things are coloured', 'There is no round square', 'All bachelors are unmarried men', etc. are necessarily true. A proposition is necessarily true if and only if it could not be otherwise, i.e., its negation is a contradiction, or it is true in all possible worlds. When we say that a proposition is necessarily true in the logical sense, truth is ascribed to it in an unconditional sense or we ascribe an absolute mode of truth to that proposition. On the other hand, some true propositions, e.g., 'Grass is green', 'The earth is round', etc. are possibly true. A proposition is possibly true if and only if it could be otherwise, or it is true in at least one possible world.

Alethic modalities are used as monadic operators to form modal propositions. For example, if a proposition 'p' is necessarily true, we may express it as 'Necessarily p' and if a proposition 'p' is possibly true, we may express it as 'Possibly p'. The symbols '□' or 'L' and '◊' or 'M' are used for 'Necessarily' and 'Possibly' respectively. Modal operators 'Necessarily' (or '□') and 'Possibly' (or '◊') are interdefinable. That means, any one of them may be definable in terms of other:

- Necessarily P (□P)$=_{Df.}$ Not possible that not P (~◊~P)

[2] Michael Jubin, *Contemporary Metaphysics*, p.132

- Possibly P ($\Diamond P$) $=_{Df.}$ Not necessarily not P ($\sim\Box\sim P$).

The notion of necessity (or possibility) may be used in two different ways, namely, *de dicto* and *de re*. This difference depends on the way in which the model word 'necessarily' is attributed in the proposition concerned. In the cases of *de dicto* attribution of necessity, the model word 'necessarily' qualifies the whole of the proposition or dictum (what is said). For example, in the proposition 'Necessarily every bachelor is unmarried man' modal operator necessarily is used to qualify the whole proposition 'Every bachelor is unmarried man'. The proposition 'Necessarily every bachelor is unmarried man' is used to assert that the proposition 'Every bachelor is unmarried man' is necessarily true, i. e., *true in all possible worlds*. The necessity of this type of proposition is *de dicto* necessity. On the other hand, in the cases of *de re* attribution of necessity; the modal word 'necessarily' qualifies only the predicate part of the proposition which says something about the subject of the proposition which is a *res* (thing). For example, in the proposition 'Every bachelor is necessarily unmarried man' modal operator 'necessarily' is used to qualify the predicate 'unmarried man' to say about bachelor persons that they are such as to be necessarily unmarried man. The proposition 'Every bachelor is necessarily unmarried man' is used to assert that its subject necessarily has the property of being unmarried man. That means, the subject of the proposition, bachelor, has the property of being unmarried man in *all possible worlds* in which he exists. The necessity of this type propositions is *de re* necessity.

The Notion of Possible World: The notion of possible world originates from the idea that any actual situation might have been otherwise. Leibniz uses the notion of possible world to explain the modal notion, i. e., the notion of necessity. The idea behind the notion of possible world, according to Leibnitz, is that the whole universe might have been made differently. For him, there are different possible worlds and each possible world consists of a certain type of collection of possible objects, each object of this collection is compossible with all the other objects (of that collection). A world is only the collection of a certain kind of compossibles, and the actual world is the collection of all existent possibles. Moreover, as there are different combinations of possibles, some better than others, there are many possible worlds, each collection of compossibles making one of them.[3]

Chisholm, as a contemporary thinker, has clearly explained how we can have descriptions of different possible worlds from a description of the actual world. Let us suppose that we have a complete description of the actual world which is sometimes regarded as one of the possible worlds. We may call it W^1. We may now have descriptions of different possible worlds in a number of different ways, for example, by altering the descriptions of one or several (or all) of the entities of the actual world and adjust the descriptions of other entities to fit the alteration.[4] Chisholm holds that there is a constraint

[3] Cf. C. I. Gerhardt (ed.), *Die Philosophischen Schriften von G. W. Leibniz*, Vol.3, P. 573.
[4] Cf. R. M. Chisholm, 'Identity Through Possible Worlds: Some Questions', *Noûs*,1, 1967,pp.1-2

on the construction of a possible world, that is, in constructing a possible world we should not transgress the actual world.

Kripke also explains the notion of possible world as a possible state of the world. Possible worlds are defined as relative to the actual world since they are the descriptions of *how the world could have been*. 'A possible world is *given by the descriptive conditions we associate with it*.'[5] We may explain this point with the help of an example. When we say that in some other possible world Aristotle might not have been the teacher of Alexander the great, we mean just that we can describe a possible situation in which Aristotle was not at all a teacher or he did not teach Alexander the great. Of course, we may not be able to imagine and we need not imagine everything that could have happened to Aristotle, but only those things which are relevant to his being the teacher of Alexander the great, though theoretically it is necessary to give a total description of a possible world that describes every individual clearly.

Kripke holds that in describing a possible world, the descriptions that we associate with the name of a particular individual are mere stipulations; they are descriptions of certain supposed or hypothetical situations about entities of the actual world. 'Possible worlds are stipulated, not discovered by powerful telescopes'.[6] That means, possible worlds are not actually existing real 'parallel worlds' as is sometimes supposed.

Moreover, Kripke opines that though we stipulate and so also can change a description associated with a name in the description of a possible world, we cannot do this according to our wise without any constraint. He speaks of some constraints in constructing a possible world. Firstly, we cannot change the description regarding the origin of an individual. Any individual, for example, Elizabeth II, *must have the same origin* in all possible worlds. Secondly, *the make-up of thing must remain the same* in all possible worlds. For example, the table which is made up of a particular piece of wood in the actual world cannot be made of a particular piece of iron in some other possible world. Thirdly, *an individual* in all possible worlds *must remain the same kind of individual* as it is in the actual world.

Quine's Responses against Alethic Modal Logic: Quine holds that alethic modal logic concerns the notion of necessity in two different ways: (a) the notion of *logical necessity*, (b) the use of the word '*necessarily*' as a modal operator. He is of the opinion that none of these two notions can be explained satisfactorily.

(a) **The notion of Logical Necessity:** The adverb 'necessarily' is generally used in two senses: it may be loosely used to mean physical or natural necessity or it may be strictly used in the sense of logical or mathematical necessity. It is supposed that some statements, for example, 'momentum is proportional to velocity' are logically or mathematically necessary. The necessity of this statement is explained on the ground that the word 'momentum' is defined as 'mass times velocity', and when this definition is expanded, it

[5] S. Kripke, *Naming and Necessity*, p. 16
[6] S. Kripke, *Naming and Necessity*, p. 44

turns the statement 'momentum is proportional to velocity' into a mathematical triviality. However, Quine thinks that this type of necessity which is attributed to linguistic truths is not different in kind from physical or natural necessity which is attributed to ordinary truths of natural sciences, since the difference between logical and physical necessity rests on 'a terminological boundary between physics and mathematics'[7]. The distinction between physics and mathematics is sometimes made on the basis of the supposition that physics is about the world and it has empirical content, while pure mathematics does not have any empirical content. Pure mathematics has its utility in its applications to physics and other natural sciences, but the content of physics is different from that of mathematics. Quine points out that the distinction between physics and mathematics is similar to an arbitrary distinction which is sometimes drawn between a more experimental or empirical physics and a more speculative or theoretical part of it. However, Quine holds that since both theoretical physics and experimental physics are aspects of a single systematic enterprise (physics), both of them are ultimately connected with observation, and each science is 'a single sprawling system' whose boundary conditions are experience, and, as a broader system, it derives its connection with experience from that boundary. Pure mathematics as a part of a broader system (i.e., totality of all sciences) is connected ultimately with the observations of experimental physics and other natural sciences. Totality of all sciences constitutes our conceptual scheme, which Quine calls technically 'science'. For him, 'the whole of science', is the totality of our knowledge and belief, '… from the most casual matters of geography and history to the profoundest laws of atomic physics or even of pure mathematics and logic'[8]. Quine holds that our science is a body of system constituted of several statements. On the outer part of the body of science, 'the periphery', there are observation statements. The relatively interior part of the body of science consists of non-observation statements or theoretical statements. Finally, the centre of the system consists of the laws of logic and mathematics. In the face of recalcitrant experiences, we may have to revise some observation statements, which are in the periphery of the system or total science. This revision may also lead us to make a revision in the interior part of the system, since all the statements of the system or conceptual scheme are logically related with each other. Accordingly, we may revise any statement whatever, even the laws of logic. Thus, Quine holds that no statement of our conceptual scheme is completely immune to revision and which statements are to be revised in the face of recalcitrant experiences depends on our decision. [9] There is no statement, which can be held to be true come what may. Accordingly, Quine holds that there is '…no higher or more austere necessity than natural necessity.' [10]

(b) **The use of the word 'Necessarily' as a modal operator:**

[7] W. V. O. Quine, 'Necessary Truth', in Quine, *The Ways of Paradox and Other Essays*, p.55
[8] W. V. O. Quine, 'Two Dogmas of Empiricism', in Quine, *From a Logical Point of View*, p. 42
[9] Cf. Ibid., p. 43
[10] W. V. O. Quine, 'Necessary Truth', in Quine, *The Ways of Paradox and Other Essays*, p.56

In modal logic, the word 'necessarily' or the expression 'it is necessary that' is used as a modal operator. Modal logicians prefers to use the expression 'it is necessary that' as a monadic modal operator on statements to construct modal statements. For example, in the statement 'it is necessary that nine is greater than seven', the modal operator 'it is necessary that' is used on 'Nine is greater than seven' to form a modal statement. However, Quine, in his paper 'Three Grades of Modal Involvement', shows that the expression 'it is necessary that' may be involved in three different ways. [11]

Firstly, the expression 'it is necessary that' or 'Nec' may be used as a *semantical predicate* in the sense of it is attributed to the name of statements. For example, in the statement

Nec '9 > 7'

'Nec' is used as a *semantical predicate*, which means that

'9 > 7' is necessary (or necessarily true).

In this use, the predicate 'Nec' is attached to a noun '9>7', which is a name of a statement and is affirmed to be necessary (or necessarily true).

Secondly, the expression 'it is necessary that' or 'nec' may be used as a *statement operator*, the way in which the negation sign is used. For example, in the statement

nec (9 > 7)

'nec' is attached to the statement '9 > 7' to form another statement.

Thirdly, the expression 'it is necessary that' or 'nec' may also be used as a *sentence operator*, which is an extension of the second type of use. This type of use of the expression 'it is necessary that' or 'nec' allows the attachment of 'nec' not only to statements, but also to open sentences. For example, in the statement

nec (x > 7)

'nec' is used before the open sentence 'x > 7'.

Quine holds that none of these three different ways in which the expression 'it is necessary that' may be used can give us a satisfactory explanation of the notion of logical necessity. Among these three different ways in which the notion of logical necessity may be used, the second use, i.e., the use of the expression 'it is necessary that' as a *statement operator* is formulated by modal logician Lewis and afterwards reformulated by Carnap. Moreover, Quine thinks that the use of the notion of logical necessity as a semantical predicate can raise 'grave questions'. The use of the notion of logical necessity as a semantical predicate cannot be satisfactorily explained, because it depends on the notion of analyticity, which itself is in need of clarification. The ascription of truth or falsity to statements of the form 'Necessarily …' depends on whether or not the statement following 'Necessarily' is analytic or not.[12] Quine writes of the adverb 'Necessarily', 'Does the adverb really make sense? To suppose that it does is to suppose that we have already made satisfactory sense of 'analytic''. [13] He also says,'…necessity in semantical application tends

[11] Cf. W. V. O. Quine, 'Three Grades of Modal Involvement', in Quine, *The Ways of Paradox and Other Essays*, pp.156 – 174

[12] Cf. R. Carnap, *Meaning and Necessity*, p. 174

[13] W. V. O. Quine, 'Two Dogmas of Empiricism', in Quine, *From a Logical Point of View*, p. 30

to be identified with what philosophers call analyticity; and analyticity, …, is a pseudo-concept which philosophy would be better off without'.[14]

[14] W. V. O. Quine, 'Three Grades of Modal Involvement', in Quine, *The Ways of Paradox and Other Essays*, p.169