Developing Metalogic to Formalize Ontological Disputes of the Systems in Metaphysics by Introducing the Notion of Functionally Isomorphic Quantifiers

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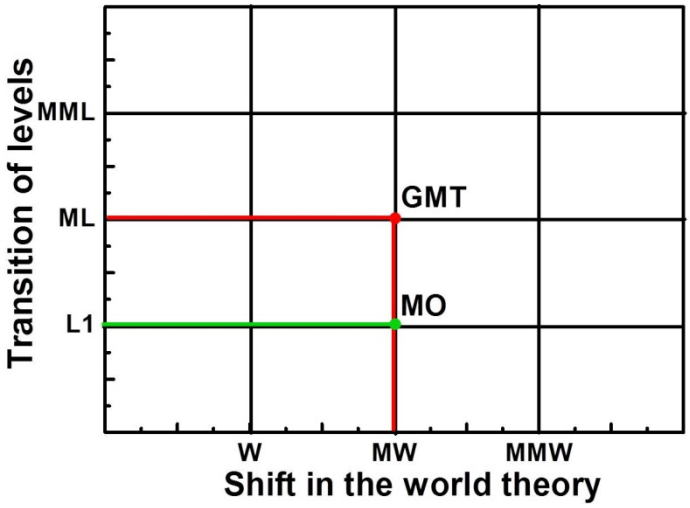
Abstract: A general meta-logical theory is developed by considering ontological disputes in the systems of metaphysics. The usefulness of this general meta-logical theory is demonstrated by considering the case of the ontological dispute between the metaphysical systems of Lewis' Modal Realism and Terence Parsons' Meinongianism. Using Quine's criterion of ontological commitments and his views on ontological disagreement, three principles of metalogic is formulated. Based on the three principles of metalogic, the notions of independent variable and dependent variable are introduced. Then, the ontological dispute between Lewis' Modal Realism and Terence Parsons' Meinongianism are restated in the light of the principles of metalogic. After the restatement, Independent variable and dependent variables are fixed in both Lewis' Modal Realism and Terence Parsons' Meinongianism to resolve the dispute. Subsequently, a new variety of quantifiers are introduced which is known as functionally isomorphic quantifiers to provide a formal representation of the resolution of the dispute. The specific functionally isomorphic quantifier which is developed in this work is known as st-quantifier. It is indicated that how st-quantifier which is one of the functionally isomorphic quantifiers can function like existential quantifier.

Keywords: Metalogic, Metaontology, Ontology, Quine, Modal Realism, Meinong

1. Introduction

Introductory section gives an overall view about how the General Meta-logical Theory (GMT) is developed. The proposed GMT in this paper takes into account two points: transition of levels in the logic and shift in the ontological theory. The mode of enquiry in GMT is presented in the following graph.



In the graph y-axis stands for the transition of levels in logic and x-axis stands for the shift in the world theory or the ontological theory. In y-axis, L1 stands for Logic, ML stands for meta-logic and MML stands for meta-meta-logic. In the x-axis W stands for a world theory, MW stands for meta-world theory and MMW stands for meta-meta-world theory. A world theory or meta-world theory presents a context where a particular logic is applicable. The meeting point of the theoretical enterprise from y-axis and the theoretical enterprise from x-axis presents a context. GMT is a context where the concerns of both meta-world theory and meta-logic together play a role. The GMT which is developed in this paper makes two assumptions: (a) mere transition of levels in the y-axis doesn't ensure the development of General Meta-logical Theory and (b) mere shift in the world theory based on a particular logic wouldn't provide a General Meta-logical Theory. Without the shift in the world-theory in x-axis, the transition from logic to meta-logic and meta-logic to meta-meta-logic could happen in y-axis. Without the transition of the levels in the y-axis, the world theories could be extended as meta-world theory, meta-meta-world theory in the x-axis etc. The Transition and shift are not interdependent. However, the first level in the y-axis is dependent on the x-axis and vice versa. Mere transition of levels in the y-axis doesn't ensure that we would have a general meta-logical theory. General meta-logical theory emerges through the combination of both transition in the y-axis from L to ML and shift in the world theory in x-axis from W to MW. The GMT which is proposed here develops certain tools and methods and they are independent variable, dependent variable and functionally isomorphic quantifiers. In this setting, meta-ontology (MO) cannot be identified with GMT. In the graph, MO will be the meeting point of L1 and MW. To develop a MO, MML is not a requirement. Meta-ontology could be developed just by depending on First Order Logic. Here, the project is to develop a

GMT by pushing one level up from L1 to ML by combining MO. Ontological disputes provide a proper context where it is necessary to make a distinction between meta-level and object level. This is explained in the following section.

2. Briefly on the Ontological Disputes

Two systems[1], let us say, ***S1*** and ***S2*** is said to have ontological dispute/disagreement when ***S1*** and ***S2*** disagrees on what entities are to be admitted in their respective ontology[2]. Ontological disputes can be of at least three kinds: when the systems have disagreement (1) on all the entities, (2) on some of the entities, and (3) the acceptance of particular kind of entities let us say ***K*** entities by ***S1*** and the rejection of the same by ***S2*** and the acceptance of some other kind of entities let us say ***K**** entities by ***S2*** and the rejection of the same by ***S1***. When any above mentioned ontological dispute persists between the systems, Quine points out the following predicament which the disagreeing systems might encounter.

> When ***I*** try to formulate our difference of opinion [with my opponent]…***I*** seem to be in a predicament. ***I*** cannot admit that ***there are some things*** which ***you***[the opponent] countenances and ***I*** do not, for in admitting that ***there are such things I*** should be contradicting ***my*** own rejection of them.[3]

When ***S1***ontologically disagrees with ***S2***, ***S1***cannot admit the entities of***S2*** in order***S1*** to state its disagreement with ***S2***. Or else, such admissions will lead to contradiction. ***S1***cannot admit that ***there are some things/entities*** which ***S2*** countenances and ***S1*** does not, for ***S1***in admitting that ***there are such things/entities***, ***S1***should be contradicting ***S1***'s rejection. So, the problem here is as to how to formulate the ontological disagreement among the systems without leading to any kind of inconsistency in disagreement? This is the problem of ontological dispute[4]. Formalizing ontological dispute through a GMT is the core project which I propose to undertake. Formalization will show how the metaphysical systems can make ontological disagreements without leading to any kind of inconsistency while stating the disagreement. Since the question is how to be logically consistent while stating the disagreement with the opponent, the issue is not just a system specific one. It is a logical problem relating to consistency which any system having ontological dispute with another system would be in, while stating the ontological disagreement. Therefore, this problem

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[1] Here we use systems and theories interchangeably.
[2] Ontology of the theory ***T*** consists the set of entities which theory ***T*** requires for its theoretical enterprise.
[3] Quine, W. V. 1948. "On What There Is", p.35. italics added
[4] A case for ontological dispute between two systems is cited in section 2.

cannot be resolved by taking recourse to the systems themselves. Characterisation of such a disagreement happens at meta-level. So the enquiry is meta-logical.

This GMT uses techniques from both First-Order-Quantificational-Logic (FOQL) and Meta-Ontology. From Meta-Ontology, Quine's Criterion of Ontological Commitment (QCOC) is used: to be is to be the value of a bound variable.[5] QCOC is considered since this criterion takes into account both existential quantifier and the variables bound by the existential quantifier of the FOQL. Quine links quantification of first order quantificational logic and existence to formulate a criterion for ontological commitments. Quine formulates the criterion of ontological commitments as "to be is to be the value of (bound) variable"[6].

> For Quine …it (his criterion of ontological commitments) allowed one to measure the ontological cost of theories, an important component in deciding which theories to accept; it thus provided a partial foundation for theory choice. Moreover, once one had settled on a total theory, it allowed one to determine which components of the theory were responsible for its ontological costs.[7]

Through QCOC one could measure the ontological costs as well as the responsible components of the ontological costs of the theories. If a theory is committed to certain entities then inevitably those entities to which theory is committed will be kept as the value of bound variable. Therefore, to find out the ontological commitments of a theory what we need to do is just look into the bound variable and see what entities would be the value of bound variable. However, the very idea "looking into the bound variable" needs to be explained adequately. The point of QCOC is that if a theory is committed to certain entities then those entities will be kept as the value of bound variable of the Quantifier Variable Idioms (QVI)[8]. Characterising the notion of ontological commitment is a project that falls in the area of

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[5] Quine, W. V. 1939. "Designation and Existence."*The Journal of Philosophy* 36 (26): 701-709, p. 708.

[6] Ibid.

[7] Bricker, Phillip. 2014 "Ontological Commitment", *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/win2014/entries/ontological-commitment/>.

[8] There are idioms of quantification in natural language which can be represented in a formal language. In natural language such idioms are stated as "there are something", "there exist things" and "something". These idioms in natural language can be represented in formal language through the quantifier variable idiom (Q-V-I) of the first-order-quantificational/predicate logic to talk about the entities. So, we have got the existential quantifier "(∃)", the variable "x" and the predicate expressions. The variable "x" stands for an entity and is attached to "(∃)" and thus it is a bound variable, and the predicate expressions are represented by using capital letters which is attached to the bound variable. For example, consider the sentence which is expressed in natural language: there are tigers. Under the method of quantification this sentence is given the following formal representation: (∃x) Tx.

meta-ontology. A brief explanation is given regarding different metaphysical systems that are considered here: David Lewis' Modal Realism (LMR) and Meinongianism (MS).The project would be one where a general meta-logical theory is developed and its usefulness is demonstrated by considering the case of the dispute between LMR and MS. In the process of developing the meta-logical theory, one would look at example disputes like that of LMR vs MS, to see in what way the dispute arises and the nature of such disputes.

3. Two systems from metaphysics: David Lewis' Modal Realism (LMR) and Terence Parsons' Meinongianism (MS)

LMR is a system of metaphysics within modal metaphysics which provides a metaphysical foundation for modality/modal concepts: necessity and possibility. How to provide the truth condition for the sentences involving modal concepts? One of the ways to provide truth condition for the modal statements is to assume the existence possible worlds and say that modal concepts work as quantifiers over the possible worlds. How to explain the ontological status of possible worlds? LMR attempts to answer this. The fundamental tenet of LMR is the following. All possible worlds exist and are spatiotemporally isolated concrete particulars. This tenet of LMR entails that there are entities that are spatiotemporally unrelated to our actual world. It leads to the recognition of the objects other than the one which inhabit the actual world. There is no categorial difference among worlds and the things in the worlds. The worlds and the things in the worlds are categorially same or are of the same kind. They are concrete entities. The worlds differ not in kind but only in what goes on in them. There is no causal relation between the things across the worlds. Each world is spatiotemporally isolated. There are attempts to associate the ontology of LMR with Meinongianism (MS). Central to MS is the acceptance of the reality of entities which donot exist in the actual world/the reality of entities that are spatiotemporally unrelated to the objects in our actual world. According to Meinongians, reality consists of both existing entities and subsisting entities. Existing entities are spatiotemporally located. The entities like Golden-mountain, Pegasus, etc. do not exist. Nonetheless, these are real in some sense and they subsist. Both LMR and MS admit the reality of entities that are spatiotemporally unrelated to our actual world in their respective ontology. Therefore, in certain cases the ontology of LMR coincides/overlaps with the ontology of MS[9]. LMR would point out that

[9] Linsky and Zalta as well as William G. Lycan argues that LMR is met with features of Meinongian ontology which David Lewis rejects. See Linsky B. and E. N. Zalta. 1991. Is Lewis a Meinongian?,*Australasian Journal of Philosophy*, 69 (4):438–453.

there no categorial difference between the objects that exists in our actual world and the objects that exist in the other possible worlds i.e., they are of the same kind. There is no categorial difference between the objects in one room and the objects in the other, similarly there is no categorial difference between objects in the actual world and the objects in other possible worlds. According to LMR, for MS the categorial difference between the objects that exist and the objects that subsists is crucial. For MS the objects that exist and the objects that subsist are not of same kind. Linsky and Zalta point out that Parsons' theory which is fundamentally Meinongian one will not accept categorial difference between or kind difference between objects that fall in the realm of existence and those fall only in the realm of subsistence. The objects that exist and the objects that subsist are of the same kind. In LMR also there is no categorial difference between actual and possible objects i.e., the objects that are spatiotemporally related to us and the objects that are not spatiotemporally related to us. Therefore, the ontology of LMR coincides with the ontology of Parsons' Meinongianism. Here, there persists a kind of ontological dispute between LMR and MS, if any of these systems wants to reject the coincidence/overlap. The rejection of the coincidence/overlap entails the rejection that the entities that are spatiotemporally unrelated to the objects of our actual world for both LMR and MS are the same kind of entities. Now, the ontological disagreement needs to address this coincidence/overlap. Thus, a rigorous characterisation of the disagreement is required. It is so, because the disagreement needs to address the alleged overlap that is attributed to the ontology of LMR and of MS. So, the ontological dispute between these two systems seems to be an apt case to develop a GMT.

4. Formulating the principles of GMT

In order to formulate the principles of GMT, from Quine's meta-ontology we consider criterion of ontological commitment and two formulations on ontological disagreements. We specify different concerns of QCOC. Then, by considering two formulations on ontological disagreements the principles of metalogic is presented. We direct the development of GMT by considering the chief concerns of this criterion: theories, the entities of the theories, sentences of the theories and the QVI of these sentences of the theories. Below, these different concerns of QCOC are arranged in different worlds to motivate analysis. Shortest

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Lycan, W. G. 1979. "The Trouble with Possible Worlds", In Michael J. Loux (ed.), *The Possible and the Actual*. Cornell University Press. pp. 274-316.

form of the criterion is, to be is to be the value of bound variable.[10] In order to indicate the different concerns of the criterion we use the following version. In general, an entity of a given sort is assumed by a theory if and only if it must be counted among the values of the variables in order that the statements affirmed in the theory be true.[11]

4.1. Ordering the Concerns of the Criterion

1. The world of theories ($\mathbf{W^t}$)

($\mathbf{W^t}$) consists of all theories, such as $\{T^1, T^2 \ldots\ldots T^n\}$

2. The world of entities ($\mathbf{W^e}$)

($\mathbf{W^e}$) consist of all entities which are assumed by the members of ($\mathbf{W^t}$), such as $\{e^1, e^2 \ldots\ldots e^n\}$

3. World of constant letters ($\mathbf{W^c}$)

($\mathbf{W^c}$) consists of all constant letters which stand for an entity and which will take the place of variables in the QVI. $\{C^1, C^2 \ldots\ldots C^n\}$

4. World of sentences ($\mathbf{W^s}$)

($\mathbf{W^s}$) consists different sets of sentences which the members of ($\mathbf{W^t}$) will use to talk about the members of ($\mathbf{W^e}$).

$\{S^1, S^2 \ldots\ldots S^n\}$

5. World of QVI ($\mathbf{W^q}$)

($\mathbf{W^q}$) consists of quantifier-variable idiom, such as $\{Q^1, Q^2 \ldots\ldots Q^n\}$

Meta domain = D^m

The domain of object theory = D^o

$D^m = \{D^{o1}, D^{o2}, \ldots\ldots\ldots D^n\}$

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[10] Quine, W. V. 1939. "Designation and Existence."*The Journal of Philosophy* 36 (26): 701-709, p. 708.
[11] Quine, W. V. 1963. "Logic and Reification of Universals."*From a Logical Point of View: Logico Philosophical Essays*, 102-129, p. 103.

$\mathbf{D^m}$= ($\mathbf{W^e}$)

Apart from QCOC the following two formulations on ontological disagreements by Quine should also be considered here for the formulation of the principles of metalogic.

First formulation

> I cannot admit that there are some things which McX countenances and I do not, for in admitting that there are such things I should be contradicting my own rejection of them.[12]

Second formulation

> So long as I adhere to my ontology, as opposed to McX's, I cannot allow my bound variables to refer to entities which belong to McX's ontology and not to mine.[13]

For convenience sake let us call Quine's above mentioned formulations as ontic restrictive formulations (ORF). ORF concerns an issue when someone has ontological disagreement with the opponent i.e., when someone disagrees with her opponent on what ***things*** are to be regarded as real. These formulations are directed towards the issue of restriction of the variable which comes under the scope of existential quantifier. Variables are regarded as referring to an entity and also regarded as ranging over the ontology. When ***X*** disagrees with her opponent ***Y*** on what things exist, ***X*** (the one who disagrees) cannot allow her bound variable to range over the entities of ***Y*** (the one with whom the disagreement is made). Considering QCOC and ORF, the principles of GMT can be stated in the following way.

4.2. The Principle of Isolation of Entities

($\mathbf{W^t}$) consists of the set of theories. ($\mathbf{W^e}$) consists of the set of entities. Ontological commitment is a relation that obtains between the members of ($\mathbf{W^t}$) and ($\mathbf{W^e}$). Consider $\mathbf{T^1}$ which is a member of ($\mathbf{W^t}$). $\mathbf{T^1}$ will have the relation of ontological commitment to some set of members of ($\mathbf{W^e}$) and $\mathbf{T^1}$ will not have the relation of ontological commitment to all the members of ($\mathbf{W^e}$). An ***X*** cannot be the member of ($\mathbf{W^t}$), unless ***X*** has the relation of ontological commitment to at least one member of ($\mathbf{W^e}$). Nothing can be the member of ($\mathbf{W^t}$),

[12] Quine, W. V. 1948. "On What There Is", p.35.
[13] Ibid.

without the relation of ontological commitment with the members of ($\mathbf{W^e}$). The same is applicable to the relation between other members of ($\mathbf{W^t}$) and ($\mathbf{W^e}$). In that case, ($\mathbf{W^e}$) can have a subset in relation to $\mathbf{T^1}$. Let us call the members of ($\mathbf{W^e}$) in relation to $\mathbf{T^1}$ as $\mathbf{T^{1E}}$ entities. $\mathbf{T^{1E}}$ entities are the only entities to which $\mathbf{T^1}$ is ontologically committed. $\mathbf{T^{1E}}$ entities constitute the domain of the theory $\mathbf{T^1}$. Therefore, $\mathbf{T^{1E}} = \mathbf{D^{T1}}$.The same can be said about $\mathbf{T^2}$ or the other members of the $\mathbf{T^1}$. In this way, some kind of non-overlapping is to be expected here.

Statement of the first principle

> Ontologically disagreeing theories $\mathbf{T^1}$ and $\mathbf{T^2}$ will have at least one entity each $\mathbf{e^1}$ and $\mathbf{e^2}$ such that to which $\mathbf{T^1}$ has the relation of ontological commitment to $\mathbf{e^1}$, concurrently $\mathbf{T^1}$ lacks the relation of ontological commitment to $\mathbf{e^2}$ and $\mathbf{T^2}$ has the relation of ontological commitment to $\mathbf{e^2}$, concurrently $\mathbf{T^2}$ lacks the relation of ontological commitment to $\mathbf{e^1}$.

Quine's two formulations on ontological disagreement regarding the range of the variable assume this principle. Quine says in disagreeing with my opponent, I shouldn't be allowing my bound variable to refer to the entities of the opponent. The principle of isolation upon entities puts up a limitation for the variable to refer to any entity. Limit of the variable to refer to any entity and specifically opponent's entity cannot be shown or indicated in the object level. Let us call this limit as variable reference limit. Variable reference limit can be shown or indicated only in the meta-level. From two different directions the instantiation process is considered: from the direction of metaphysics or ontology and from the direction of logic. From the point of view of logic, instantiation process is the substitution instance of a variable. The substitution instance of QVI is formed by dropping the quantifier and by eliminating each occurrence of the variables with an individual constant. An individual constant refers to an entity. The constant that is used to eliminate a variable is said to be the instantiating constant. Instantiation process from the point of view of logic, is limited or restricted by the Principle of Isolation of Entities and it is stated as the Restriction Principle of Variable which is the third principle. Instantiation process from the direction of metaphysics is explained as the Principle of Isolation of Instantiation Process. A crucial point to be made is that it is not only the first principle but also the second principle a creates variable reference limit.

4.3. The Principle of Isolation of Instantiation Process

From the direction of metaphysics, instantiation process is the instantiation of the property by an entity. Existentially quantified sentences say the following way: there is an

entity ***a***, such that, ***a*** instantiates the property ***P***. From the point of view of metaphysics, we say the entity that is referred by ***a*** is an instantiating entity and the entity in question instantiates a particular property ***P***. We are not aiming for an account of how properties are instantiated by an entity. Whatever the account is given to the notion of instantiation of property, the way an entity instantiates a property may change from theory to theory.

Statement of the second principle

> Ontologically disagreeing theories $\mathbf{T^1}$ and $\mathbf{T^2}$ will have at least one entity each $\mathbf{e^1}$ and $\mathbf{e^2}$ to which $\mathbf{T^1}$ has the relation of ontological commitment to $\mathbf{e^1}$, concurrently $\mathbf{T^1}$ lacks the relation of ontological commitment to $\mathbf{e^2}$, due to the variation in the instantiation process of $\mathbf{T^1}$, and $\mathbf{T^2}$ has the relation of ontological commitment to $\mathbf{e^2}$, concurrently lacks the relation of ontological commitment to $\mathbf{e^1}$, due to the variation in the instantiation process of $\mathbf{T^2}$.

This principle requires a detailed explanation, since it is this principle that plays a crucial role in the introduction of independent variable and dependent variable in GMT. Consider the ontological disputes between the Russellian ontology[14] and MS and, LMR and MS. The Russellian orthodox ontology is committed to just one kind of entities and also keeps down the number of entities that are posited. In MS, there are at least two kinds of entities: the entities that subsist and the entities that exist. The Russellian ontology has only one kind of entities, the entities that exist. In relation to the Russellian ontology, MS will have more fundamentally different kinds of entities and also more entities of each fundamentally different kind. Russellians and LMR will posit exactly the same kind of entities i.e., only existing entities. The instantiation process of entities in LMR and Russellian ontology is exactly the same. The way an entity instantiate a property is same for both Russellian ontology and LMR: entities instantiate property by being a space-time point or by being spatiotemporally located. However, in relation to the Russellian ontology, LMR will have more entities. There is proliferation of entities in LMR. So, the sentence "there are talking donkeys" or similar kinds of sentences will be false for orthodox Russellians whereas true for LMR. Though there is no dispute between LMR and MS, over the truth of the sentence, "there are talking donkeys" or similar kinds of sentences, the instantiation process is not the same for these systems. In LMR, the way an entity instantiates a property is different from MS. The difference between the LMR and MS is pointed out by the difference

[14] Russellians have the robust sense of reality.

in the instantiating process. In LMR any entity insatiate a property as a space-time point or as spatiotemporally located. In MS though there are entities which are spatiotemporally located which are existing entities, the subsisting entities are not spatiotemporally located. So, the principle of instantiation process is at work. Variation in the instantiation process will bring variation in the ontological commitments.

Here, in the proposed GMT the introduction of two principles will illuminate the notion of ontological commitment[15] through the following distinction: qualitative difference in the ontological commitment and quantitative difference in the ontological commitments. We would say Russellian orthodoxy and MS have both qualitative and quantitative difference in the ontological commitments. Since there is difference in the instantiation process of MS and Russellian orthodoxy, there is qualitative difference in the ontological commitment between Russellian orthodoxy and MS. In addition, since MS is committed to more entities than Russellian orthodoxy, there is quantitative difference in the ontological commitments between MS and Russellian orthodoxy. Since there is no difference in the instantiation process of LMR and the Russellian orthodoxy, there isn't any qualitative difference in the ontological commitments. However, there is quantitative difference in the ontological commitments in relation to the Russellian ontology and LMR. Though there is no variation in the instantiation process (and because of which there is no qualitative difference in the ontological commitments) of Russellian ontology and LMR, in LMR there is proliferation of entities. But in relation to MS, LMR has both quantitative and qualitative difference in ontological commitments. It is so, because there is variation in the instantiation process. MS has fundamentally different kind of entities and also more instances of the different kinds of the entities. The quantitative and qualitative difference in the ontological commitments plays a crucial role in fixing the ontological commitments of a particular theory. Emergence of this difference is the result of the first and second principles of GMT. The Principle of Isolation of Instantiation Process creates a restriction upon a variable in the QVI to take any value. That is any member of the world ($\mathbf{W^e}$) cannot be regarded as the value of a variable of a QVI of the sentence of a theory. Thus, we have got the following Restriction Principle of Variable.

4.4. The Restriction Principle of Variable

[15] The notion of ontological commitment is the one that falls in the area of meta-ontology. Here, the proposed GMT which is a meta-level enquiry will require us to make a distinction between qualitative and quantitative difference in the ontological commitments.

In the regimentation procedure not any entity can be the value of a variable. Some kind of restriction principle is at work. According to the principle of isolation of entities, a theory may not be committed to any members of the world ($\mathbf{W^e}$). When the regimentation (of the sentences of a theory into Q-V-Idioms) is performed upon a theory then this point (that a theory is not committed to any members of the world ($\mathbf{W^e}$)) has to be taken into consideration. $\mathbf{Q^1}$ which is a member of ($\mathbf{W^q}$) and $\mathbf{T^1}$ the member of ($\mathbf{W^t}$) employs $\mathbf{Q^1}$ then $\mathbf{Q^1}$ will not range over any member of ($\mathbf{W^e}$) as the values of the variable, but only some members and the same is applicable to the relation between other members of ($\mathbf{W^t}$) and ($\mathbf{W^e}$). As there is isolation upon entities and isolation upon the instantiation process, there needs to be restriction upon the variables to take any value. There are cases (as we could see in the dispute between LMR and MS) where in relation to different members of **($\mathbf{W^t}$)**, there could be overlapping in using the members of **($\mathbf{W^s}$)** and this doesn't entail the overlapping of members of **($\mathbf{W^e}$)** in relation to different members of **($\mathbf{W^t}$)**.In order to show this first we need to convert the overlapping members of **($\mathbf{W^s}$)** into the member of **($\mathbf{W^q}$)**. The members of **($\mathbf{W^q}$)** are the quantified sentences with variables. Then we need to determine which entity or which member from **($\mathbf{W^e}$)** could be the value of variable. Such determination is performed through the application of the principle of isolation of instantiation process. Even when the sentence yield the truth value false or even to create a sentence with truth value false, the variables in the QVI of that sentence cannot take any entity from **($\mathbf{W^e}$)**. It is this restriction which Quine considers in his two formulations about the ontological disagreement. When ***x*** disagrees with her opponent ***y*** on what things exist, ***x*** (the one who disagrees) cannot allow her bound variable to range over the entities of ***y*** (the one with whom the disagreement is made). Such ontological disagreement can be shown in meta-theory only. Some kind of restriction is there for the variables of the QVI of the sentences of a theory to take any value. The bound variable (specifically the variable which comes under the scope of existential quantifier) of a theory cannot be allowed to range over the entities of the opponent's theory. We have tried to state this formulation in the form of the Restriction Principle of Variable. To clarify the notion of range we need to introduce the distinction of independent-dependent variable.

4.5. Introducing the Independent Variable (IV) and the Dependent Variable (DV)

Based on the three principles of metalogic, the notions of independent variable (IV) and dependent variable (DV) is introduced in GMT. What is an IV and what is a DV in the context of GMT? And why certain variables are regarded as IV and some other variables are regarded as DV in the current context of developing GMT? The set of conditions of a world

or meta-world theory that specify in what way the reality of an entity is to be construed and accepted is the IV. Such conditions are the fundamental presuppositions of a world or meta-world-theory about how an entity is to be regarded as real. Let us call such conditions as ***r***-conditions of a theory or a system or world-theory where ***r*** stands for reality. ***R***-conditions of a theory provide a particular mode of reality for *something* to be counted as an entity. ***R***-conditions of a theory or a system together constitute the IV. The conjunction of the ***r***-conditions of a particular system or theory is the IV of that system or theory. Each theory or system will have its own ***r***-conditions. Why different ***r***-conditions of the theories are regarded as IV can be explained, only in relation to those items which work as DV.

DV are the variables that occur in the QVI of the sentences of a theory. The elimination of the variables in the QVI using a constant letter which stands for an entity, is not an arbitrary elimination. What entity that is designated by a constant letter should substitute or eliminate the variable to yield a sentence with truth value depends on the ***R***-conditions which is the IV. There is some kind of non-arbitrariness in the substitution of the variable with constants. Non-arbitrariness is not in the sense of yielding a true sentence. It is true that in order to yield a true sentence from a QVI, the variables in the QVI cannot be substituted with any arbitrary constant letter which stands for a particular entity. A specific constant letter which stands for a particular entity must be the value of variable of QVI in order to yield a true sentence. Even when a particular QVI yields a false by substituting the variable in that QVI, there is a kind of non-arbitrariness in the substitution of the variable with a constant letter that stands for an entity. Non-arbitrariness can be stated in the following way as a principle.

Non-arbitrary principle

> A member of ($\mathbf{W^c}$) C^1 that stands for a member of ($\mathbf{W^e}$) e^1 and $e^{1'}$s mode of reality satisfy the ***r***-conditions **R** of a member of ($\mathbf{W^t}$) T^1 and the mode of reality of e^1 doesn't satisfy the ***r***-conditions **R*** of another member of ($\mathbf{W^t}$) T^2 and same member of ($\mathbf{W^q}$) Q^1 is presented in both T^1 and T^2 then Q^1 in relation to T^2 cannot yield a member of ($\mathbf{W^s}$) S^1 eliminating the variable in Q^1 with C^1 that stands for the entity e^1.

Suppose, Q^1 in relation to T^2 yields a sentence eliminating the variable in Q^1 with C^1 that stands for entity e^1, then the substitution will result in yielding an ill formed sentence: a sentence with neither truth value True nor truth value False. There is a range fixed by the ***r***-

conditions and the variable in the QVI can be eliminated by a constant letter that stands for an entity which falls within this range. Because of this non-arbitrariness[16] the variable in the QVI is a dependent variable i.e., its elimination is dependent on the ***r***-conditions. A stronger claim would be the following. No variables in QVI are substituted with a constant that stands for an entity without a set of ***r***-conditions. Let us consider α to represent the IV. As there are different object theories, there are various ***r***-conditions for these object theories. So, there would be various α. α will be the conjunction of the ***r***-conditions.

We can use the notion of independent variable (which is the conjunction of the ***r***-conditions) to make the following point about the qualitative difference in the ontological commitment. Qualitative difference in the ontological commitment happens with the addition or the removal of one of the constituents of independent variable and the quantitative difference in the ontological commitment happens with the variation in the number of the entities. However, the quantitative difference in the ontological commitment doesn't entail change or addition or removal of the constituents of independent variable. Consider two theories: T^1 and T^2.

> Qualitative difference in the ontological commitments persists between two of the members of ($\mathbf{W^t}$) T^1 and T^2, if and only if at least one of the constituents of ***r***-conditions (which is the independent variable) of T^1 yields fundamentally different kinds of entities in relation to T^2 in the elimination of the variables in at least one of the members of ($\mathbf{W^q}$) Q^1 in order to yield a sentence S^1 with a truth value which is a member of ($\mathbf{W^s}$).

Strong or hard ontological disagreements between the theories happen when there is qualitative difference in the ontological commitments. Hard or strong ontological disagreement occurs between two theories when those two theories accept qualitatively different kinds of entities. Qualitative difference in the ontological commitments happens only if, the addition or removal of ***r***-conditions which are the independent variable would

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[16] The point of non-arbitrariness can be explained considering the case of LMR and MS. Both LMR and MS will accept the entity golden mountain. Something is gold and mountain. However, from something is golden mountain, LMR cannot make an inference something that is gold and mountain is something that subsists. For MS, the entity that is gold and mountain is the entity that subsists. However, the entity that subsists cannot be the entity that is a gold and mountain for LMR. For LMR the entity that is gold and mountain is the entity that is spatiotemporally located. But that entity which is spatiotemporally located cannot be the instantiating entity for MS or that entity cannot replace the variable in QVI in relation to MS. The entity that subsists which is a gold and mountain cannot be the entity that could be the substituent of the QVI (There exists x, x is gold and x mountain.) for LMR. The entity that is spatiotemporally located which is gold and mountain cannot be the entity that substitute the variable of the QVI for MS. In this sense there is a range for the variable in the QVI of these sentences. This range is fixed by the ***r***-conditions. Elimination of the variable is dependent on these *r*-conditions.

affect the range of the variable in QVI of the sentences of the theories. If there is qualitative difference in the ontological commitments between two theories then the range of the variable would be extended in order to include different kinds of entities when the quantification is performed. When there is addition or removal of ***r***-conditions which constitute the independent variable then the range of the variables in the sentences of the theories will change.

5. Reformulating the ontological disagreement between LMR and MS in the light of the the principles of GMT

In our world of theories (W^t) we have got two theories and these are the following:

(i) Lewis' Modal Realism (T^{LMR})

(ii) Meinongianism (T^{MS})

(W^t) consists of (T^{LMR}) and (T^{MS}). And, (W^e) consist of set of entities to which (T^{LMR}) and (T^{MS}) are ontologically committed. Based on the Principle of Isolation of Entities, we say that LMR will not have the relation of ontological commitment to all the members of (W^e), but only to some set of members of (W^e). Similarly, MS will not have the relation of ontological commitment to all the members of (W^e). Let us call the members of (W^e) to which LMR has the relation of ontological commitment as E^{LMR} entities. The domain of LMR (D^{LMR}) consists of E^{LMR}. Let us call the members of (W^e) to which MS has the relation of ontological commitment as E^{MS} entities. The domain of MS (D^{MS}) consists of E^{MS}. MS has a larger ontology compared to the LMR as MS accepts different kinds of entities. If the domain of meta-theory (D^M) is exclusively concerned of LMR and MS, (D^M) will consist of both (D^{LMR}) and (D^{MS}).

$(D^M) = (D^{LMR}) + (D^{MS})$

In relation to (T^{LMR}) and (T^{MS}), there is overlapping in using the members of (W^s) and they are true sentences about ***seemingly*** overlapping entities. For example, consider the sentences which are true for both (T^{LMR}) and (T^{MS}): *There exist things* which are spatiotemporally unrelated to us and *there are* talking donkeys. Such sentences are true for both systems. From the context of GMT, one could say that there is overlapping in using the members of (W^s). This overlapping in using the members of (W^s), might compel to conclude that there is some ontological parallelism between these two systems. There is overlapping in using the members of (W^q): ($\exists x$) (x is spatiotemporally unrelated to us) or ($\exists x$) (x is a talking

donkey). This overlapping also might compel to conclude that there is some ontological parallelism between these two systems.

In such a situation, one needs to look into the bound variables of the QVI ((∃*x*) (*x* is spatiotemporally unrelated to us) and (∃*x*) (*x* is a talking donkey)) to determine the ontological commitment of these two theories. What sort of an entity could be the value of variable ***x*** in these sentences for LMR and MS? Here, *looking into the bound variable* is to look into the way the entity becomes the value of the variable that is looking into the instantiation process. So, the second principle of metalogic the principle of isolation of instantiation process is at work. Based on the principle of isolation of entities we can say that although these sentences might be true for both object theories and similar entities figure in both object theories, they differ in their ontological commitments. 1st principle will ensure only the quantitative difference in the ontological commitment between LMR and MS. To show the qualitative difference in the ontological commitments, the 2nd principle needs to be applied. Variation in the mode of instantiation puts up a restriction upon the variables to take any entity as the value. The Restriction Principle of Variable comes into play in the following manner. When ***X*** disagrees with her opponent ***Y*** on what things exist, ***X*** (the one who disagrees) cannot allow her bound variables to range over the entities (which do not belong to the ontology of ***X***) of ***Y*** (the one with whom ***X*** is in disagreement). Those who attribute features of Meinongian ontology to LMR would say that at least in some cases, the bound variable of LMR seems to range over the entities of MS. If so, LMR assumes at least in part, the ontology of MS. Lewis, apart from allowing his bound variables to range over the entities which are spatiotemporally related to us, in some way, also allows his bound variables to range over the entities which are spatiotemporally unrelated to us, to which a Meinongian is also ontologically committed. The member of (W^q) in relation to T^{LMR} ranges over the members of (W^e) or the entities of D^{MS}. Thus, Lewis has some Meinongian features. Now, the problem for Lewis is to show that his bound variable doesn't range over the Meinongian entities. So, the project is to fix the range of the variable of both LMR and MS. Here, we need to introduce the distinction of independent-dependent variable in ontological dispute between LMR and MS.

6. Independent Variable and the Dependent Variable in LMR

Here, we should look into the **α-**independent variable of LMR. Let me bring down various ***r***-conditions of LMR which provide the mode of reality for an entity.

_R_-conditions of LMR

Theses of Counterpart system[17]

1. Nothing is in anything except a world.

2. Nothing is in two worlds.

3. Whatever is a counterpart is in a world.

4. Whatever has a counterpart is in a world.

World-thesis of possible worlds

5. Possible worlds are spatiotemporally isolated concrete particulars.[18]

At the minimum, these five theses together provide ***r***-conditions for an entity to be regarded as real in LMR. First four theses together provide a particular mode of existence exclusively for objects in LMR i.e., objects as existing in possible worlds. The fifth thesis provides a particular mode of existence for worlds themselves. According to the first thesis everything that exists, exists in some worlds. According to the second thesis every object is world bound and none of the objects can exist in two worlds. Second thesis not only leads to the introduction of counterpart of objects[19] (mentioned in 3rd and 4th theses) but it also presupposes worlds being isolated in some way. These four theses together provide a particular mode of existence for objects. The nature of possible worlds including the actual one is pointed out in 5th thesis. 5th thesis provides a particular mode of existence for the worlds themselves. According to this thesis, possible worlds are isolated and this has some connection to 2nd thesis (nothing is in two worlds). Unlike 2nd thesis, 5th one provides demarcation principle for possible worlds: possible worlds are spatiotemporally isolated. 5th thesis also mentions that the possible worlds are concrete entities. Though 5th thesis provides a particular mode of existence for possible worlds, the mode of existence of objects has a

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[17] Lewis, D. 1968."Counterpart Theory and Quantified Modal Logic", *Journal ofPhilosophy*, 65: 113–26.p.114.

[18] 5th thesis is formulated by combining the point of isolation and the point of concreteness of possible worlds.See, Lewis, D.1986.*On the Plurality of Worlds,* pp. 69-86.

[19] Introduction of counterpart of objects has some other motivations. Humphrey could have won the election. According to LMR, this is true because there a possible world in which Humphrey wins the election. The question is, are Humphrey in our world and Humphrey in the other world identical. The second thesis wouldn't allow LMR to say that they are same. LMR explains this by saying that Humphrey in the possible world is the counterpart of Humphrey who is in our world. Since our concern here is different, we don't have to worry much about the counterpart relation and its pros and cons.

connection with this thesis: in what way or in what manner these objects in different worlds exist. To explain this we need to look into the significance of the notion of spatiotemporality.

6.1. Significance of the notion of spatiotemporality

The notion of spatiotemporality becomes crucial in explaining the worldmate relation and also to give the isolation principle for worlds. Lewis explains the notion of isolation of possible worlds, by explaining the notion of worldmate: if two things or individuals are parts of the same world then they are said to be worldmates. A world ***W*** is the mereological sum of all the possible individuals that are parts of ***W*** and those individuals are worldmates of one another. A part being a worldmate of another part is further correlated with the spatiotemporal relations between those parts of the worlds. Consider what is said by Lewis, "……things are worldmates iff they are spatiotemporally related. A world is unified, then, by the spatiotemporal interrelation of its parts."[20] Spatiotemporal relation works as necessary and sufficient condition for individuals being worldmate. Lewis works out this interrelation between parts of a world as spatiotemporal interrelation. Since nothing is in anything except a world, as things in each world are interrelated through spatiotemporal relation, there isn't anything that stands outside this relation. The notion of spatiotemporality is also crucial in LMR to provide the demarcation principle of the worlds. Worlds are demarcated on the basis of spatiotemporal isolation. When we consider the worldmate relationship and the demarcation principle together, we can see that the notion of spatiotemporality plays a crucial role in providing the mode of existence for the objects which are the parts of the worlds and also for the mode of existence for the worlds themselves as isolated entities. These five theses together provide a particular mode of existence for worlds and for also for the things in those worlds. These five theses are the ***r***-conditions of LMR and their conjunction is the IV of LMR.[21]Now consider the variable in QVI which is the dependent variable in relation to

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[20] Lewis, D.1986.*On the Plurality of Worlds*, p. 71.

[21] One significant question arises regarding the spatiotemporal relation and the things between which the relation obtains. What could be the status of spatiotemporal relation and the things between which the relation obtain? There are three views regarding the spatiotemporal relations and Lewis is neutral to take any position, though he prefers one among them over others. One of the views accepts the reality of space-time parts and the occupants that occupy these space-time parts. Lewis regards this as dualist conception. The properties are instantiated by the objects or the occupants which occupy the spacetime parts. Under this conception, space-time is separate entity which can exist independently of the occupants or the objects which are with some spatiotemporal locations. It is to this view the notion spatiotemporal location is crucial. But Lewis isn't much attracted to this view. The other view rejects a separate reality for space and time and accepts objects alone. Under this view there are only objects and the spatiotemporal relations. Properties are instantiated by those objects which stand in some spatiotemporal relations. There is a third view, which Lewis

LMR. Its replacement is dependent on these ***r***-conditions. Only those entities that are spatiotemporally located/the space-time point eliminate the variable in the QVI in relation to LMR. The variable in the QVI ranges over only those entities which satisfy the mode of reality provided by the above mentioned five theses. The independent variable of LMR represented as α would be the following.

> α= {Nothing is in anything except a world, Nothing is in two worlds, Whatever is a counterpart is in a world, Whatever has a counterpart is in a world, Possible worlds are spatiotemporally isolated concrete particulars}

7. Independent variable and dependent variable in Terence Parsons' Meinongianism[22]

The reason we consider Parsons' MS is that it is to Parsons' version LMR is mostly associated. Meinongians makes a distinction between being/subsistence and existence. Reality consists not only of existing entities but also of subsisting entities. Existing entities are those entities which are spatiotemporally located and examples for such entities are the Mount Everest, Tasmanian Tigers, London Bridge, Socrates, etc. However, the entities like Golden-mountain, Holmes, Pegasus, batman etc. do not exist. Nonetheless according to Meinong, these entities are real in some sense. They don't exist but they subsist. Once this distinction is accepted then how to explain the nature of this distinction remains to be the most significant project. Apart from this, how to work out the quantification over them is also a significant problem to address. Meinongians consider existence as a predicate and this predicate will be represented as "***E*!".**When the quantification is performed upon the entities that are in the domain of existence, the predicate "***E*!**" is used to restrict the quantifier to this domain of existence. Parsons makes a distinction among properties: nuclear and extra-nuclear properties and uses this distinction to develop his own version of Meinongianism.

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is interested in and this view rejects occupants or the objects as separate entities. What is there is the different parts of the space-time or spatiotemporal regions or the points of space-time itself. The spatiotemporal relations are the distance relations between these regions or the points of space-time. Properties are instantiated by the part of the space-time points or the space-time regions. Lewis maintains neutrality between the first and the last conception. Lewis rejects the second view which means Lewis gives significance to space-time. To the first view the notion of spatiotemporal location is crucial and to the last view the notion of space-time point is crucial. Lewis maintains neutrality between spatiotemporal locations and spacetime points. Therefore, either the objects have spatiotemporal location or they are the space-time points itself. For, LMR there isn't anything that is real which is not a space-time point. Everything that is real is points in space-time itself. For details, see Nolan, Daniel. 2005. *David Lewis*, Chesham: Acumen Publishing. p. 48.

[22] Parsons, Terence. 1980. *Nonexistent Objects*, New Haven: Yale University Press.

Nuclear properties are those properties which determine the nature of the object. Some of the examples for nuclear properties are the following: “is green”, “is fat”, “is golden”, “is mountain”, “is bald” etc.

Parsons suggests four kinds of extra-nuclear properties and they are the following

1. Ontological

e.g., “exists”, “is mythical”, “is fictional” etc.

2. Modal

e.g., “is possible”, “is impossible”

3. Intentional

e.g., “is thought about”

4. Technical

“is complete”, “is consistent”

Only nuclear properties are significant in determining the nature of an object or characterising the nature of an object. Extra-nuclear properties don’t affect the nature of the objects. Parsons makes another kind of distinction among properties: constitutive and consecutive. Constitutive properties are those properties of the object which stated explicitly in the description of the object and picks out the object. Consecutive properties are those properties of an object which are implied by the constitutive properties. for example, the constitutive properties of golden-mountain is the property of being gold and being mountain and the consecutive property of the same is being material thing or being physical entity. According to Parsons, for every set of nuclear properties, there is an object which exemplifies exactly the properties in the set. What advantage Parsons is going to get from the distinction between nuclear and extra-nuclear property is that it would allow him to say that nuclear property doesn’t entail extra-nuclear properties. There are cases where an object has nuclear properties but not extra-nuclear properties. Now regarding the Golden Mountain, Parsons would say the following: there are objects that exemplify the nuclear property of being gold and the nuclear property of being mountain but they don’t have the extra-nuclear property of existence. An object having nuclear property of being gold and mountain doesn’t entails that

that object having extra-nuclear property of being existent. The object that lacks the extra-nuclear property of existence will fall in the realm of subsistence.

In order to fix the ***r***-conditions in Parsons' MS, the distinction of nuclear-extra-nuclear properties and the distinction of constitutive-consecutive properties should be taken into account. Since Parsons assumes that it is the nuclear property that is significant in determining the nature of the objects, the ***r***-condition will be the following. For every set of nuclear properties, there is an object which exemplifies exactly the properties in the set. Non-existing but just subsisting entities could exemplify a property. This condition will be related to the distinction of constitutive-consecutive properties to fix the other ***r***-condition. If for every set of nuclear properties, there is an object which exemplifies exactly the properties in the set then that object has some consecutive property. If we take any non-existing but just subsisting entities that are similar to golden mountain, Pegasus then these objects will have the consecutive property of being physical kind. The independent variable of MS represented as αwould be the following.

> α= { For every set of nuclear properties, there is an object which exemplifies exactly the properties in the set, If for every set of nuclear properties, there is an object which exemplifies exactly the properties in the set then that object has some consecutive property}

These two theses are the ***r***-conditions of Parsons MS and their conjunction is the IV of Parsons MS. Now consider the variable in QVI which is the dependent variable in relation to Parsons MS. Its replacement is dependent on these ***r***-conditions. Only those entities that are physical kind can eliminate the variable in the QVI in relation to MS. For MS, the variable in the QVI ranges over only those entities which satisfy the mode of reality provided by the above mentioned two theses.

In a very short form IV could be represented in both LMR and MS in the following manner.

> In LMR
>
> α^{LMR} = Physicality +being spatiotemporally located/being space-time points
>
> In Parsons MS
>
> α^{MS} = Physicality

8. Formation of Functionally Isomorphic Quantifiers (FIQ)

FIQ is introduced in one of the systems to give a formal representation of the solution of the ontological disputes. Here, FIQ is introduced in LMR. First,we will see the nature of the expression "x is spatiotemporally located" or "x is a space-time point.

8.1. Are "*x* is spatiotemporally located" or "*x* is a space-time point"[23] predicate expressions in LMR?

In LMR, all the properties are instantiated. Properties are construed as sets of objects which are located or situated in worlds and are world-bound. A property is the total instances of that property in all possible worlds including in the actual one. These instances or objects are in different worlds and this follows from 1st thesis that nothing is in anything except a world. These instances are world bound and this follows from 2nd thesis that nothing is in two worlds. From 5th thesis we could say that these objects are spatiotemporally located or they are the space-time points. Considering the various point of 5th thesis, we could say that these properties are instantiated by something that is the space-time points or something that is spatiotemporally located. Being points of space-time or being spatiotemporally located is very significant in providing the mode of reality for an entity in LMR. Now let us ask the following question. What are these expressions "*x* is spatiotemporally located" or "*x* is a space-time point" stand for? Are they predicate expressions? If they are regarded as predicate expressions then what is predicated is a property. Are they properties of things in LMR? If *being spatiotemporally located* is regarded as a property of things then a problem that is similar to Russell's problem of negative singular existential might arise for LMR. For the sake of argument, let us consider *being spatiotemporally located* as a property of things. Now let us consider the sentence; some entity/object is not spatiotemporally located. The puzzle that is similar to the negative singular existential arises in the following way. The above mentioned sentence says that some object lacks the property of *being spatiotemporally located*. If so, then the reality includes an object such that that object lacks the property of *being spatiotemporally located*. We try to recognize and accept one object in our reality and we say that that object lacks the property of *being spatiotemporally located*. So, we recognize the sentence "something is not spatiotemporally located" as expressing a true proposition.

[23] As Lewis maintains neutrality between having spatiotemporal location and being points in spacetime itself, whenever something is said about one, the same would be applicable to the other. So, here, we would be using them synonymously.

There is/exists an entity such that that entity is not spatiotemporally located. Since these inconsistencies arise, along with existence, *being spatiotemporally located* also cannot be regarded as the property of individuals in LMR.

Consider the following sentence with regard to LMR. Hobbits don't exist. Hobbits are not spatiotemporally located. This is a true sentence. They are fictional characters. We cannot say (∃*x*) (*x* is not spatiotemporally located). We are trying to identify some objects in LMR which are not spatiotemporally located/not a space-time point and say that the object lacks the property of being spatiotemporally located. In LMR everything that is real is a space-time point/spatiotemporally located. If so then it might be that, the sentences in which "being spatiotemporally located" or "being space-time points" occurs as a predicate adds nothing to the sentences. In what sense these expressions don't add anything to a sentence is explained with the help of the examples below. Sometimes considering them as property that can be predicated of things might figure in some kind of incompatibility also. To show this let us, consider the different sentences and their Q-V-Idioms in relation to LMR.

Hobbits are not spatiotemporally located. This can be represented in Q-V-I in the following way.

(1) ~ (∃*x*) (H*x*&ST*x*)

Consider the following unacceptable representation of the same sentence.

(2) (∃*x*) (H*x*& ~ST*x*)

Problem with this representation is that, one is trying to accept something that is Hobbits and deny the property of having spatiotemporal location to that thing. It means it leads to the acceptance of the reality of something which is not a space-time point or is not spatiotemporally located in LMR. But for LMR, everything that is there to the reality is the different space-time points or regions. Here in this kind of representation the variable ***x*** is allowed to range over some other entity which normally doesn't figure in LMR. Somehow there is the violation of the range. This leads to some kind of alteration upon the range of variables of these sentences, which will affect the ***r***-conditions. What it sounds like, accepting the reality of something that is Hobbits and also accepting the reality of something which is not spatiotemporally located or which is not a space-time point. This will obviously go against the ***r***-conditions of LMR. The range of the variable is altered. This will result in some kind of incompatibility. So the acceptable representation of the same sentence for LMR is the following.

(3) ~ (∃*x*) (H*x*&ST*x*)

This representation doesn't lead to the kind of problem which was faced by the previous one. But consider the second conjunct "(ST*x*)" which is read as "*x*is spatiotemporally located" or "*x* is a space-time". This portion in the Q-V-I adds nothing to the sentence itself. The independent variable which is constituted by the ***r***-conditions had already put up a restriction upon the variable ***x*** which will occur in the Q-V-Idioms of these sentences. In doing so, spatiotemporality plays a crucial role and we saw this in 5th thesis. If so, then the variable ***x*** is already assumed to have certain import of spatiotemporality: ***x*** in LMR will stand for an entity with spatiotemporal location or a space-time point. So when we consider the open sentence "*x* is spatiotemporally located" in relation to LMR, sentence seems to be tautology. If not tautology at least the occurrence of such expression as predicate in the sentences seems to be redundant. Thus, the second conjunct "(ST*x*)" of the sentence adds nothing to the entire sentence.

(4) (∃*x*) (ST*x*)

To put it in the normal language this sentence says something similar to the following: spatiotemporally located thing is spatiotemporally located thing. Now consider the following Q-V-I.

(5) (∃*x*) (~ST*x*)

And this seems to suggest something similar to the following: spatiotemporally located thing is not spatiotemporally located thing.

(ST*x*) seems to be tautology

(~ST*x*) seems to be contradiction

Once you try to give value for this expression by considering any entity form LMR, the first one will always end up in redundancy and the second one will always end up in falsity. This ***x*** already has an import of spatiotemporally located things or being space-time points in LMR. Not only are the substitutional instances always false. In the 2nd one, we face some kind of inherent inconsistency. Therefore, the spatiotemporality (being spatiotemporally located or being space-time point) cannot be regarded as property of things in LMR. It can be further shown that it can function like quantifiers. In what follows, it is shown that how this can function like quantifiers.

8.2. Functionally Isomorphic Quantifier (FIQ)

In Lewis' system the sentences like possibly there could have been a talking donkey can be interpreted as there is a talking donkey (there exists an ***x*** such that ***x*** talks and ***x*** is a donkey).

(6) ◊ ∃***x*** (T***x*** & D***x***) can be interpreted as the following.

(7) ∃***x*** (T***x*** & D***x***)

FIQs are those quantifiers which can be employed at the place of existential quantifier. We don't say that existential quantifier can be replaced by FIQ of a particular system. This is introduced in metalogic specifically to give solution to ontological disputes. Such quantifiers are functionally isomorphic to existential quantifiers in the sense this can function like existential quantifiers. With regard to function there is a similarity between the FIQ and the existential quantifier.

Considering LMR, FIQ can be devised by introducing the spatial and temporal elements into existential quantifier. We saw that spatiotemporality plays a very crucial role in his system. This rearranged FIQ or particular quantifier will be effective iff this FIQ yields the same results whatever Lewis' system gets when existential quantifier is used. One such result is the following: the truth value of the sentences with existential quantifier should remain same for the sentences in which the existential quantifier is replaced by FIQ. FIQ needs to quantify or should be able to quantify those entities which could be quantified by existential quantifier in Lewis' system. Let us call this LMR based FIQ as spatiotemporal quantifier or st-quantifier. Let me represent it in the following way: "(^{s}□)". "s" stands for space and the symbol "□" stands for temporal element and all of them are enclosed within the parenthesis. This can be read as spatiotemporally located/spacetime point. When we use it in the sentences, this can be read as the following.

Spatiotemporally located thing [is] such that…..

Here, when we introduce the variable ***x*** this would look like the following.

Spatiotemporally located ***x*** [is] such that…..

Abbreviated formulation would be the following:

(^{s}┼^{x})

What I would be showing is the following:

(8) ◊(∃x)$\overset{def}{\equiv}$(∃x)

(9) (∃x)$\overset{def}{\equiv}$(s┼x)

First one is already explained in Diamond Dropping Possibilism. Let us see the second one. First let us see how this work in sentences.

1. Possibly there is a talking donkey.

2. There is/exists a talking donkey.

3. Spatiotemporally located thing [is] such that it is a talking donkey.(Spatiotemporally located thing [is] such that, that thing talks and that thing is a donkey.)

(3) doesn't use the existential quantifier (∃). It uses the FIQ which is generated from the element of spatiotemporality of LMR. Introducing the spatiotemporal element, the above mentioned sentence can be represented in QVI in the following way.

(10)(s┼x) (T*x*&D*x*)

Following are the different interpretations.

◊(∃**x**) (T**x**&D**x**) can be interpreted as the following which was explained previously.

(∃**x**) (T**x**&D**x**)

(∃**x**)(T**x**&D**x**) can be interpreted as the following.

(s┼x) (T**x**&D**x**)

This particular st-quantifier (FIQ), can yield the same results which our standard existential quantifier can yield. It has the existential import and it quantifies over those things which the standard existential quantifier quantify in Lewis' system. This is possible because of the kind of possible world theory or the kind of metaphysics of possible worlds he has.

8.3. Development of meta-proof for quantifier equivalence

The equivalence in quantification between existential quantifier and FIQ is to be proved. ***Augmented*** FOQL will have FIQ. We have st-quantifier as FIQ. LMR's existential quantification will be equivalent to st-quantification. Existential quantification will not be equivalent to st-quantification in MS. A general structure of the meta-proof for the quantifier equivalence in LMR will be like the following.

(1) $\Diamond (\exists \boldsymbol{x}) \overset{\text{def}}{=} (\exists \boldsymbol{x})$ (LMR)

(2) $(\exists \boldsymbol{x}) \overset{\text{def}}{=} ({}^{s}\!\!\dagger^{x})$

In (1) *possibly there exists* ***x*** is reduced to *there exists* ***x***. *There exists* is reduced to *spatiotemporally located* ***x***. Meta-proof for (1) is given from the already available literature. But (2) involves the augmented portion. The proof for this involves at least the below given steps.

E = An entity/object that is spatiotemporally unrelated to the entities/objects in our actual world the world

P = Property that is predicated to E

Sentence = E is P

QVI = $(\exists x)$ (Ex&Px)

1. $(\exists)$	Traditional existential quantifier
2. $({}^{s}\!\!\dagger)$	Augmented st-quantifier/FIQ
3. $(\exists) \equiv ({}^{s}\!\!\dagger)$	Quantifier equivalence
4. $(\exists x)$ (Ex&Px)	
5. $({}^{s}\!\!\dagger^{x})$(Ex&Px)	
6. $(\exists x)$ (Ex&Px) $\equiv ({}^{s}\!\!\dagger^{x})$ (Ex&Px)	(3, 4 & 5)

Conclusion

Here, the proposed GMT illuminates the concept of ontological commitment in meta-ontology and resolves a problem in metaphysics or meta-world theory the ontological

parallelism between LMR and MS. Use of the st-quantifier in LMR will resolve the difficulty in expressing the ontological dispute between LMR and MS. This is justified by giving a meta-proof showing the equivalence of the st-quantifier and the existential quantifier. Here, the meta-proof shows that the entities quantified by the st-quantifier are also quantified by the existential quantifier. The set of entities quantified by the st-quantifier is a subset of the set of entities quantified by the existential quantifier and all spatiotemporal entities quantified by existential quantifier are also quantified by the st-quantifier. In this manner the ontological dispute is stated by developing certain tools and methods in GMT. Introduction of FIQ and the independent variable-dependent variable distinction is the example for such tools and methods. Here, st-quantifier is the functionally isomorphic quantifier. Independent variable is the ***r***-conditions of a system. The distinction of independent variable and dependent variable is introduced by considering the three principles of GMT. Here, GMT provides a set of tools or an inventory of conceptual tools. An ontological dispute between systems is an appropriate case where distinction between object level and metalevel and meta-meta level is very much required. Such disputes cannot be resolved on the same level. Here, at the metalevel we introduced the concepts like FIQ and independent variable. Here, one cannot address the ontological dispute, unless due focus is directed towards the levels. Along the same line meta-meta level concerns would arise when we talk about the independent variable itself. Suppose, the sentences which are regarded as ***r***-conditions are translated into QVI then what one could say about the variable x in these QVI. What would be the range and the reference of the variable of the sentences that are regarded as the ***r***-conditions? This question will require one to have meta-meta-level concerns.

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