The Realizations of Real Pluralism and Their Difficulties

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ABSTRACT

Firstly, I give the definition of Real Pluralism. Then I give 10 examples of the realizations of Real Pluralism. And in section 3, I show the difficulties encountered in the realizations of Real Pluralism. Following the difficulties, I try some possible savers to save us from the difficulties. Lastly, I give a metric to measure different Ontologies.

Keywords: real pluralism, realization

1. DEFINITION OF REAL PLURALISM

"There is an irreducible plurality of equally true descriptions of the World, descriptions not hierarchically ordered, nor qualitatively different with respect to the way they hook onto the World, because they differ with respect to their structure." [1]

Here, I would like to make a new definition that is more abstract by replacing the World with the Phenomena under study.

"There is an irreducible plurality of equally true descriptions of the Phenomena under study, descriptions that are interpreted or generated by the Ontologies, because they differ with respect to their structure."

So here I will confine myself to the relationship between the Phenomena under study and their Ontologies that produce the Phenomena. Next I will try to realize the Real Pluralism by the following 10 examples.

2. REALIZATIONS BY PHENOMENA AND THEIR ONTOLOGIES

2.1 First Order Logical Axiom System

Here Phenomena are the axioms in the first order logic system. Ontologies are the models in first order terms. For the ancestor example, the first order logic axioms are

For-all X, Y,

IsParent(X,Y) -> IsAncestor(X,Y)

For-all X, Y, Z

　(IsParent(X,Y)and IsAncestor(Y,Z))

　　-> IsAncestor(X,Z)

For-all X　　IsParent(fatherOf(X),X).

For-all X　　IsParent(motherOf(X),X).

Where isAncestor and isParent are first order predicates. motherOf and fatherOf are first order functions.

The model of these axioms is just the model of the real world. So there is only one model.(The realism holds.)

Therefore the Pluralism does not hold for these 4 axioms because there is only one model now. This is the first difficulty of Pluralism.

The next difficulty is that, without giving the axioms (the Phenomena), we are not able to know how many models (Ontologies) are left. Therefore it is just that we cannot know the number of models a priori before the axioms are given. Hence the Pluralism holds or does not hold according to the axioms given, we don't know about it a priori. This is the second difficulty of the realization of Pluralism in axiomatic systems.

2.2 Coordinate Systems in Mathematics

A vector is described by its coordinate, and each coordinate gives the interpretation of the vector. The first known coordinate is the Cartesian coordinate(x,y). The second useful coordinate is the Polar coordinate(r,θ). They are related by the coordinate transformation x=r*cos(θ), y=r*sin(θ). And note that each coordinate system is a conceptual schema. We change the description and interpretation when we change the coordinate system. Because there are two ontologies of coordinate systems, this is an example of pluralism.

2.3 Quantum Physics

In Quantum physics, there are two independent theories that describe the world equally. One is Heisenberg's Matrix Mechanics [2], and the other theory is Schrodinger's Wave mechanics [3]. They were developed independently using different math languages, one is by matrix, while the other one is by differential equations. But finally they are proved to be equivalent. I think this is a good example of Pluralism.

2.4 Cognitive Science

Cognitive Science studies the Psychology(mental phenomena) and their implementations(ontologies of Biology and Artificial Intelligence). Nowadays, A.I. has defeated the human chess champion by Deep Blue [4] and defeated the human Go champion by Alpha Go [5]. Turing test [6] and natural language processing were passed by Eliza [7]. However, the biological ontology system still exceeds the A.I. ontology system in the area of computer vision. In the same mental

phenomenon, there are two ontological conceptual schemas to achieve, this is also a good example of Pluralism.

2.5 Artificial Intelligence

There are two schools of Artificial Intelligence, Connectionism [8] and Symbolism. The same mental phenomena, such as Learning the XOR function, can be implemented by both two ontological conceptual schema Connectionism and Symbolism. This is a good example of Pluralism.

2.6 Theory of Computability [9]

Different machines(ontologies) can have the same computability (functional phenomena), such as Turing machine [10] and modern VLSI computers [11]. This is an example of Pluralism.

2.7 Programming Language Interface [12]

Interface(phenomenon) and its implementations(ontologies). For example of the interface +, it can be implemented by 2 conceptual schemas number class and string class. number+number has its ordinary interpretation of arithmetic addition, while string+string means the concatenation of two strings. This is another example of Pluralism.

2.8 Programming Language Abstract type [13]

In programming language Java [14], The abstract type List(Phenomenon) can be implemented by two concrete types(Ontologies) such as Linked List[15] and ArrayList [16].

2.9 Linguistics

A sentence could have two interpretations. Such as the sentence "A boy watches the girl with a telescope". There are two readings of this sentence, the telescope is with the boy, or the telescope is with the girl.

A boy watches (the girl with a telescope)

A boy watches (the girl) with a telescope

In reality there is only one interpretation that is true. However, in the areas of novels and poetry, we would like to leave more imaginations possible in mind. Hence the two interpretations both exist in two possible worlds parallel.

2.10 Mathematics, Guessing a function

Given a sequence of numbers (phenomena), guess an analytic function (ontology) that generates the sequence.

For example of the number sequence 1,2,3,4,......,99,100,101,........
We already know that there is a candidate function f(n)=n to generate the sequence. The difficulty resides in how to guess the second function that generates the same sequence? Is it possible that there is only one function that generates a sequence? If so, then the Pluralism fails in this case.

3. DIFFICULTIES OF REALIZATION OF PLURALISM

It is lucky that from example 2 to example 9 we

can always get two ontologies that generate the phenomena which satisfies the Pluralism. However, for the case 2.1 First Order Logic Axiom System : When the number of axioms increases, the number of models decreases. Then there is a difficulty for the logic case if the number of models turns out to be 1 (the realism). This is the first difficulty of Pluralism.

The second difficulty resides in example 2.10, Guessing a function, it's harder when we try to guess more than one function, especially for the sequence is not finite, which goes into infinity.

4. THEIR POSSIBLE SAVERS

One possible way to save the first difficulty is to increase the number of propositions in proposition logic (or predicates in predicate logic). Every time we add a new proposition, the number of the models is the original size times two.

So here we grow the number of propositions, the number of models increases. However, to make these propositions meaningful to the original system, we need to add axioms for the new axioms. So the number of the models decreases again.

An example in Physics is the theory of Quantum Chromodynamics(QCD) [17]. There they introduced 6 types of Quarks[18], Pup, Pdown, Pcha, Pstrange, Ptop, Pbottom. And a proton could be composed of 2 Up Quark and 1 down quark.

Pup and Pdown -> P proton

This axiom is made by coupling the new propositions with original proposition of the existence of proton. And there are many other rules of QCD. Limited to the page length, I just stop the physics here.

Employing the same way of expanding the ontology we can similarly do it for the example 2.10. Guessing the functions. Here we add a function $g(n)$ to our original ontology { $f(n)$ }. So

Let $h(n) = f(n)+g(n)$

Let $f(n)=n/3$, $g(n)=2n/3$, we get in this model that $h(n)=n$ which successfully re-generates the sequence.

The ontology $\{f(n)=n/3, g(n)=2n/3\}$ generates the same sequence by different ontological structures, which is just the definition of Pluralism.

5. A METRIC OF ONTOLOGIES

In last section, we expand the ontology to match the Pluralism. However, we know that in this way we can select infinitely many ontologies such as in the Guessing Number example, $\{f(n)=n/4.$

g(n)=3n/4}, {f(n)=n/5. g(n)=4n/5}, {f(n)=n/6. g(n)=5n/6}..... infinite cases.

As a result, a question naturally arises is that, is there some metric of the ontologies such that it can differentiate good ontologies from bad ontologies? Or possibly can we choose the best one for Realism, or the best 2 for Pluralism?

The answer is positive. There is a principle called "Occam's razor"[19] It can be stated by many forms but the spirit of the rule is simple :

1. With competing theories or explanations, the simpler one, for example a model with fewer parameters, is to be preferred.
2. When presented with competing hypotheses about the same prediction, one should select the solution with fewest assumptions.
3. Simpler theories are preferable to more complex ones.

Therefore, we can see that in the example of Guessing functions, { f(n)=n } is the simplest one solution with respect to the other solutions gotten by expanding the ontology { f(n)=n/3, g(n)=2n/3 }. Similarly for the example of proposition axiom systems, it would be worse if we add any unnecessary propositions, which have more parameters in the structure.

6. CONCLUSION

I have shown 10 examples of the realizations of Real Pluralism, 2 cases(example 1 and example 10) got failed while the other 8 cases succeeded. It seems that Real Pluralism is prone to be the answer. However, the difficulties shown by the examples also tell us that, firstly we cannot know if the Pluralism holds or not a priori. We must wait for the phenomena to be handy to compute the possible models left by the constraints from the phenomena. Lastly, for the aesthetic reason, if we hold the Occam's razor, then we will choose the simplest one solution in the example of guessing the ontological structures to generate a series of phenomenon presented. However, in this case there are no best 2 ontologies we can choose for Pluralism.

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