

Exponential Path Reference Class Duality Problem

by Sven Nilsen, 2019

The Exponential Path Reference Class Duality Problem is to determine whether the combination of Exponential and Path Reference Classes can be used to make predictions that separate the many-worlds interpretation from the single-world interpretation in the Path Reference Class Duality.

Path Reference Class Duality is that there are two equally valid interpretations, one where the observer is existing in a many-worlds with similar observers, and one where the observer is existing in a single-world but makes choices with various chances.

The hope is that by mixing Path Reference Class with Exponential Reference Class, one can “lure out” some predictions that separate the two.

Alternatively, one would like to have a mathematical proof that these two interpretations can not be separated this way.

For example, it could be a way to reason about Path Reference Classes as mathematical objects.

If the many-worlds interpretation and the single-world interpretation are identical, then according to path semantics there is no way to talk about them in different ways. This would include ways of mixing them with other reference classes such as the Exponential Path Reference Class.

If the many-worlds interpretation and the single-world interpretation are not identical, then according to path semantics there exists at least one way to talk about them in different ways. The question still remains whether it would be possible to perform a practical physical experiment to test this.

This duality problem is very hard because interpretations are usually not considered an intrinsic part of a mathematical object. A description or expression is treated as being interpreted by some program from the outside that gives meaning to what happens when the program executes. A mechanism for integrating the interpretation into the object is required. It might be possible to use the analogy of constrained functions vs traditional functions from path semantics.

One would also like to answer questions like “what would the world look like if physics is interpreted as a single-world with chances of making choices, yet the universe undergoes eternal inflation?”. Our intuition for what the world would look like might be wrong, since either we might be living inside a many-worlds universe while believing it is a single-world universe, or maybe we are living inside a single-world universe while believing it is a many-worlds universe. There should be some kind of argument that narrows down the expectations we have about the observations we are making. The ability we have to talk about such arguments is currently limited, which is part of the motivation for working on this problem. The development of some toolbox to talk about this might yield different insights. Alternatively, some simple math trick might be used to give the proof that the argument works. It does not always happen that working on some hard problems and solving them gives new insights.