Quantum Information Flux of Rotating Complex Amplitudes

by Sven Nilsen, 2020

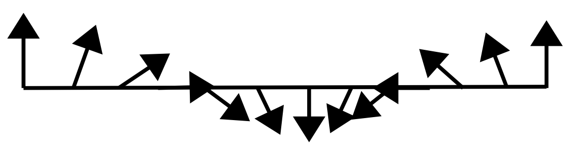
In this paper I derive the quantum information flux of rotating complex probability amplitudes.

Quantum information flux is defined as following:

$$dI / dt = k \cdot \log_2(|\exists g|) \cdot t_p$$

dI = Change of information (quantum information flux)
dt = Change in time
t_p = Planck time (or a corresponding discretized unit of time)
$\exists g$ = Existential path of partial observation \`g\` (codomain predicate function)

Under Feynman Path Integration formulation of quantum mechanics, the complex probability amplitudes are rotating along the paths with the frequency of the particle used in the experiment:



In this context, it makes sense that \`k\` can be interpreted as some kind of frequency. However, information is independent of the state of the particle, so one can use \`k = 1 / dt\` instead and simplify:

$$dI / t_p = \log_2(|\exists g|) \qquad k = 1 / dt$$

This means that the change of information per Planck time, is the number of bits \`$\log_2(|\exists g|)$\` used to measure something, but what?

As long the particle is unobserved, one can set \`$\log_2(|\exists g|) = 0$\`, until the moment when the particle is observed. In this moment, the length of the path modulus the wavelength is known from the new state:

length_of_path % wavelength

This modulus length also describes the new rotation. At each wavelength interval, this value “resets” such that the change of information is erased. Similarly, when the rotation takes one turn, it “erases” the information about previous turns. All bits extracted from this experiment refers to the rotation or modulus length. As a consequence, the quantum information flux can be obtained by the oracle in this computational complexity class at an instant. It is as if no time has elapsed, just a single moment. This is the intuition behind Feyman Path Integral formulation, that one considers all possible paths at once.

I find this explanation still lacking, but the idea is that a rotating complex amplitude is in itself a kind of information added to an experiment, which prevents more bits from being extracted than put in.