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Rhythm Based Time and the conventional time

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Abstract: I explain how Riemann surface splits Rhythm Based Time into conventional time.

It is known that the exponential function $e^z = \exp(z)$ of a complex number $z \in \mathbb{C}$ has the form, when we write $z = x + iy$ with $x, y \in \mathbb{R}$,

$$(1) \qquad \exp(z) = e^x e^{iy} = e^x(\cos y + i \sin y).$$

Therefore e^z is cyclic or periodic with respect to the imaginary part y of z, and takes the same values on each strip

$$(2) \quad (k-1)(2\pi) < y < k(2\pi) \quad (k = \cdots, -2, -1, 0, 1, 2, \cdots).$$

$\exp(z)$ maps each strip onto the whole complex plane. These strips can be connected through the positive real axis of e^z to form a Riemann surface of e^z. On this Riemann surface $w = e^z$ is invertible and the inverse function is the logarithm function $z = \ln w$.

The local clock $\exp(-itH)$ is expressed as we have seen before as

$$(3) \qquad \exp(-itH) = \int_{-\infty}^{\infty} e^{-it\lambda} dE(\lambda).$$

This means that, on an abstract space $\frac{dE}{d\lambda}(\lambda)\mathbb{H}$ (where $\mathbb{H}$ is the base Hilbert space), the local clock is represented by a periodic function $e^{-it\lambda}$ of t. This periodicity is exactly that of the Rhythm Based Time of Dr. Beamish.

In so far as we consider the value $e^{-it\lambda}$, it is periodic and takes the same value infinitely many times when t varies. The Riemann surface of e^z splits this periodic function, into a one-to-one function $e^{-it\lambda}$ from the set of real numbers into the Riemann surface of e^z. (Note that $-t\lambda \in \mathbb{R}$ is the imaginary part of the exponent of $e^{-it\lambda}$.)

This Riemann surface is a spiral surface, as expected by Dr. Beamish.

This is the relation between the cyclicity of Rhythm Based Time $T = \exp(-itH)$ and the linearity of conventional time t.

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