

Re: An Invitation to Quantum Mathematics

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- *From:* "Mpilot" <mobilepilot@xxxxxxxxxx>
 - *Date:* 20 Nov 2006 05:35:46 -0800
-

No. They are angular momentum.

There are two different kinds of angular momentum operators that can be combined to define the total angular momentum $J = L + M$, to which you refer. Note that the variables J , L and M are the expectation values of the vectors).

The eigenvalue of $J^2 = l(l+1)/(\hbar/2\pi)^2$ and $J_z = (\hbar/2\pi)m$, where $|m| \leq l$ and the quantum numbers may be either integers or half integers.

Timothy Golden BandTechnology.com wrote:

Mpilot wrote:

Will you please discuss J_x , J_y , and J_z ?

If we define Information (bits) as the most elementary parts in our Universe, we can ask the question whether information resides in points of non-analyticity or if information is more distributed in nature, which relates to the wave-particle duality of light.

If we define your J_z the axis of points of "non-analyticity", Information as your J_y axis and Physical entropy S as your J_x -axis, we can define a Dynamic Theory of Information and Entropy.

Opinions on the Physical Nature of Information have tended to be contradictory. One view is that information is inherent to points of non-analyticity ("virtual particles"), whereas others consider information to be more distributed in nature. Such considerations are akin of the wave-particle duality, with the question of which of the 2 complements best characterises information.

Timothy Golden BandTechnology.com wrote:

Mpilot wrote:

Let me try to clarify the above given

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statements.

It turns out that fundamental notions and results of classical mathematics do have substantial quantum analogues. You can say that these classical notions represent a small classical part of a huge quantum iceberg. To comprehend all of this iceberg we must replace functions lying in the foundation of the notions (results, methods, problems) with operators. The question is how to perform such quantization in practice for a concrete notion taken from some area of mathematics. Often it is not clear in advance what to do and different people can give you different suggestions.

However, some conformity has been established. For instance, the book by Connes is especially impressive. It is a main source for quantum mathematics.

Let me concentrate on the theory of normed spaces. There are no other normed spaces, but function spaces. Thus every normed space coincides with some space of bounded functions endowed with the uniform norm. Being spaces of functions automatically become spaces of operators.

The essential new phenomena of quantum mathematics appear when we move from linear operators to multilinear operators. In principle, the relations between quantum and classical functional analysis are similar to those between quantum and classical physics. On one hand, the things in classical science (notions, facts, methods) have meaningful quantum analogues, which allow to better understand their classical prototypes. On the other hand, quantum science comes across essentially new phenomena not encountered in classical science.

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Timothy Golden BandTechnology.com
wrote:

Mpilot wrote:

Quantum
Mathematics
is the
mathematical
apparatus of
quantum
mechanics.

What is the
essence of
this
mathematical
ideology ?

We can say
quantum
mathematics
emerges
from the
classical
mathematics
after
replacing
functions by
operators.
The
outstanding
role of
functions in
classical
mathematics
with the
pointwise
commutative
multiplication
is passed in
quantum
mathematics
to operators
with their
non-commutative
multiplication
(composition).

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The following 2 statements serve as a "guide to action":
* Classical Mathematics deals exclusively with spaces of functions and its main structure is the uniform norm.
* Quantum Mathematics deals with the spaces of operators and the main structure is the quantum norm.

Will you please discuss J_x , J_y , and J_z ?

-Tim

I probably would not pass a test on the multilinear function's norm space but I'm getting some of the gist. And you are addressing the classical/quantum correspondence which I appreciate. When a physicist is concerned about a free particle in one of these situations and comes up with these complex probability distributions and they have already expressed the particles behavior in terms of momentum and position what right have they to reintroduce in angular momentum atop this free point particle's trajectory? I fail to see the classical interpretation of this. It seems to me more like

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attributing
additional degrees of freedom in a false way.

-Tim

No. They are angular momentum.

I believe the simpler form is just L in the standard developments, but they go to J after introducing spin. I hope to understand how they develop this theory. I am entirely open to not understanding the problem and so my question may be phrased inadequately. The phrase "angular momentum" is at the heart of the problem. As I go over the treatments I see momentum equations developed and then angular momentum equations developed. I am left with the impression that they have superposed these two to get results and I question the validity of that, particularly in light of the correspondence principle which you have a keen awareness of.

-Tim