Re: An Invitation to Quantum Mathematics

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- *From*: "Mpilot" <mobilepilot@xxxxxxxxx>

- *Date*: 20 Nov 2006 10:41:11 −0800

> No. They are angular momentum.

The above given reaction is a bit short.

The two angular momentum operators L and M which combined give the total angular momentum J are defined as follows (J, L and M are vector observables):

For any given value of l, the possible eigenvalues of the z−component of the angular momentum Lz are Lz= h/(2pi)m, m=0, +/− 1 ,..+/− l The eigenvalues are given by L^2 = h/(2pi) l (+1), l=0,1,2,3,...
Thus a measurement of L^2 can yield as its result only the values 0, 2(h/2pi)^2,...

The results for M are precisely the same as for L, except that the orbital angular momentum operators for M are half−integer.

Timothy Golden BandTechnology.com wrote:

> Mpilot wrote:
>
> > > Will you please discuss Jx, Jy, and Jz ?
> >
> > If we define Information (bits) as the most elementairy 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−partice duality of light.
> >
> > If we define your Jz the axis of points of "non−analyticy", Information as your Jy axis and Physical entropy S as your Jx−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 ("vitual 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 characterses information.

Timothy Golden BandTechnology.com wrote:

> Mpilot wrote:
>
>> Let me try to clarify the above given
>> 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 lineair operators to multilineair
>> 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 meaningfull quantum analogues, which allow to better understand their classical prototypes.
On the other hand, quantum science comes across essentially new phenomena not encounted in classical sience.

Timothy Golden BandTechnology.com wrote:

> Mpilot wrote:
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> > 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).

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 Jx,
Jy, and Jz ?

−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 attributing
> additional degrees of freedom in a flase 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

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