# Re: are Real Numbers evil?

***Source:*** http://coding.derkeiler.com/Archive/General/comp.theory/2005−06/msg00140.html

- *From*: tttpppggg@xxxxxxxxx
- *Date*: 14 Jun 2005 16:12:19 −0700

Claudio Grondi wrote:
> > Polysigned numbers can be used for 3D space.
> I have spent some hours on that, but can't see
> any practical case making it useful.
Thanks for taking the time to study them. It sounds like you understand how they work pretty well.
>
> To give an example what I mean with useful:
> Quaternions are abstract constructs, but they make
> it possible to add rotations in 3D space and help to
> make animate transitions from one orientation into
> another look natural. If not looking behind the scenes
> of operating on them it is easy to work with them, so
> they are widely used replacing vector transformations
> using matrices.
Do you just throw away the fourth dimension?
Aren't you then really just working with the complex plane as I had suggested?
I am not honestly that familiar with how you use them for rotations that you are doing. You must have an axis of rotation and an angle theta right? And then a group (CM) velocity on top of this yielding two positional coordinates?
>
> From what I understand now, the polysigned numbers
> are nothing else as a complicated way of speaking
> about vector operations where the coordinate system
> is not orthogonal but based on a regular triangle (2D)
> and regular tetrahedron (3D). I suppose, that the core
> of the fascination and the observation related to this
> concept is, that going around a triangle or a tetrahedron
> will allow to come back to same point with less turns as
> needed in orthogonal systems (2D: two turnes for triangle,
> three turns for square, 3D: max. four turns for tetrahedron,
> six turns for cube).
I would say these above some of the results of applying the polysigned paradigm. I do not believe that they are really so complicated.
In fact I can argue that they are more fundamental. No cross product is needed to generate them. They extend naturally from the real numbers.
These are direct consequences of allowing more than two signs in a

number system.
>
> Is there more behind the polysigned numbers
> as pure theoretical fun to do some new math?
Well as you know I argue that they generate space−time.
I you buy this then they are deeply meaningful.
I do not know of any other natural construction that can do this.
This comes about as a result of a breakpoint in their properties as sign increases. The breakpoint is beyond sign three.
I'm pretty sure that they support Maxwells equations in that the construction:
P1 x P2 x P3
demonstrates a rotational (P3) and an axis (P1) orthogonal to it.
The right hand law is analogous.
To attempt the same concept from P2 to P1 is challenging. But this is the sort of thing that the polysigned construction suggests to do. So I let them lead me around rather than force them to do things that I want them to.
I am just lucky that they do the thing that I hoped they would.
>
> What idea was the initial spark which has lead to
> creating this additional operators for real numbers?
Ah but they are not an extension of the real numbers.
The real numbers are a member of them. Reals are two−signed.
The first time I considered a three−signed number system was in college taking a real analysis course. I posed the problem to the proffessor and he dismissively told me to study vectors. I put it down until a few years ago when it stunk of a possible answer to your next question.
> What was the reason you have started to think about
> such a construct and finally published it on Internet?
I started questioning why there are three observed physical dimensions after reading enough string theory to understand that they distinguish between extended dimensions and curled dimensions. It is a very dirty construction that is akin to an emperical method.
Why three dimensions? Why this magic number?
Physicists generally assume it to be true because that is what is observed.
But what if there were an answer? Shouldn't this answer hold more than just the reason for three dimensions? Shouldn't it be a fair basis for physics?
Polysigned numbers or some other construction that begets space−time should be an important step toward cleaning up physics.
>
> By the way: I suppose the core of the problem with
> 3D not occuring in 2D in the fact, that when in 2D it
> is possible to cover a plane with regular triangles,
> it is not possible to cover 3D space with regular
> tetrahedrons (as it is possible using cubes).

Diamonds cover 3D space as packed tetrahedrons.
It may be true that the iterator for coding such an algorithm is not

straight forward. There is a very easy redundant iterator which is
simply a series of nested for loops over each sign. But it is not very
likeable since it covers the space far more than once.
−Tim
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> Claudio
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>
> <tttpppggg@xxxxxxxxx> schrieb im Newsbeitrag
> news:1118342475.019484.107700@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
> > Polysigned numbers can be used for 3D space.
> > ( http://bandtechnology.com/PolySigned/PolySigned.html )
> > 3D cartesian is equivalent to four−signed numbers.
> > The graphical representation is four rays emanating from the center of
> > a tetrahedron to its corners. These are unsigned components. There are
> > four of them.
> > They follow the rule:
> > − x + x * x # x = 0. (where * and # are new signs)
> > In other words the sum of vectors of magnitude x from each of those
> > tetrahedral rays lands you back at the origin.
> > This is equivalent to the two−signed numbers obeying:
> > − x + x = 0.
> > This is of course the real numbers. They have two signs. They are
> > one−dimensional.
> > In general a sum in two−signed will boil down to a single number but in
> > four−signed general sums can only be reduced to three values, the
> > fourth being zero. Reduction is not really a necessity. For example:
> > − 1.32 + 1.24 * 0.24 # 3.24
> > is a fine representation, even though the star (*) component could be
> > reduced to zero, with the other values reduced by 0.24.
> >
> > A product also exists.
> > Interestingly the three−signed numbers are equivalent to complex
> > numbers under this product rule, as well as sums. The meaning of the
> > four−signed product is more elusive however. The product does do some
> > rotation. However, magnitudes are not preserved.
> > Three−signed numbers do rotation as do complex numbers. perhgaps there
> > is where your solution lies, since rotations are generally taken about
> > an axis you can transform each plane normal to the axis, multiply by
> > your theta equivalent, then transform back to get your original
> > cartesian mess.
> >
> > −Tim
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- ***Follow−Ups***:

- ***Re: are Real Numbers evil?***
  - ◊ *From:* Claudio Grondi

- ***References***:
  - ***Re: are Real Numbers evil?***
    - ◊ *From:* tttpppggg
  - ***Re: are Real Numbers evil?***
    - ◊ *From:* Claudio Grondi

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