The Tri-Identity

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@Steve -

The post below clarified (to me) what I think you are attempting to do, so I was able to think more clearly about your issue. Briefly, I think the complexity of your formula comes from **translating from cylindrical coordinates to spherical coordinates (which is where the arctangent comes in)**; and possibly using Cartesian coordinates to define parameters, which would require yet more coordinate translation(s).

To me, the issue becomes clear in cylindrical coordinates that define the base of the hemispherical cap, with the gimbal lock occurring when that base goes to zero (the radius of the sphere is coincident with the radius of the base, but its area goes to zero), so you use a degree of freedom no matter how you rotate the global sphere to re-orient its base.

I tried to be consistent with notation, but even if not, you should be able to piece together my perspective if interested (if not, this will be a short thread indeed).

(Scroll past your post for the analysis).

From Steve

"This goes right to the heart of the new geometry. In our particular case, we are converting the planar angle between the plane normal to the main axis of the sphere (cardinal direction) and plane normal to the axis passing through the small circle center (ordinal direction) to an area. This area is the scalar value that is associated with the difference in orientation between the two (cardinal and ordinal) directions.

In practice, the tridentity is used to identify the function that represents a single member of the family of functions. This function is computed over a complete cycle to generate a curve similar in meaning to a sine curve for two dimensions. The area under the curve is integrated to complete the transformation of an angle to a scalar.

There are a few important points that should be understood about this process. For one thing, in order to make these scalar values (family member to family member) relate to one another on the same scale, it is necessary to "normalize" the results before graphing the solution. This involves making the range for the abscissa and ordinate equal to one in all cases. In other words, as the difference between the ordinal and cardinal directions ranges between zero and pi, along the ordinate, it also ranges between zero and one along the abscissa.

Another point has to do with the idea of gimbal lock. It isn't really the same thing as what happens when you use normal rotations in the conventional manner. In this case, the complete range for the family of functions (difference between cardinal and ordinal directions) is from zero to 2pi. The curve, and therefore the scalar values, repeats itself in order to make a complete cycle. I think that this is what is referred to as relating to the rotation group SO(3), but I don't really know what I'm talking about with a lot of this stuff. One rotation of the ordinal direction relative to the cardinal direction will yield two complete waveforms, or what might appear to be something that is associated with 720 degrees of rotation. It's easy to mistake this for gimbal lock, except for the fact that the point at which the polarity flips for the scalar value is perpendicular to the point at which the polarity flips for the angular input. This is the feature that makes me think that octonians are closely related to this particular structure. In any event, there is more bookkeeping to do relative to the sign, and we believe that the extra bookkeeping is to keep track of the chirality of the scalar amount. No one has worked this detail out yet.

When we make a plot of all the scalar values, for all the functions in the family (all relative directions between the ordinal and cardinal axes), then I think we end up with a curve that looks like the graph of the Lorentz factor. This hasn't been verified. As a matter of fact, a large part of our research has not yet been validated. We definitely need help with moving things forward. Our progress in developing the geometry has been stalled for a while due the fact that we have gone way past our mathematical abilities. Don't misunderstand what I mean by this statement. We have quite a large capacity for problem solving, but we don't have anyone in our group that has the skills or training to make more sense of the relationships that we're working with. You definitely have some skills. I was in the last class in my high school that had to learn how to use a slide rule. A lot has changed regarding the tools that are available now.

I think that you mentioned something earlier about the uncertainty principle. We have a theory that the disconnection between momentum and position is due to the mathematical representations that we use for these two values. One of our expectations is that by having the ability to match directions in space to a scalar amount, we should be able to gain a better understanding of the relationship between probability densities and quantum measurements. This is just an idea at this point, and we have no reason to make this supposition other than the recognition of some of the deep symmetries that exist in this new geometry.

Before I forget, I want to thank you for the link to the life of pi analysis. This is a very deep dive into the way these things can be viewed geometrically at this time. I wasn't aware of these different ways to do the analysis, and I was sure that you were on the right track with your conclusions about how the sequence is related to the arctangent. I was not aware of the source of the demonstration, it was sent to me by a friend in an email, and when I questioned its origins they said that they found it posted on 9GAG, of all places.

It’s probably important to understand what these scalar values actually represent, mathematically and conceptually. All we are defining with this value is the difference in orientation between directions that are normal to two planes. What that means can also be expressed in terms of a surface. The surface consists of two interconnected cones, where the generatrix of one is the axis of the other, and vice versa. This surface is oriented in space somehow, and to help discuss how it is orientated we have come up with the idea of arbitrarily assigning the cardinal direction to one axis and the ordinal direction to the other axis.

In our particular case, we are converting the planar angle between the plane normal to the main axis of the sphere (cardinal direction) and plane normal to the axis passing through the small circle center (ordinal direction) to an area. This area is the scalar value that is associated with the difference in orientation between the two (cardinal and ordinal) directions.”

$r_0 = 1$ Radius of sphere

Spherical Coordinates (r, θ, φ) (Wiki)

Point on Surface of Sphere, $r_0 = 1$ (Three degrees of freedom)

$$|s_0| \triangleq (1, \theta, \varphi) \triangleq \begin{vmatrix} 1 & 0 & 0 \\ 0 & \theta & 0 \\ 0 & 0 & \varphi \end{vmatrix}$$ (Wiki)

Cylindrical Coordinates (ρ, φ, z)

(Defining Cylindrical coordinates in red to avoid confusion)

$$|c_0| = \begin{vmatrix} \rho & 0 & 0 \\ 0 & \varphi & 0 \\ 0 & 0 & z \end{vmatrix}$$

This is a vertical cylinder from the base of the hemisphere to the top of the sphere.

The area of the base of the cylinder is $A_c = \pi(\rho)^2$

Spherical Cap (Wiki)

The distance r from the center of the sphere to a point on the cylinder is

$$\sin \varphi = a = \rho$$
$$\cos \varphi = r - h = 1 - h = z$$
$$r^2 = 1^2 = \sin^2 \varphi + \cos^2 \varphi = a^2 + (r-h)^2 = (\rho^2) + (z)^2$$
$$r = 1 = \sqrt{\sin^2 \varphi + \cos^2 \varphi} = \sqrt{(\rho^2) - (z)^2}$$

The area of the base of the cylinder is $A_{cyl} = \pi a^2 = \pi \rho^2 = \pi\left[(x_{cyl})^2 + (y_{cyl})^2\right]$

Notice that:

if $\varphi = 0$ then $\rho = a = 0$ and $A_{cyl} = 0 \Leftrightarrow \left[(x_{cyl})^2 + (y_{cyl})^2\right] = 0$

if $\theta = \pi / 2$ or $\theta = \frac{3\pi}{2}$ Then $h = r = 1$ so $z = (r-h) = (1-h) = 0$. so the z-axis goes to zero, and you lose a degree of freedom where $A_{cyl} = A_{base} = \pi r^2 = \pi\rho^2 = \pi(1^2) = \pi(1^2)$

No matter how you rotate the sphere in its third coordinate (φ) in spherical coordinates you will get gimbal lock at $\theta = \pi / 2$ or $\theta = \frac{3\pi}{2}$

(you can make the transformation back and forth between spherical coordinates and cylindrical coordinates, but the result will always be the same; when r is coincident with a you get gimbal lock where $A_{cyl} = 0$ so $\frac{A_{cyl}}{A_{base}} = 0$

Conversion from Cylindrical coordinates to Spherical Coordinates

$$|s_0| = \begin{vmatrix} \sqrt{\rho^2 + z^2} & 0 & 0 \\ 0 & \tan^{-1}\left(\frac{\rho}{z}\right) & 0 \\ 0 & 0 & z \end{vmatrix}$$

(this model has nothing to do with momentum or energy, either classical or relativistic. To see that, you have to understand momentum and energy and then compare Newton to Einstein, as I have done in pdf after pdf after pdf …

Think about it.