# Visualising Hypersphere Vorticitation.

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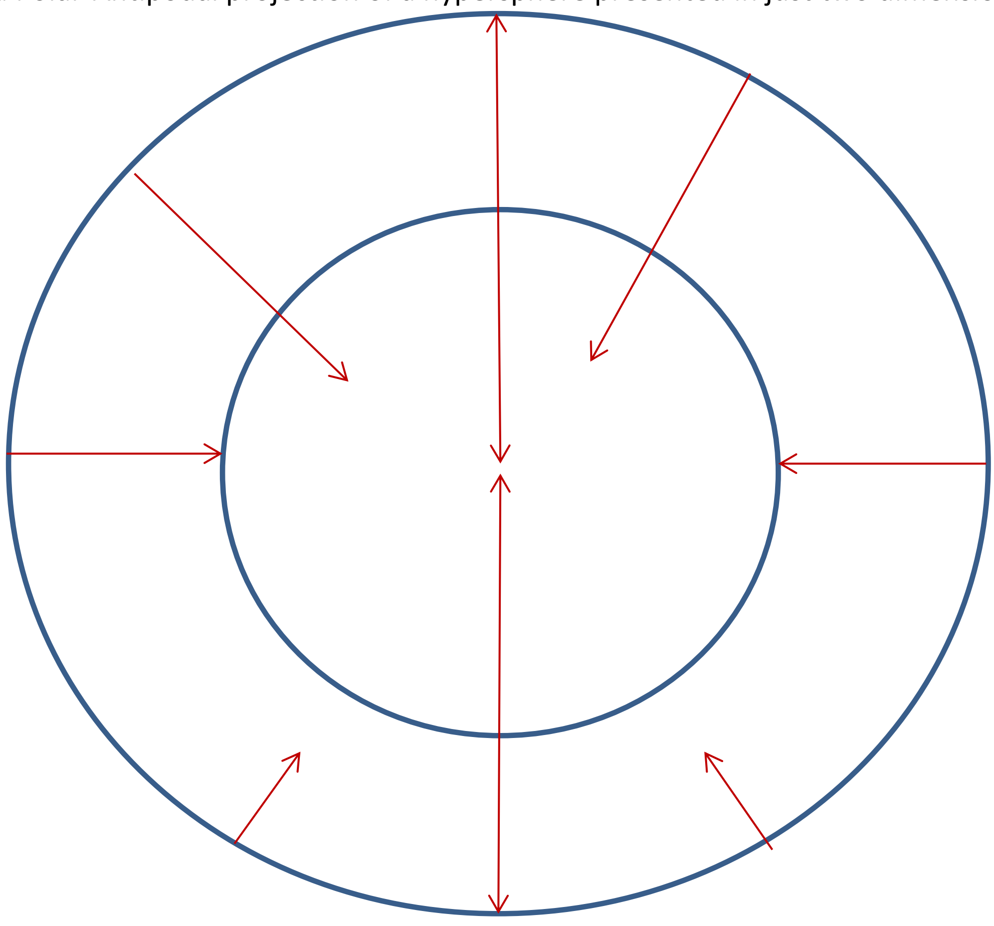
Abstract. This paper provides a method of visualising the rotation of a hypersphere (3-sphere or 4 ball) on the inside. As such, it may represent the actual behaviour of the universe and this paper gives figures which may apply to the universe and which await observational confirmation. As a hypersphere will 'rotate' in a more complex way than a simple ordinary sphere (2-sphere), we can refer to it as a vorticitation.

**Visualising Hypersphere Vorticitation.**

Consider a Polar-Antipodal projection of a hypersphere presented in just two dimensions.



The central point of the inner circle represents the position of an observer, the inner circle represents the halfway to antipode distance for that observer and the circle itself represents a sphere around the observer. The outer circle represents the antipode to the observers position as a surrounding sphere, analogous to the way in which the south pole stretches all the way around the horizon when we make a polar projection of the earth and then 'unwind' the southern hemisphere around the northern hemisphere.

Now all points in the hypersphere rotate around great circles to their antipode positions and back. The great circles in a hypersphere have a circumference of twice the hyperspheres antipode distance.

The position of the observer could rotate through a circle on any plane at right angles to a line drawn from the initial position to anywhere on the antipode line. The diagram shows just two possible lines, the ones corresponding to points just slightly either side of the observer.

Bodies starting from other positions and the lines about which their rotation circles lie orientated appear as the points of the arrows with their antipode positions corresponding to the point at the other end of the line.

Now the orientations of the planes of rotation of bodies about their lines has a random distribution. A hyperspherical universe as a whole has no overall direction of rotation, the bodies within it simply move in randomly orientated great hyperspherical great circles and this prevents it from collapsing under its own small positive gravitational spacetime curvature, according to the equation:

$\omega = \sqrt{2\pi G d}$ see Hypersphere Cosmology http://vixra.org/abs/1601.0026

Thus any two very distant bodies may appear to an observer to gradually move closer together or further away from each other as the angle between their positions gradually changes. This effect will appear almost immeasurably small as the following calculation shows.

If $\frac{M}{L} = \frac{c^2}{G}$ Where m = Mass of universe and L = Antipode length

And if we take the Hubble time x lightspeed as the Antipode length

Then M = $1.758 \times 10^{53}$ kg, a reasonable figure in accord with observation of the universe.

And $\frac{c^2}{L} = A$ = $6.6886 \times 10^{-10}$ $m/s^{-2}$ The residual Anderson Pioneer Deceleration

corresponding to the small positive curvature of a hyperspherical universe, which also causes galactic redshift, flattens galactic rotation curves without dark matter, and creates a lensing effect which obviates the need of dark energy to explain ‘accelerating expansion’.

If any body rotates to its antipode point and back in twice the Hubble time of 13.8bn light years then it rotates at a rate of just 0.0046 arcseconds per century. Thus the maximum and minimum observable angular changes between any two very distant bodies (which do not gravitationally effect each other significantly) will correspond to precisely twice this, i.e. 0.0096 arcseconds per century.

Careful measurement of the relative positions of very distant bodies over long periods may show small random changes with ± 0.0096 arcseconds per century as the maximum observed.

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